An Investigation of the associations between hangover symptom cluster severity, individual differences, and cognitive performance.

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List of tables and figures.

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Declaration.

I declare that this thesis is my own original work and has not been submitted, in whole or in part, in any previous degree award. The thesis is presented in the alternative format, including four articles that are either published or in preparation. I confirm that appropriate credit has been given below in respect of multiple author publications.

W. Sam. S. Royle

Paper contributions.

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Abbreviations.

5-HIAA - 5-hydroxyindoleacetic acid

5-HTOL - 5-hydroxytryptophol

Acetyl-CoA - Acetyl coenzyme A

ADH – Alcohol dehydrogenase

AHS – Acute hangover scale

AHSS – Alcohol hangover severity scale

ALDH – aldehyde dehydrogenase

AUD – Alcohol use disorder

AUDIT - Alcohol Use Disorder Identification Test

BAC – Blood alcohol concentration

BAES – Biphasic alcohol effects scale

BSRI – Brief state rumination inventory

DASS – Depression anxiety and stress scale

DEQ – Drug effects questionnaire

DERS - Difficulties in emotion regulation scale

eBAC – Estimated blood alcohol concentration

EEG – Electroencephalography

ERQ – Emotion regulation questionnaire

EtG – Ethyl glucuronide

EtS – Ethyl sulfate

GABA - gamma aminobutyric acid

HSI - Hangover Signs Index

HSS – Hangover symptoms scale

IFN - Interferon

IL – Interleukin

mAHSS – Modified alcohol hangover severity scale

MAO - monoamine oxidase

NAD+ - Nicotinamide adenine dinucleotide

NADH - Nicotinamide adenine dinucleotide hydrogen conjugate

NADP+ - nicotinic adenine dinucleotide phosphate

NADPH - nicotinic adenine dinucleotide phosphate hydrogen conjugate

NHS – National Health Service

PC – pain catastrophising

PCS – pain catastrophising scale

POMS – Profile of mood states

PTQ - Perseverative thinking questionnaire

SMAST - Short Michigan Alcoholism Screening Test

TNF – Tumor necrosis factor

Abstract.

Alcohol hangover is the combination of negative symptoms experienced after a single episode of alcohol consumption, when blood alcohol concentration is approaching 0. Hangover has economic costs and links to alcohol-related health outcomes, but neither the mechanisms of hangover, nor the mediators of hangover experience are fully understood. Mixed evidence has been found for a variety of individual difference-based influences on hangover severity, including measures of personality, and emotion regulation ability. This may be explained by the use of self-report measures of hangover severity that reduce hangover to a single score. Hangover symptomologies may elucidate relationships between hangover severity and individual differences, as well as hangover-related outcomes, such as cognitive performance in hangover. This thesis explores severity of symptom clusters in hangover and their relation to individual differences and cognitive performance during hangover. A survey addressing hangover symptom severity indicated two symptom clusters in the Acute Hangover Scale, 'headache and thirst', and 'gastric and cardiovascular' symptoms. Additionally, both symptom clusters were shown to be independently positively associated with pain catastrophising. A further survey investigating psychological distress, maladaptive coping, and hangover symptom cluster severity confirmed these symptom clusters. Neither psychological distress or maladaptive coping were associated with symptom cluster severity, but were both related to a 1-item measure of hangover severity, with maladaptive coping partially mediating the relationship between distress and 1-item hangover severity. Finally, a novel paradigm was developed to permit the remote experimental investigation of cognitive performance during hangover. Results showed increased effects of task irrelevant information on performance, with hangover symptom cluster severity correlating with different aspects of performance during hangover. Collectively, results indicate the presence of symptom clusters in hangover associated with different performance outcomes, providing novel insight into hangover outcomes. Future research into hangover symptom clusters may potentially help to further elucidate both physiological mechanisms of hangover, and relationships between hangover experience, individual differences, and health outcomes.

COVID-19 impact statement.

The COVID-19 pandemic had a considerable impact on the ability to conduct research generally, but in particular on research that has typically required extended social contact to complete. Experimental hangover research has typically relied on participants attending laboratories for the supervision of alcohol consumption and testing. This was not possible during the course of the COVID-19 pandemic, and, for the purposes of this thesis, necessitated the development of a novel remote approach to alcohol challenge research. This development presented a number of challenges, as no previously published research has presented a methodology that involved the remote administration of doses of alcohol. Alcohol administration requires a variety of considerations with regards to participant safety, and subsequently the ethical conduct of research. This resulted in a considerably extended timeline for both the development and approval of research included in this thesis examining the cognitive effects of hangover. The timeline for approval of this remote alcohol challenge research (presented in chapters 4 and 5) exceeded 9 months. This extended research approval timeline precluded the ability to further expand to investigations of the biological correlates of hangover severity and the cognitive effects of hangover, as had been originally planned. This research would have allowed us to examine relationships between the hangover symptom clusters that are identified within the thesis and physiological/biological markers of hangover, and may have revealed links between mechanisms of hangover and specific symptoms.

Chapter 1: Characterising alcohol hangover and reviewing individual difference factors associated with hangover severity.

1.1 Thesis introduction

The alcohol hangover represents a prevalent but poorly understood aspect of alcohol use, with implications for health (Išerić et al., 2024; Piasecki et al., 2010; Vatsalya et al., 2019) economic productivity (Bhattacharya, 2019), and public safety (Frone & Verster, 2013; Høiseth et al., 2015). Estimates suggest that 77-95% of drinkers will experience alcohol hangover (Harburg et al., 1993; Howland, Rohsenow, & Edwards, 2008; Kruisselbrink et al., 2017), with early research indicating 25% of students experienced hangover in the past week (Meilman et al., 1990). Despite the high prevalence of hangover in the drinking population, hangover has received comparatively little attention in research literature. Searches of the PubMed database for "alcohol intoxication" resulted in 3,572 results, and "chronic alcohol" resulted in 6,021 results. In contrast, a search for "alcohol hangover" returned 161 results, demonstrating the higher prevalence of research on acute and chronic effects of alcohol consumption in comparison to hangover research.

Research has indicated a variety of biological factors that influence the experience of hangover (e.g. Slutske et al., 2014; Turner et al., 2024; Verster, 2006), and some individual difference factors have been associated with the experience of hangover, including coping (Terpstra et al., 2022), emotion regulation (Gunn et al., 2021a) and subjective intoxication (Verster, Arnoldy, et al., 2020). These factors do not, however, fully account for the variability in hangover severity observed. Likewise, though cognitive effects of hangover have been established (Gunn et al., 2018), there is a lack of reliable associations between hangover severity and cognitive outcomes in hangover, which may have implications for longer-term health outcomes (Piasecki et al., 2005). This thesis aims to develop understanding of alcohol hangover symptomology, the predictors of hangover severity, and the consequences of hangover. The thesis is presented in the 'alternative/journal format' and consists of 5 papers, as well as a general discussion. This chapter will aim to define and characterise alcohol hangover by summarising knowledge of the biological processes that lead to hangover following alcohol consumption, as well as the consequences of alcohol hangover for cognition. It will also explore variability in the hangover experience based on a systematic

review of individual difference factors that have been associated with the severity of alcohol hangover.

1.2 Abstract.

Hangover is a poorly understood consequence of alcohol consumption with implications for health and economic productivity. The experience of hangover has been associated with a number of biological mechanisms, including oxidative stress, inflammation, and congener content of drinks, as well as effects on a number of domains of cognition. The variability in hangover severity ratings, however, is not sufficiently accounted for within current knowledge. One contributor to this may be the role of individual difference factors in hangover severity ratings. A systematic review of research examining relationships between hangover severity and individual difference factors was therefore conducted. Nineteen studies were identified for inclusion in the review, addressing mood, personality, resources for responding to stress (emotion regulation/resilience/coping), perceived functioning, and subjective intoxication during the alcohol consumption that led to hangover. Limited measures have been reliably associated with hangover severity, with the strongest evidence for a relationship between subjective intoxication and hangover severity, that may be indicative of opponent processes. Measures of mood have been examined on several timeframes, including general mood, mood during drinking and mood during hangover. General mood does not show relationships with hangover severity, with limited evidence of relationships between mood during drinking and hangover severity that should be explored. Mood during hangover is more reliably associated with hangover, though not consistently. This may be because negative affect is generally considered a symptom of hangover, with research that failed to find a relationship based on measures of hangover severity that focus on somatic symptoms. In contrast, broad measures assessing traditional conceptualisations of personality (e.g. the Big Five model) do not appear to explain variability in hangover severity. Significant relationships between broad measures of personality and hangover severity may indicate that traits more specifically related to the experience of, and responses to, pain and stress, are predictive of hangover severity. Research examining resources for responding to stress have not, however, consistently shown relationships with hangover severity, though emotion regulation measures show promise in this regard, and require further investigation. Finally, Hangover severity has been

associated to perceived functioning, however it is not clear how this relates to measures of actual performance. Future research should explore the time-course of intoxication and hangover to explore potential for opponent processes, relationships between perceived and actual performance in hangover, and relationships between hangover symptom severity and traits associated with the experience of pain.

1.3. Alcohol use prevalence and disease burden.

The National Health Service (NHS) Health survey for England conducted in 2021 indicated that 79% of adults in the United Kingdom (UK) had engaged in the use of alcohol in the last 12 months, with 28% of men, and 15% of women drinking to a level associated with adverse health outcomes (NHS, 2022). Alcohol is the most widely used recreational drug in England, with a report indicating that in 2019, 54% of adults had consumed alcohol in the past week, with 30% of men and 15% of women drinking more than the recommended weekly limit for the UK of 14 units of alcohol per week (Zambon, 2021), and 84% of those aged 16+ consuming alcohol at least once in the last year (NHS, 2022). Comparatively, the most common illicit drug is cannabis, with 7.8% of adults reporting cannabis use in the last year (Stripe, 2020), illustrating the high prevalence of alcohol-use compared to other psychoactive drugs. In the UK, maximum daily alcohol consumption in the last week has been decreasing since 2009, and the number of people who haven't consumed alcohol in the past 12 months has increased from 17% to 21% in the decade since 2011 (NHS, 2022), demonstrating trends towards lower alcohol consumption in the population. Alcohol-related health problems, however, are still a considerable issue, with approximately 271 thousand hospital admissions in England primarily attributable to alcohol recorded in a year between 2021 and 2022 (NHS, 2023). Previous estimates have suggested that 2% of all hospital admissions are associated with alcohol use (Zambon, 2021), and particular groups, such as those experiencing greater deprivation, are at higher risk of alcohol-related mortality (Jones et al., 2015).

In addition to healthcare costs, a variety of broader economic costs are also associated with alcohol use (Rehm et al., 2009), with a proportion of societal costs associated with lost productivity (Manthey et al., 2021). One source of lost productivity and economic costs associated with alcohol use is the lingering next-day effects of alcohol, known medically as 'veisalgia', but colloquially referred to as 'hangover'. The following

sections will characterise alcohol hangover and describe our current understanding of the biological underpinnings and impact of hangover on physiology and everyday functioning.

1.4. Characterising alcohol hangover.

1.4.1. What is alcohol hangover?

Hangover is broadly defined as "a combination of negative mental and physical symptoms, which can be experienced after a single episode of alcohol consumption, starting when blood alcohol concentration (BAC) is approaching 0" (Verster et al., 2020). The alcohol hangover was first described in the Susruta Samhita, a Sanskrit medical textbook dated to approximately 1000BC (Verster, 2012). The symptoms of *para-mada*, the 'reactionary effects of the abuse of wine', included thirst, headache, and a sense of heaviness in the body. Today, the most common symptoms of hangover still include tiredness, headache, and thirst (Rohsenow et al., 2007), but a wide variety of symptoms have been associated with the hangover experience (Penning et al., 2012). These symptoms include gastrointestinal complaints such as nausea and stomach aches, as well as cardiovascular effects (e.g. the sensation of an increased heart rate), and psychological effects, such as anxiety and depression.

Hangover has been recognised as a general sign or symptom of a medical disease as part of the 11th revision of the International Classification of Diseases (World Health Organisation, 2021), indicating the greater significance that is being given to hangover in the consideration of illness and disease. Hangover has, however, been equated with intoxication, which, it has been argued by Verster, van Rossum, et al., (2021), discounts the definitional difference between intoxication and post-intoxication (hangover) symptoms, reinforcing the need for continued research on hangover and its implications for disease.

The experience of alcohol hangover symptomology is highly variable, with between 5% and 23% of people reporting hangover resistance (Howland et al., 2008; Kruisselbrink et al., 2017). The incidence and severity of symptoms of hangover are known to vary between different people and different drinking episodes, even when the amount of alcohol consumed is the same (Verster et al., 2020). Measures of hangover are predominantly based on ratings of the incidence or severity of common symptoms of hangover. The 3 most commonly utilised measures of hangover severity in research are the Acute Hangover Scale (AHS; Rohsenow et al., 2007), the Hangover Symptoms Scale (HSS; Slutske et al., 2003), and

the Alcohol Hangover Severity Scale (AHSS; Penning et al., 2013). Though there are some consistencies in the symptoms listed within these scales, there are also some key differences. The AHS consists of 8 symptomatic items, as well as a rating of general hangover, and focuses on somatic symptoms of hangover such as headache, stomach ache, and nausea. Comparatively, the HSS and AHSS include psychological symptoms. The HSS includes 13 symptoms, and includes items regarding concentration problems, anxiety and depression. Likewise, the AHSS is a 12 item measure and includes clumsiness, confusion, and concentration problems. A total of 22 symptoms are included across the 3 different hangover severity questionnaires, but given the wide variety of symptoms that have been associated with hangover (Penning et al., 2012), these measures do not necessarily capture all the possible symptoms of hangover, and may therefore not capture the full breadth of the experience. For this reason, it has been proposed that single-item measures of hangover severity may be more effective in capturing hangover severity, as participants are able to consider everything that is contributing to their experience of hangover (Verster et al., 2020).

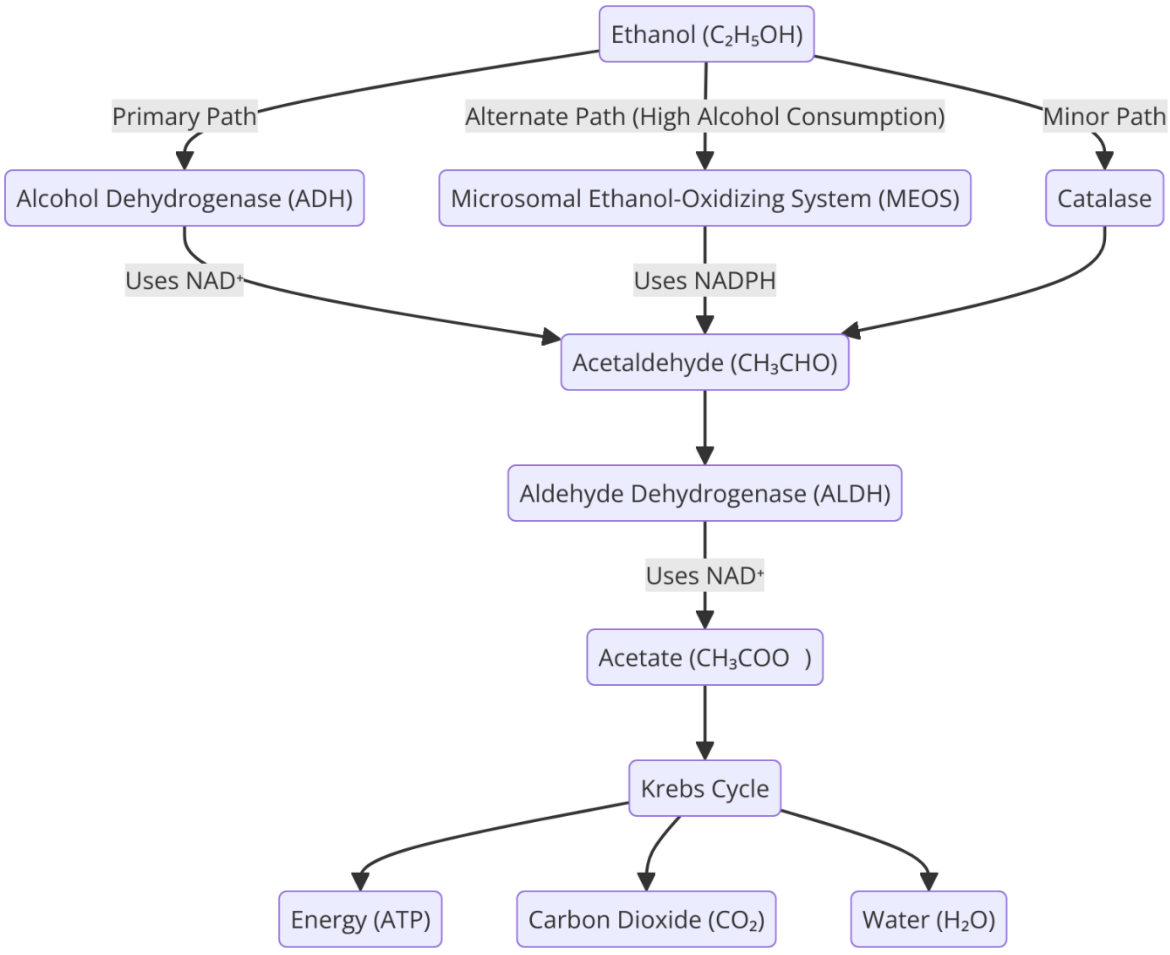
1.4.2. The biology of alcohol hangover.

1.4.2.1. Alcohol metabolism.

By definition, alcohol hangover is inherently linked to the consumption of alcohol, and so it is often viewed from a psychobiological perspective. When consumed, alcohol is metabolised in humans via 2 major oxidative pathways: the alcohol dehydrogenase pathway and the microsomal ethanol-oxidising system. The primary pathway for the metabolism of alcohol is the alcohol dehydrogenase pathway and involves conversion of ethanol to acetaldehyde via the enzyme alcohol dehydrogenase (Edenberg, 2007). This oxidation is facilitated by the reduction of nicotinamide adenine dinucleotide (NAD+) to a conjugation with hydrogen (NADH). The resulting acetaldehyde is rapidly metabolised to acetate via another enzyme, aldehyde dehydrogenase. Again, this oxidation is facilitated by the reduction of NAD+ to NADH. Acetate is then converted into acetyl coenzyme A (acetyl-CoA), which is then utilised in energy production as part of the Krebs (citric acid) cycle. These processes occur in both the liver and stomach at lower to moderate levels of alcohol consumption. At higher levels of alcohol consumption, a secondary metabolic pathway is responsible for increased ethanol oxidation (Cederbaum, 2012). This pathway is known as

the microsomal ethanol-oxidising system (Teschke, 2019), and occurs in the endoplasmic reticulum of liver cells. Key to this pathway is the catalysation of ethanol oxidation by cytochrome P450 2E1. Via this pathway, the oxidation of ethanol to acetaldehyde is facilitated by concurrent oxidation of nicotinic adenine dinucleotide phosphate conjugated with hydrogen (NADPH) to a version with no conjugated hydrogen (NADP+) using molecular oxygen. The produced acetaldehyde is then metabolised in the same way as in the alcohol dehydrogenase pathway. A further minor pathway of alcohol metabolism is based in the oxidation of ethanol via catalase.

Figure 1. Diagram illustrating oxidative metabolism pathways for ethanol in humans.



1.4.2.2. Genetic variability of alcohol metabolism

A number of factors may affect the oxidative metabolism of ethanol, and may contribute to the experience of alcohol hangover. These include variations in the genes that encode for the enzymes employed in oxidative metabolism of ethanol; alcohol dehydrogenase (ADH) and aldehyde dehydrogenase (ALDH). Variations in the

pharmacokinetic properties of these enzymes can result in either particularly active or inactive enzymes, and have been linked to addiction outcomes (Edenberg, 2007). A primary example of genetic variation affecting ethanol metabolism is seen in the genes encoding ALDH. Asiatic populations have a comparatively high prevalence of ALDH2*2 alleles which results in a reduced ability to metabolise acetaldehyde and therefore an increased level of acetaldehyde in blood after alcohol consumption (Chen et al., 2021). This variation in ALDH gene manifests as an increased sensitivity to alcohol with greater subjective effects, increased heart rate, and flushing responses (reddening of the skin, often on the face or neck, caused by vasodilation and increased blood flow). These populations also have lower rates of alcohol addiction, and report more severe hangover following alcohol consumption (Wall et al., 2000). Overall, genetic influences on hangover have been estimated to account for 24% and 16% of variability in hangover susceptibility in men and women respectively (Slutske et al., 2014).

1.4.2.3. Metabolic mediators of hangover severity.

Differences between individuals in ethanol metabolism rate have been associated with hangover, with faster metabolism of ethanol associated with less severe hangovers, and slower metabolism of ethanol associated with more severe hangovers (Mackus et al., 2020). Direct relationships between blood alcohol concentrations and hangover severity have been observed, whereas no such relationship appears evident between blood acetaldehyde concentrations and hangover severity (Mackus et al., 2020), indicating acetaldehyde is not directly related to hangover symptomology. Mackus et al. (2020) suggested that this is because ethanol can cross the blood brain barrier, whereas acetaldehyde cannot. Acetaldehyde is also rapidly metabolised, which may limit toxic effects (Palmer et al., 2019). In contrast, acetate can cross the blood brain barrier, and has been associated with the experience of hangover headache in rats (Maxwell et al., 2010). Research on the potential role of acetate in hangover severity, however, is lacking. Mackus et al. (2020) argue that acetate is unlikely to play a critical role in the pathology of hangover as it is used as a common food additive and not associated with adverse effects when consumed as part of typical diet. Acetaldehyde and acetate are therefore not considered to be primary causes of hangover symptomology.

Though the primary routes of ethanol metabolism are based in oxidation of ethanol, a number of other processes may occur that result in detectable metabolites. These include; ethyl glucuronide (EtG), a product of glucuronidation of ethanol in the liver; ethyl sulfate (EtS), a product of sulfation of ethanol in the liver; phosphatidylethanol, a product of transphosphatidylation of ethanol within cell membranes; and fatty acid ethyl esters, produced as a product of esterification of ethanol with fatty acids (Nguyen et al., 2018; Vela et al., 2021). As direct metabolites of ethanol, these markers provide an indicator of alcohol consumption over longer periods than ethanol itself, which is metabolised relatively rapidly. Of these metabolites, EtG, EtS, and fatty acid ethyl esters may have particular relevance to hangover, as they remain detectable in blood/plasma for 1-2 days after drinking. Comparatively, phosphatidylethanol is detectable in blood for 2-3 weeks after drinking and is more commonly used as an indicator of chronic alcohol consumption. Fatty acid ethyl esters can be found in blood for 24 hours following alcohol consumption and detection in hair is used for longer term detection of alcohol use (Wurst et al., 2015), however no research appears to have assessed the presence of fatty acid ethyl esters in relation to hangover severity. EtG and EtS are both elevated the day after alcohol consumption, however concentrations in blood do not correlate with overall hangover severity (Mackus, van de Loo, et al., 2017). At a symptomatic level, EtG did correlate with the severity of headache during hangover, which may indicate a relationship with some symptoms of hangover.

1.4.2.4. Alcohol hangover and dehydration.

Dehydration has been proposed as a mechanism for hangover (Penning et al., 2010; Tipple et al., 2016), given the diuretic effects of alcohol (promotion of electrolyte and water loss through urine production; Hobson & Maughan, 2010). Vasopressin, a hormone released from the kidney in response to dehydration, is supressed by the consumption of alcohol. Vasopressin has not been found to correlate with self-reported hangover severity, though greater levels of vasopressin have been observed in hangover compared to sober states (Penning et al., 2010). In comparison, decreases in blood glucose, and increases in blood lactate, which would be indicators of hypoglycaemia, were not observed between hangover and sober states in a small sample, though the quantities of alcohol administered were relatively small (Kruisselbrink et al., 2006). A recent review by Mackus et al (2024) examined the impact of thirst and water consumption on alcohol hangover severity, theorising that if

dehydration were a significant causal factor, the consumption of water would alleviate hangover symptoms. The authors concluded that hangover and dehydration are two co-occurring but independent consequences of alcohol consumption.

1.4.2.5. Alcohol hangover and the inflammatory response

Though acetaldehyde and acetate are not generally considered to be responsible for hangover symptoms, the oxidative metabolism that produces these metabolites does have an effect on free-radical/antioxidant concentration balances, creating oxidative stress. Oxidative stress is thought to promote inflammation during hangover (Karadayian et al., 2019; Mackus et al., 2020; Palmer et al., 2019; van de Loo et al., 2020), which may be responsible for the experience of certain hangover symptoms and can be assessed by examining levels of inflammatory cytokines. Cytokines are proteins involved in both the initiation and persistence of pathologic pain (Zhang & An, 2007). Changes in cytokine response have been observed between hangover and control conditions (Kim et al., 2003; Raasveld et al., 2015), however, when immunological reactivity was compared between hangover-sensitive and hangover-resistant drinkers no significant differences were observed (Raasveld et al., 2015). Conversely, van de Loo, Mackus, et al. (2020) re-analysed data from two previous studies that had examined the physiological effects of hangover interventions (Kim et al., 2017; Mammen et al., 2018), in order to evaluate the relationship between hangover severity and immunological cytokine biomarkers. This was achieved by examining the relationships between hangover severity and indicators of immunological response in placebo (alcohol only) conditions across each investigation. This re-analysis did show significant relationships between hangover severity and interleukin-6, tumour necrosis factor-alpha, and C-reactive protein, as well as markers of oxidative stress (malondialdehyde and 8-isoprostrane). The exclusion of participants who did not report hangover symptoms limits the applicability of these correlations to broader samples, as markers of inflammation may still be altered in those who do not report hangover symptoms. Drinkers who report hangover-immunity do still exhibit significant changes in cytokine concentrations during hangover, though the effect is more pronounced in hangover sensitive drinkers (Merlo et al., 2023). Inflammation then is likely to play a role in hangover symptomology, but is not sufficient to account for variation in reported hangover severity.

1.4.2.6. Alcohol hangover and mitochondrial bioenergetics.

Oxidative stress is also associated with mitochondrial dysfunction (Tsermpini et al., 2022). Alcohol consumption causes disruption to mitochondrial membrane potentials and the mitochondrial respiratory chain (Steiner & Lang, 2017), which is responsible for the production of adenosine triphosphate, a key source of cellular energy. Disruption of bioenergy systems by alcohol may provide an explanation for common symptoms of hangover, such as fatigue or tiredness. Disruption of mitochondrial function may also cause neurological changes following consumption of alcohol (Reddy et al., 2013) which may be linked with cognition. Alterations to mitochondrial function of cells from the central nervous system of mice have been demonstrated during hangover, alongside disruptions to motor functions (Bustamante et al., 2012; Karadayian et al., 2014, 2016, 2017). Alterations to neural bioenergy systems may explain observations of neurological changes seen in hangover in humans.

1.4.2.7. Neurological function and neurotransmitter systems during hangover

Early research using electroencephalography (EEG) indicated resting state decreases in alpha activity and increases in theta activity, indicating lower relaxation and higher cognitive effort, respectively (Sainio et al., 1976). More recent research has shown reduced reward-positivity in event-related EEG signals during a 2-armed bandit task, indicating a reduced brain response to positive feedback in hangover compared to sober states (Howse et al., 2018). Disturbances to brain reward deficits have also been observed in rat studies (Schulteis & Liu, 2006). Likewise, alterations to the N1, N2, and P1 components of event-related potentials have been observed in hangover compared to sober states, during a moving-dots paradigm task (Stock et al., 2017). These findings are proposed to indicate attentional selection, conflict monitoring, and perceptual gating changes, and may be due to changes in gamma aminobutyric acid (GABA) based signalling in the brain. GABA is an inhibitory neurotransmitter, and it is well established that acute alcohol use leads to increases in GABAergic activity that are associated with the psychoactive effects of alcohol (Kumar et al., 2009). Interestingly, Stock et al. (2017) found opposing effects for hangover and acute intoxication that are aligned with opponent-process theories of alcohol addiction (Koob, 2013; Koob & Volkow, 2010), and may indicate reduced GABAergic activity during hangover. Glutamate, an excitatory neurotransmitter affected by alcohol use, has also been

proposed to influence the experience of hangover (Palmer et al., 2019), with changes in glutamatergic neurotransmission in the gray matter of the midbrain associated with hangover anxiety in rats (Ezequiel Leite & Nobre, 2012). Research addressing the neurological basis for hangover is sparse, particularly in human participants, and would benefit from the introduction of varying neuroimaging modalities such as positron emission tomography (PET), which would allow for further investigation of neurotransmission effects of alcohol hangover.

Alcohol is also known to alter the metabolism of serotonin (5-hydroxytryptamine). Serotonin is primarily metabolised via a pathway in which the enzyme monoamine oxidase (MAO) converts serotonin to 5-hydroxyindoleacetaldehyde, which is rapidly oxidised to produce 5-hydroxyindoleacetic acid (5-HIAA), which is excreted in urine (Kema et al., 2000). A minor pathway metabolises serotonin via reduction with ADH, and produces 5-hydroxytryptophol (5-HTOL), which is also detectable in urine. Alcohol consumption inhibits the action of MAO, resulting in decreased levels of 5-HIAA and shifts metabolism toward the production of 5-HTOL (Beck & Helander, 2003), so reductions in 5-HIAA and increases in 5-HTOL can be used as indicators of recent alcohol consumption. These biomarkers do correlate with measures of alcohol consumption, but have failed to correlate with measures of hangover severity (Mackus et al., 2021). This suggests that alterations to serotonin metabolism caused by alcohol consumption are not associated with the severity of hangover symptoms.

1.4.2.8. Congeners and alcohol hangover.

Beyond levels of alcohol consumption, which often show relatively weak relationships with alcohol hangover severity (Penning et al., 2010), variability in hangover experience has been associated with a number of psychophysiological factors that may act via alterations to alcohol metabolism. Alcoholic drinks contain a number of biologically active compounds that are not ethanol or water, known as congeners. Congeners are produced as a result of distilling and fermenting processes (Rodda et al., 2013; Stanzer et al., 2023). Congeners include compounds such as esters, aldehydes, ketones, acids, phenols, sulphur compounds, terpenes, and fusel and short-chain alcohols other than ethanol, such as methanol. These may impact the experience of hangover due to their own toxic metabolites, for example, methanol is metabolised to formaldehyde and formic acid which

are both toxic (Penning et al., 2010). Alternatively, the presence of congeners may alter the pharmacokinetics of ethanol (Haseba et al., 2007). Early research indicated increased severity of hangover following consumption of whisky in comparison to vodka (Damrau et al., 1960), a result that has been replicated in modern research (Rohsenow et al., 2010). In contrast, a comparison of vodka, beer, and whisky, did not find that beverage type was a predictor of hangover incidence in a model including age, sex, average daily volume of alcohol, and family history of drinking problems, though this may be due to the measurement of hangover as a binary indicator of incidence (Howland, Rohsenow, Allensworth-Davies, et al., 2008).

There is some evidence that the severity of hangover symptom severity correlates with urinary methanol during hangover (Bendtsen et al., 1998). In contrast, Mackus, Van de Loo, et al. (2017) found that though methanol is elevated during alcohol hangover, urinary methanol only correlated with ratings of vomiting during hangover in hangover sensitive drinkers. This discrepancy may be explained by the use of different hangover severity measures, or may be a product of combined methanol/ethanol metabolism. Methanol, like ethanol, is metabolised via oxidation catalysed by ADH, resulting in the production of formaldehyde. Formaldehyde is metabolised to formic acid via ALDH, before the one-carbon metabolism pathway further breaks down formic acid to carbon dioxide and water that is excreted or exhaled (Barceloux et al., 2002). As methanol and ethanol are broken down by the same metabolic pathways, ethanol outcompetes methanol for enzymatic activity resulting in delayed methanol metabolism (Hovda et al., 2017), that may result in prolonged periods of oxidative stress that could contribute to more severe hangover symptoms.

1.4.2.9. Alcohol hangover, age, and sex.

Sex has been proposed to mediate the experience of hangover due to a combination of differences in body composition and the metabolism of ethanol. Females have a lower proportion of total body water through which ethanol is distributed following consumption (Seidl et al., 2000). This means that the same quantity of alcohol will result in a higher BAC in females compared to males, though modern research typically examines hangover in relation to BAC, rather than measures of the alcohol consumed to account for this difference in body composition. Metabolic differences between males and females appear to be due mainly to lower levels of gastric, or hepatic first-pass, metabolism in

females, which may manifest as stronger effects of alcohol, quicker onset of intoxication, and longer durations of intoxication (Baraona et al., 2001; Frezza et al., 1990; Thomasson, 2002). Sex differences have been observed in hangover severity at varying BACs, though these are of small magnitude (van Lawick van Pabst et al., 2019a) suggesting differences in gastric and hepatic first-pass metabolism do not produce meaningful differences in hangover experience. Interactions between sex and age have also been observed in hangover experience such that the correlation between age and hangover severity is greater in males than female (Verster, Severeijns, et al., 2021).

Age influences the metabolism of ethanol with the activity of enzymes decreasing in older individuals (Meier & Seitz, 2008), however, hangover severity actually appears to decrease with age. Probability of reporting a severe hangover is reduced in older age groups (Tolstrup et al., 2014), such that those aged 60 years or more report severe hangovers less commonly following binge drinking than those aged 50 to 59 years, 40 to 49 years, 30 to 39 years, and 18 to 29 years. Indeed, odds ratios comparing each of these age groups to those aged 60 years or more indicate that the comparative probability of reporting severe hangover following binge drinking increased across the descending age groups, being highest in the 18 to 29 year old participants. Relationships between hangover severity and age have been reported to interact with drinking levels such that younger people report more severe hangovers, particularly at higher drinking levels (Huntley et al., 2015). The negative relationship between hangover severity and age appears to be independent of BACs achieved (Verster, Severeijns, et al., 2021). One proposal to explain why hangover severity decreases when ethanol metabolism efficiency is decreased is that older people become more able to avoid hangover or cope with the symptoms (Tolstrup et al., 2014), suggesting individual differences that vary with age may be responsible for relationships between age and hangover severity.

The biology of alcohol hangover then, has been established to incorporate immune responses, mitochondrial dysfunction, and oxidative stress that occurs following alcohol consumption, though recent proposals have also suggested that changes in gut permeability and changes to the microbiome may also play a role (Turner et al., 2024). Biomarker investigations, however, have failed to establish any marker that can be used for the objective measurement of hangover severity (Verster et al., 2020).

1.5. Impacts of alcohol hangover on health and performance.

1.5.1. The relationship between alcohol hangover, drinking habits, and alcohol use disorder.

Hangover has been implicated in alcohol-related health outcomes. Hangover has previously been conceptualised as an acute form of alcohol withdrawal due to the overlapping symptom profile. Early research indicated that chloromethiazole, a medication used to treat and prevent the symptoms of alcohol withdrawal, also reduced hangover severity, as well as reducing blood pressure and adrenaline output during hangover (Myrsten et al., 1980), providing some evidence of a link between alcohol hangover and alcohol withdrawal in alcohol use disorder (AUD). This is, however, likely to be the product of shared mechanisms, given the different time-courses and symptom profiles associated with hangover and withdrawal (Prat et al., 2009). A variety of potential etiological mechanisms have been put forward to explain links between hangover and AUD, including motivational effects of hangover, or that hangover may be a marker of individual differences associated with addiction (Piasecki et al., 2010).

An investigation of hangover symptom frequency across chronotypes indicated increased frequency of; learning difficulties, thirst, tiredness, headaches, and irritability hangover symptoms in evening-type individuals as compared to morning-type or neither-type individuals (Prat & Adan, 2011). Evening type individuals also scored significantly higher on the Alcohol Use Disorder Identification Test (AUDIT; Saunders et al., 1993), indicating increased risk for alcohol use problems in the group reporting more frequent hangover, though no direct assessment of the relationship between AUDIT score and hangover symptom frequency was presented. Hangover incidence has also been associated with local drinking behaviour, with positive hangover incidence associated with increased time to next alcoholic drink when interacting with financial stressors or craving at the end of the drinking episode that led to the hangover (Epler et al., 2014).

The severity of experienced hangover has also been associated with drinking habits and alcohol use problems. Heavier drinkers report more severe hangover (Vatsalya et al., 2018), and those who report more frequent hangovers also report more severe hangovers (Verster et al., 2019). Hangover severity in adolescence predicts future alcohol use and alcohol problems, as well as mediating relationships between family history of alcohol use

disorder and alcohol-related outcomes (Courtney et al., 2018). Likewise, more severe hangovers have been associated with heavier drinking habits and risk for alcohol use disorder as measured by the AUDIT (Vatsalya et al., 2019). AUDIT scores were most strongly related to the 'heart racing' symptom of the AHS, specifically the hazardous drinking and dependence domains of the AUDIT. For the harmful domain of the AUDIT, a close relationship was observed with the symptom thirst, and the dependence domain of the AUDIT showed a close association with ratings of craving during hangover, indicating differential relationships between hangover symptoms and indicators of alcohol use disorder risk. Relationships between hangover experience and risk for alcohol use problems may also be mediated by individual difference factors, with correlations observed between AUDIT score and changes to anxiety observed in hangover ('hangxiety'), in participants high in shyness, but not those low in shyness (Marsh et al., 2019). Though the specific nature of relationships between hangover experience and risk for addiction is poorly understood, a growing body of evidence indicates a relationship, understanding of which may inform development of methods for risk detection and intervention.

1.5.2. Performance effects of hangover.

One potential contributor to relationships between hangover and risk for addiction are the effects of hangover on cognitive processes and performance (Piasecki et al., 2010). Hangover effects on performance are not only potentially related to health outcomes, but also have implications for economic activity. The institute for alcohol studies estimated that productivity losses due to working during hangover or whilst intoxicated cost the UK economy between 1.2 and 1.4 billion pounds per year, with 42% of 3000 respondents indicating they had gone to work whist hungover at least once (Bhattacharya, 2019).

Attention, memory, and executive function domains of cognition demonstrated sensitivity to effects of hangover in earlier research (Stephens et al., 2014), with a systematic review indicating effects of hangover on sustained attention, and mixed results shown for effects of hangover on psychomotor skills, short-term and long-term memory, and divided attention (Gunn et al., 2018). Meta-analysis indicated evidence of decrements in short-term memory, long-term memory, sustained attention, and psychomotor speed in hangover (Gunn et al., 2018).

Further research has indicated impaired performance in inhibitory control tasks (Gunn et al., 2021c; Opitz et al., 2019), impaired multi-tasking performance (Benson et al., 2020), effects on attentional shifting (Devenney et al., 2019b), and changes in the processing of task-irrelevant information (Devenney et al., 2019b; Opitz et al., 2020) during hangover, as well as decrements in psychomotor speed across a number of tasks (Alford, Martinkova, et al., 2020a; Devenney et al., 2019b, 2019a), though evidence for these effects is limited.

As well as impacts on economic productivity caused by hangover-related decrements in cognitive performance, these cognitive impairments have implications for public safety, particularly with regard to hungover driving. With limited exceptions, most countries have limits on the operation of motor vehicles when alcohol is present in the system (World Health Organisation, 2018). Comparatively, no specific legislation addresses driving once alcohol is no longer detectable, but hangover is being experienced. Results indicating cognitive decrements in hangover do manifest in studies of driving performance. Driving simulator-based studies have shown higher maximum speeds in highway driving simulations, greater time spent over the speed limit, and increased standard deviations in speed during hangover, compared to sober testing (Robbins et al., 2019), indicating impairments in speed control during driving. Likewise, divided attention and driving control are impaired in simulated driving tasks, and driving violations are increased (Alford, Broom, et al., 2020). Collectively, evidence regarding cognitive and performance effects of hangover demonstrate the public safety risks associated with hangover, as well as how hangover can impact on productivity.

1.6. Individual differences associated with alcohol hangover severity.

The role of individual differences in experience of hangover following alcohol consumption is indicated by the counterintuitive negative relationships between hangover severity and age (Tolstrup et al., 2014), as ethanol metabolism capacity should decrease with age and result in increased hangover severity. The use of self-report measures for hangover severity means that individual difference factors may provide an explanation for this. A systematic review was therefore conducted to collate research examining relationships between alcohol hangover severity and individual difference factors.

1.6.1. Method.

A literature search was conducted to identify studies examining hangover severity and psychosocial variables published before March 2024. PubMed, Medline, and PsycNET were searched using the terms '(hangover OR alcohol hangover OR ethanol hangover) AND (variability OR variance OR individual differences OR difference)'. Papers were screened by the author, with reference lists and lists of papers citing the identified studies searched for additional articles. Only empirical studies on humans that included a measure of hangover severity with full-texts available in English were included. Studies that only investigated hangover incidence or frequency were excluded.

1.6.2. Results.

1.6.2.1. Included studies

The literature search identified 19 studies for inclusion in qualitative analysis (for a summary of included articles, see Table 1). Literature was classified based on whether it addressed personality, mood, subjective intoxication, resources for dealing with stress (emotion regulation, resilience and coping), or perceived functioning. Most studies addressed multiple categories of individual difference variables, with 11 including measures of mood, 7 addressing emotion regulation, resilience, and coping, 6 addressing personality, 4 addressing subjective intoxication, and 5 addressing perceived functioning. Of the included studies, 11 were based on surveys, and 8 based on experimental methodologies. Figure 2 presents a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram of study exclusions.

1.6.2.2. Relationships between hangover severity and subjective intoxication.

Subjective intoxication is an indicator for the experience of the pharmacological and neurobehavioral effects of alcohol consumption, and has been associated with risk for AUD (Ray et al., 2009). Subjective intoxication is related to BAC, though BAC does not explain all the variance in intoxication, which is also related to personality factors (Celio et al., 2014). Hesse & Tutenges (2009) conducted a survey with 325 participants at a vacation resort, where participants completed responses about any drinking from the previous night, and hangovers experienced. Participants completed the AHS (Rohsenow et al., 2007), as well as a number of questions about their experience drinking the previous night. These included

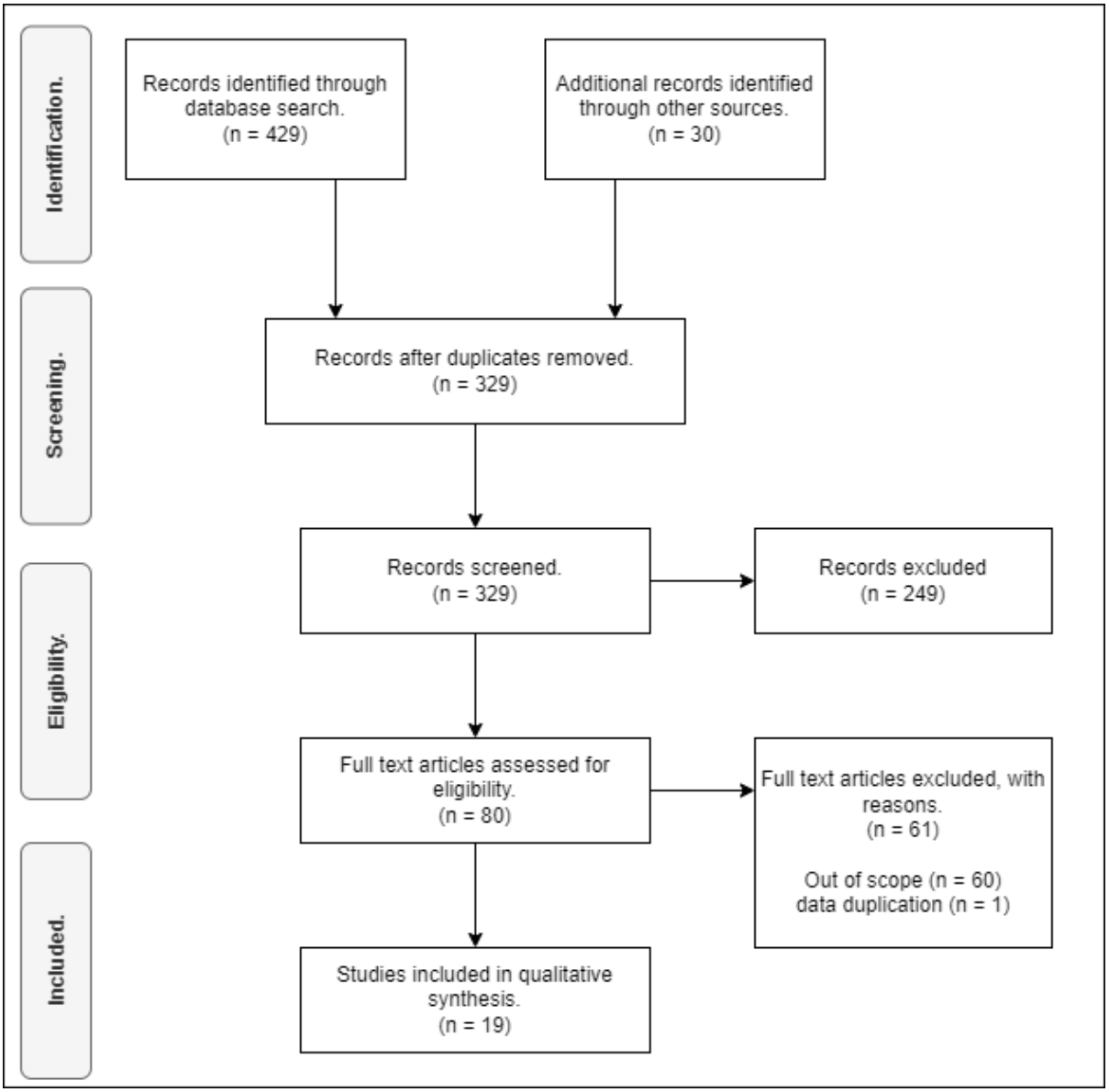
Table 1. Literature identified for inclusion in narrative review.

Year of publication	First Author	Title	Individual difference variables addressed.
2020	Benson S	Alcohol Hangover and Multitasking: Effects on Mood, Cognitive Performance, Stress Reactivity, and Perceived Effort.	Mood
2022	Ceballos NA	Blackouts and hangover experiences among Hispanic and Non-Hispanic White college students	Resilience, emotion regulation & coping; mood
2019	Devenney LE	Cognitive performance and mood after a normal night of drinking: A naturalistic alcohol hangover study in a non-student sample	Mood
2021	Gunn C	Does alcohol hangover affect emotion regulation capacity? Evidence from a naturalistic cross-over study design	Resilience, emotion regulation & coping; mood
1993	Harburg E	Psychosocial factors, alcohol use, and hangover signs among social drinkers: a reappraisal	Personality; Mood
2009	Hesse M	Evening experiences versus drinking indicators as predictors of hangover on a summer holiday	Subjective intoxication
2016	Hogewoning A	Characteristics of social drinkers with and without a hangover after heavy alcohol consumption	Sleep; Mood
2023	Hudson F	Does Personality, Trait Emotion Regulation, and Trait Attentional Control Contribute toward the Experience and Impact of an Alcohol Hangover?	Resilience, emotion regulation & coping; personality; mood
2006	Rohsenow DJ	Effects of heavy drinking by marine academy cadets on hangover, perceived sleep, and next-day ship power plant operation	perceived performance
2012	Rohsenow DJ	Hangover sensitivity after controlled alcohol administration as predictor of post-college drinking	Subjective intoxication
1999	Span SA	Familial risk for alcoholism and hangover symptoms	Personality
2022	Stangl BL	Pharmacodynamic determinants of hangover: An intravenous alcohol self-administration study in non-dependent drinkers	Subjective intoxication
2023	Tellez_Monnery K	Investigating the effects of emotion dysregulation and repetitive negative thinking on alcohol hangover anxiety and depression	Resilience, emotion regulation & coping; mood

Table 1 Cont. Literature identified for inclusion in narrative review.

Year of publication	First Author	Title	Individual difference variables addressed.
2022	Terpstra C	Associations between Mental Resilience, Mood, Coping, Personality, and Hangover Severity	Resilience, emotion regulation & coping; personality; mood
2018	van de Loo AJAE	Impact of mental resilience and perceived immune functioning on the severity of alcohol hangover	Resilience, emotion regulation & coping; perceived performance
2020	van de Loo AJAE	Perceived Immune Fitness, Individual Strength and Hangover Severity	perceived performance; subjective intoxication; mood.
2017	van Schrojenstein Lantman M	The impact of alcohol hangover symptoms on cognitive and physical functioning, and mood	Mood; perceived performance
2023	Verster JC	Predictors of Hangover Frequency and Severity: The Impact of Alcohol Consumption, Mental Resilience, Personality, Lifestyle, Coping and Mood	Resilience, emotion regulation & coping; personality; mood
2020	Verster JC	The Impact of Mood and Subjective Intoxication on Hangover Severity	Subjective intoxication; Mood; perceived performance; personality

Figure 2. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram.



329 articles were screened and 80 had full text assessed. Nineteen articles met inclusion criteria and were considered as part of the narrative review.

questions on whether the participant; got hurt, had fun, did something they regretted, had sex with someone who was not a partner, threw up, kissed someone who is not a partner, danced, got more drunk than intended, had an argument, and had a good time with people they know. Participants were also asked if they still felt drunk, whether they drank 8 or more alcohol units the previous night, whether the participant had been at the resort for more than 3 days, and whether they had experienced blackout during their drinking the previous evening. All of these items were treated dichotomously. Significant relationships were

observed in Chi Square analyses between hangover severity and; number of days at the resort, having drunk more than 8 units the previous night, still feeling drunk, having done something that they regretted, having had sex with someone who was not a partner, having kissed someone who is not a regular partner, having been more drunk than intended, and having had an argument with someone. Regression analyses, however, indicated that only still feeling drunk, having been more drunk than intended, and having been at the resort for more than 3 days were associated with AHS score. These results indicate that feelings of drunkenness both during drinking and during the hangover are associated with reported hangover severity, though participants still feeling drunk during data collection may indicate that participants were not necessarily experiencing a hangover, but rather still intoxicated. Results regarding time at the resort may be indicative of the cumulative effects on hangover severity of repetitive evenings of drinking (Verster et al., 2019).

A further survey-based study with an international sample of 331 young adults visiting Fiji for work or holidays was conducted by Verster et al. (2020). Participants reported on hangover related information over a 3-day period (today, yesterday, and 2 days ago) and completed single-item measures of both hangover severity (0 = absent, to 10 = extreme) and subjective intoxication (0 = sober to 10 = very drunk). Analyses were stratified for each of the days, with participants classed as having a hangover if the 1-item hangover severity score was greater than 0 for that day. Subjective intoxication correlated significantly with hangover severity reports on all 3 days in the hangover groups. Subjective intoxication was also the greatest contributor to hangover severity in regression models, explaining between 37% and 43% of variance in scores for all days. Likewise, van de Loo, Kerssemakers, et al. (2020), conducted a retrospective survey of 199 Dutch students using 1-item scales for hangover severity and subjective intoxication. Partial correlations controlling for BAC's associated with the latest heavy drinking session in the last month, for which hangover was reported, indicated significant positive relationships between hangover severity and subjective intoxication. Subjective intoxication was also the greatest contributor to regression models predicting hangover severity, explaining 50.9% of variance across all participants.

Experimental investigations have also found a relationship between subjective intoxication and hangover severity. Rohsenow et al. (2012) administered high alcohol beer to a 0.12g% breath alcohol concentration in 134 college seniors, in a double-blind placebo-

controlled investigation. Participants consumed a high alcohol beer in the evening and rated their intoxication at peak BACs using a 5-point scale from 'not at all' to 'completely'. The following morning, participants completed the AHS. Correlation analyses indicated a significant moderate-strength relationship between AHS scores and ratings of intoxication at peak BACs. More recently, Stangl et al. (2022) ran a lab-based intravenous self-administration study in which 95 participants were able to control the amount of alcohol received over a 125-minute session, following a priming to .03g% BAC. Participants completed the Drug Effects Questionnaire (DEQ; Morean et al., 2013) and the Biphasic Alcohol effects scale (BAES; Martin et al., 1993) every 15 minutes during the administration session. The DEQ measures subjective effects of a substance based on 5 items; 'do you feel the drugs effects?', 'do you like the drugs effects?', 'would you want more?', 'do you feel high?', and 'do you feel intoxicated?'. The BAES consists of 14 items rated on an 11-point scale and results in scores for the stimulant and sedative effects of alcohol. Prior to completing the alcohol consumption, participants also completed the AUDIT (Saunders et al., 1993), and the Alcohol Effects Questionnaire (AEQ; Rohsenow, 1983), which assesses beliefs about alcohol effects, and consists of 40 true/false statements. The AEQ results in scores for 6 positive effects; global positivity, social and physical pleasure, sexual enhancement, power and aggression, social expressiveness, and relaxation and tension reduction. The AEQ also provides scores for 2 negative effects: cognitive and physical impairment, and careless unconcern.

After completing the self-administration session, participants were surveyed over the following 1-2 days about their hangover experience, based on the AHS. For analyses, participants who scored greater than 0 on the 'hangover' item of the AHS were denoted as hangover positive, whilst those with a score of 0 on the 'hangover' item of the AHS were hangover negative. Participants who were classified as hangover negative had significantly lower negative expectancies based on the AEQ. Mediation analyses of the entire sample indicated a total effect of AUDIT score on AHS score via the DEQ intoxication score, such that higher AUDIT and DEQ intoxication scores predicted more severe hangover. These results support propositions that subjective intoxication is related to the experience of hangover. Participants, however, only had average peak BACs across the self-administration session of .0617g%, which may be too low to reliably result in hangover (Verster, Kruisselbrink, et al.,

2020). This may explain why minimal differences between hangover positive and hangover negative participants were found.

There is therefore a growing body of evidence utilising varied approaches that supports the idea that subjective intoxication during drinking is a key determinant of reported hangover severity. Limited research, however, has examined separate aspects of intoxication, such as sedation and stimulation, in relation to hangover severity.

1.6.2.3. Relationships between hangover severity and mood.

Mood has long been linked with alcohol use (Freed, 1978), with mood proposed as a motivator for alcohol consumption with implications for development of addiction (Dvorak, Pearson, et al., 2014). Early research into the mood effects in the experience of hangover was conducted by Harburg et al. (1993), based on a retrospective survey of 1104 drinkers. Those who drank alcohol but did not report feeling intoxication effects were excluded from this sample. Participants were asked whether they ever experienced guilt related to their drinking behaviour using an item from the Short Michigan Alcoholism Screening Test (SMAST; Selzer et al., 1975). Participants were also asked to complete 15 items addressing how they feel when drunk. Factor analysis was used to determine that 6 items related to feelings of depression when drunk, and 3 items related to feeling angry when drunk. Hangover severity was assessed using the Hangover Signs Index (HSI). The HSI provides an assessment of hangover severity based on the occurrence of 8 symptoms, and was framed around the last time the participant had more to drink than intended or got drunk. Hangovers were classified as; 'no signs' if the participant gets drunk but doesn't report occurrence of any symptoms; 'weak' if the participant reported any or all of headache, diarrhoea, or loss of appetite symptoms; 'mild' if the participant reported anxiety and/or stomach pains; 'strong' if the participant reported any one of the symptoms blackout, tremor, or thoughts of suicide; 'very strong' if the participant reported anxiety and any one of the symptoms blackout, tremor, or thoughts of suicide; or 'severe' if the participant reported two or more from the symptoms blackout, tremor, or thoughts of suicide.

Correlational analyses indicated significant relationships between the severity of hangover and all mood related variables (guilt about drinking, depression when drunk, and

anger when drunk). Stepwise multiple regression models indicated that guilt about drinking, anger when drunk, and depression when drunk were associated with hangover severity in men. Comparatively, for women, guilt about drinking and anger when drunk were associated with hangover severity, but depression when drinking was not. The contribution of anger and depression when drunk to these models was however minimal, explaining 1% of variance in hangover severity. Guilt about drinking was the largest contributor in models for both men (9%), and women (11%). The HSI is, however, unvalidated as a measure of hangover severity, and only addresses the occurrence of symptoms rather than the experienced severity of those symptoms, and therefore may not fully capture variance in the experience. There is, however, evidence that classes of hangover exist that may be captured by this approach to hangover measurement (Shorter et al., 2017).

A further retrospective survey was conducted by Ceballos et al. (2022), with 381 Hispanic and 332 non-Hispanic white undergraduate students in the USA, addressing shame and hangover severity. Hangover severity was measured on a single-item scale of 0-100 based on general experience of hangover in the past year, and shame was assessed using the Internalized shame scale (Cook, 1989), a 35 item measure addressing lifetime feelings/experiences. Subscales include; inadequate/deficient, embarrassed/exposed, fragile/out of control, and empty/lonely. Results did not indicate any relationship between lifetime measurements of shame and general experience of hangover severity in the past year. van de Loo, Kerssemakers, et al. (2020) assessed baseline mood in relation to hangover using a retrospective survey that incorporated a general measure of fatigue, applied to the previous month, using the Checklist Individual Strength (CIS; Vercoulen et al., 1999). The CIS consists of 20 items rated on a 7-point Likert scale. The CIS provides scores for fatigue, concentration, motivation, and physical activity, as well as an overall score, however, no significant associations were found for any of these measures with a 1-item hangover severity scale. The CIS is built predominantly around the measurement of fatigue, which makes it surprising that no relationship was observed with hangover, for which tiredness/fatigue is a prominent symptom (Rohsenow et al., 2007; Slutske et al., 2003). This may be due to the timescales to which the measure is applied – the CIS is usually framed around experiences of fatigue over the last 2 weeks, and therefore may not capture relationships between acute fatigue and hangover. Likewise, the shame measure used by

Ceballos et al. (2022) addressed lifetime experience of shame, and may not capture any relationships between acute states of shame and hangover.

A prospective approach to a survey investigation was adopted by Tellez-Monnery et al. (2023), who conducted a survey-based investigation in which 39 participants completed baseline measurements of depression and anxiety based on a modified version of the depression, anxiety and stress scale (DASS-21; Henry & Crawford, 2005; Lovibond & Lovibond, 1995). At a 2-week follow-up, the participants who had reported hangover during the 2-week period provided ratings of the severity of anxiety and depression symptoms that were associated with their hangover based on the modified DASS-21. Though significant correlations were found between hangover anxiety with general depression and anxiety, and between hangover depression with depression and anxiety, general anxiety was not a significant predictor of hangover anxiety in regression models. Likewise, general depression was not a significant predictor of hangover depression in regression models including measures of stress response capability as control variables.

Verster et al. (2023) also assessed anxiety and depression in hangover, alongside a number of other mood variables. They conducted an online retrospective survey with 153 Dutch adult participants. Hangover was assessed using a 1-item hangover severity scale, framed around the heaviest drinking occasion in an approximately 2-month period prior to the COVID-19 pandemic. Single item mood scales were also completed, addressing stress, anxiety, depression, fatigue, hostility, loneliness, and happiness, in the period prior to the pandemic. Mood was rated on a scale of 0 (absent) to 10 (extreme). Bonferoni corrected partial correlations, correcting for estimated BACs, were conducted examining relationships between mood variables and hangover severity, however, no correlations reached significance, though this may be because general mood measures for a 2-month window do not capture pertinent mood states associated with the specific experience of hangover, given the transient nature of mood states (Beedie et al., 2005). A further retrospective survey was conducted by Terpstra et al. (2022) with 690 participants surveyed, of whom 477 reported drinking in the last 30 days, and 90 reported hangover occurrence following drinking. The DASS-21 was used to measure depression, anxiety, and stress, as experienced over the preceding seven days. Hangover severity was assessed using the AHSS. Partial correlations, controlling for the greatest number of drinks consumed in one day within the

last 30 days, indicated significant moderate correlations between hangover severity and all 3 mood measures; anxiety, depression, and stress.

Verster, Arnoldy, et al. (2020) 3-day survey also included consideration of mood effects in hangover. Baseline mood, assessed when taking the survey on day 3, was addressed using 6 items reflecting the dimensions of the short form profile of mood states (POMS) rated on an 11 point scale. For each of the 3 days that data was collected for, participants also rated their mood state whilst drinking on 11 point scales for 'angry/hostile/irritable', and for 'depressed/sad'. Participants also reported on their mood during hangover using 11-point scales. Items addressed fatigue, stress, and guilt about drinking. A total of 331 participants completed the survey with 143 reporting hangover on the day, 122 reporting having experienced hangover the previous day, and 87 having experienced hangover 2 days prior to the survey. The total sample had an average age of 23.6 years (SD = 4.2), with 143 of the participants reporting being male, and 188 female. Participants that reported experiencing hangover across the course of the 3 days addressed in the survey had an average age of 23.5 years (SD = 4.3), with 81 males and 62 females. Partial correlations indicated that ratings for being angry/hostile/irritable during drinking were correlated with 1 item hangover severity, but only for day 2. Comparatively, ratings of mood during hangover (fatigue, stress, and guilt about drinking) were significantly correlated with hangover severity for all 3 days, though this may be considered unsurprising given that mood disturbances during hangover are considered a symptom of the hangover.

Where measurements examining mood during hangover were excluded, stepwise regression analyses for hungover participants on each day only indicated one mood variable as a significant predictor of hangover severity across the whole sample, with baseline fatigue predicting hangover severity for the day of the survey (day 3), however, fatigue only explained a small amount of variance (1.5%), and this may have been due to cumulative effects over the course of several days of drinking in a holiday environment. In gender stratified models for males, baseline anger was a predictor of hangover severity for the day of data collection (day 3), and stress and fatigue while hungover were significant predictors of hangover severity for day 2, however the variance explained was generally low, with the exception of stress whilst hungover on day 2, which explained 12.3% of variance in hangover severity. For analyses with next day measures of mood included, fatigue and stress during

hangover was a significant predictor of hangover severity on all days, guilt about drinking was a significant predictor of hangover severity for the days 2 and 3, and anger while drinking was a significant predictor of hangover severity for day 1. In gender stratified models for males, fatigue whilst hungover was a significant predictor of hangover severity on day 3, as was guilt about drinking. For day 2, baseline anger was a significant predictor, and for day 1, stress whilst hungover and anger while drinking were significant predictors of hangover severity. For females, fatigue while hungover and guilt about drinking were significant predictors of hangover severity on day 3. Fatigue while drinking, guilt about drinking, and stress while drinking were predictors of hangover severity for day 2. For day 1, fatigue and stress while hungover, and baseline fatigue, were significant predictors of hangover severity ratings. Variance explained by mood variables in these models was generally less than 10%, with the exceptions of stress while hungover, which explained 13% of variance in hangover severity for the whole sample on day 2, and fatigue while drinking, which explained 39.6% of variance in hangover severity for females. Given this was the only model in which subjective intoxication was not the strongest predictor of hangover severity, this may suggest that fatigue whilst drinking is related to subjective intoxication. This would be in line with the sedative effects of alcohol. Collectively the results of this investigation do not provide any consistent evidence of relationships between mood variables and hangover severity, outside of those mood variables measured during hangover, and which may be considered symptomatic of hangover. The use of retrospective mood measurements addressing several days may also be problematic, as recall of mood states may have been affected by the experience of subsequent, fluctuating mood states associated with sober/intoxication/hangover state transitions (Levine & Safer, 2002). An alternative approach for future research would be to adopt ecological momentary assessment to collect this data contemporaneously with the states.

Regardless of results addressing direct relationships between hangover severity and mood, participants do report perceiving hangover symptoms to have an effect on mood. van Schrojenstein Lantman et al. (2017) conducted an online retrospective survey of 1837 18-30 year-old Dutch students, addressing their most recent hangover experience. Participants were asked to rate the impact of 22 hangover symptoms (derived from the AHS, AHSS, and HSS) on their mood, using a 6 point scale from 0 (no impact) to 5 (extreme). Each hangover

symptom was rated on a scale from 0 (absent) to 10 (extreme), and all symptom ratings correlated significantly with ratings of the impact the symptom had on mood at $p<.05$, however no specific correlation coefficients were reported and no corrections were made for multiple comparisons. Symptoms with the greatest impact on mood were; tired (2.7), sleepiness (2.4), headache (2.4), and nausea (2.2).

Lab-based investigations that included consideration of mood and hangover have indicated mood changes during hangover. Hogewoning et al. (2016) conducted a naturalistic within subject experiment with 36 participants, 18 of whom claimed to be hangover resistant, and 18 of whom reported experiencing hangovers. Mood was assessed using the short form of the POMS (Douglas, 1971). The POMS results in scores for 5 subscales representing tension-anxiety, depression, anger-hostility, vigor-activity, and fatigue. Hangover severity was assessed using both a 1-item hangover severity score, as well as a combined measure based on all the different symptoms included across the AHS, the AHSS, and the HSS. Significant differences were found between hangover and control days, with increased depression, and increased anger-hostility for the group that did not claim hangover immunity during hangover in comparison to control days. Reduced vigor-activity and increased fatigue was observed for hangover compared to control days in both the group that did not claim hangover immunity, as well as the hangover immune group. Correlations were also assessed for the hangover group between change scores for mood between hangover and control days, with 1-item hangover severity. None of these correlations reached significance, however this may have been due to the limited number of participants included in these analyses (n=18).

Benson et al. (2020) also conducted a semi-naturalistic experiment assessing the effect of hangover on mood with 25 participants aged between 18 and 35. Participants attended the lab twice, once during a hangover, and once following a 24 hour period where no alcohol was consumed. Alcohol hangover was assessed with both a 1-item hangover scale, and the AHSS. A number of mood state measures were taken; stress and fatigue were assessed using visual analogue scales; state anxiety was examined using the Spielberger state-trait anxiety inventory (Spielberger, 1983); and the 16-item Bond-Lader visual analogue mood scales (Bond & Lader, 1974) were used, which produce scores for alertness, calmness, and contentment. Scales were completed twice per session, either side of a cognitive task.

ANOVA analysis indicated main effects of hangover such that alertness and contentedness were reduced following the tasks whilst hungover, and anxiety and mental fatigue were increased. Pre-cognitive testing scores indicated differences between hangover and no-hangover conditions, with reduced alertness and contentedness, and increased mental fatigue and anxiety. Hangover measures were used to verify the hangover state, with significant differences observed in all symptoms except sweatiness, which approached significance, however, no assessment of relationships between hangover severity and mood variables was reported.

Effects of hangover on alertness were also observed in Devenney et al's. (2019a) naturalistic study. A non-student sample of 43 participants completed assessments of mood and hangover severity following a normal night of drinking. The 18-item Bond-Lader bipolar visual analogue scale was used for the assessment of mood, resulting in 2 scores for alertness and tranquility. Hangover severity was assessed using the AHS, however, this was only used for verification of hangover state, with participants scoring 0 being excluded. Bonferroni corrected t-tests indicated significant differences between hangover and control testing on both the alertness and tranquility measures, such that participants reported being less alert and less tranquil during hangover. For individual items on the Bond-Lader scales, significant differences were found where participants reported; being more lethargic/less energetic during hangover, being more clumsy/less well coordinated during hangover, being more depressed/less elated during hangover, being more 'fuzzy'/less clear-headed during hangover, being more mentally slow/less quick witted during hangover, being more feeble/less strong during hangover, being less contented/more discontented during hangover, and being less alert/more drowsy during hangover. Gunn et al. (2021a) also examined mood as measured using Bond-Lader scales in a naturalistic within subjects experiment with 45 18-30 year olds. Hungover participants reported significantly lower alertness and tranquillity, in line with the results of Devenney et al. (2019a), but neither study directly addressed correlations between hangover severity and mood states.

Collectively, there is then mixed evidence regarding relationships between hangover severity and mood. Measurements of general or baseline mood have been shown to be associated with mood experienced during hangover, but baseline measures of mood have not consistently shown relationships with measures of overall hangover severity. This may

be because some hangover measures place a greater emphasis on somatic symptoms, such as headache and stomach ache. It is unclear with single-item measures of hangover severity how participants weight symptoms in deriving an overall rating. Though mood does seem to be negatively affected by hangover, as indicated in experimental studies, mood as measured during hangover does not consistently correlate with overall hangover severity. This is surprising, given that emotional disturbances are considered within symptoms of hangover. This would be particularly true where single item hangover severity measures are used, as this approach to hangover severity measurement is supposed to capture the breadth of the hangover experience, and these mood changes may not be related to more somatic symptoms of hangover. Finally, assessment of mood during drinking has not shown relationships with hangover severity, though limited research has examined this, and approaches adopting contemporaneous measurement would be beneficial.

1.6.2.4. Relationships between hangover severity and personality.

Consideration of traditional conceptualisations of personality (e.g. the Big Five model) as a predictor of hangover severity has been investigated for a comparatively long period of time, and has potential links to risks for adverse health outcomes such as addiction (Earleywine, 1993). Early research conducted by Span & Earleywine (1999) focused on personality-based risk for alcohol use disorder. This investigation utilised a lab-based experimental approach in which 40 participants completed 3 sessions. At the first session, participants consumed a placebo, with the second and third sessions including administration of 0.5g of ethanol/Kg of body weight. Prior to the sessions, participant completed the MacAndrew scale (MacAndrew, 1965), which provides an indicator of personality-based risk for alcohol abuse disorder. For each session of the study, participants completed 2 hangover measurements. The first hangover severity scale consisted of 9 items from McCaul et al. (1991), with the second consisting of 12 items from Newlin & Pretorius (1990). All symptoms were rated on a 10-point Likert scale from 0 (not at all) to 9 (a great deal). Results indicated that there was no significant relationship between scores on either of the two hangover severity measures with the MacAndrew scale, with correlation values not exceeding 0.2. Though there were differences in hangover severity scores between the 20 participants with a familial history of alcohol use disorder and the 20 participants with no familial history, such that those with familial history reported more severe hangovers, there

was no difference between these two groups on personality-based risk for alcohol use disorder. This, alongside the relatively small sample size, may explain the lack of relationship between personality-based risk for alcohol use disorder and hangover severity.

Other early research conducted by Harburg et al. (1993) also addressed the potential role of personality in the experience of hangover. With regards to personality, neuroticism was investigated using Eysenck's neuroticism scale (Eysenck & Eysenck, 1968), with hangover severity assessed on the Hangover Signs Index (HSI). In both correlational and regression-based analyses, neuroticism was significantly related to hangover severity as indicated by the HSI, however, this relationship was not particularly strong, with the addition of neuroticism to regression models explaining 4% of variance in hangover severity for both men and women. Further research considering neuroticism was Verster et al. (2023) online retrospective survey, which assessed personality using the 48-item version of the Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1968). This results in scores for 3 subscales; psychoticism, extraversion, and neuroticism. A fourth subscale, socialisation, assesses the level of social desirability in responding and is utilised as a correcting factor in partial correlations of the other personality variables. Hangover was assessed using a 1-item hangover severity scale, framed around the heaviest drinking occasion in an approximately 2-month period prior to the COVID-19 pandemic. Partial correlations and regression analyses indicated no significant relationships between any of the 3 personality measures and 1-item hangover severity. Verster, Arnoldy, et al. (2020) 3-day survey also examined neuroticism as a predictor of 1-item hangover severity. Participants in this study completed a baseline measure of neuroticism based on the neuroticism scale of the EPQ revised short scale. This version of the scale consists of 12 items answered yes or no. Neuroticism did not show any significant relationships with hangover severity in correlation or regression analyses.

Terpstra et al's. (2022) retrospective survey assessed personality using the 10-item version of the big five inventory (BFI-10; Rammstedt & John, 2007) which results in scores for neuroticism, openness, conscientiousness, extraversion, and agreeableness. Hangover severity was assessed using the AHSS (Penning et al., 2013). Partial correlations showed no significant relationships between big five personality traits and hangover severity following Bonferroni corrections, however, the partial correlation between conscientiousness and

hangover severity would have been significant without this correction (*r*=-.234, *p*=.031), and the relationship between neuroticism and hangover severity approached significance without application of the correction (*r*=.213, *p*=.052). This may suggest a more focused study would find significant relationships, that could be considered of moderate size given the use of partial correlations (Doucouliagos, 2011). Further examination of broader personality traits was conducted by Hudson & Gunn (2023) who completed a retrospective survey of 108 participants assessing the relationship between hangover severity, as measured by the mAHSS (Hogewoning et al., 2016), and personality traits measured with the 60-item HEXACO personality inventory (HEXACO-PI; Ashton & Lee, 2009). The HEXACO-PI results in scores across 6 dimensions of personality; honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness. Participants also completed the 20 item Attentional Control Scale, which assesses general attentional control on 2 subscales (focusing, and shifting) based on the frequencies of various behaviours. Regression analyses indicated that there was a significant negative association between the focusing subscale for attentional control, and a positive association between agreeableness and hangover severity. Zero-order correlations indicated that the relationship between agreeableness and hangover severity was, however, small (r = .03).

Evidence regarding links between traditional measures of personality (e.g. the Big Five model) suggest that these broader indicators of personality are not associated with the experience of hangover severity. Research has generally failed to find any association between neuroticism and hangover severity, and where relationships have been found between traditional personality traits and hangover experience, this relationship has been small, and may be the product of relationships between personality and other psychosocial variables that are thought to influence hangover, such as resources for responding to psychological distress.

1.6.2.5. Relationships between hangover severity and resources for responding to stress.

Resilience, emotion regulation, and coping strategies all broadly capture the ability to respond to psychological stress, and have been related to drinking behaviours (Alim et al., 2012; Dvorak, Sargent, et al., 2014). Seven of the identified investigations addressed associations of hangover severity with resilience, emotion regulation, or coping.

With regards to resilience, Terpstra et al. (2022) retrospective survey addressed both resilience and coping, alongside mood and personality, with participants completing the brief resilience scale (BRS; Smith et al., 2008) to measure resilience, the brief COPE as an assessment of coping styles, and the Alcohol Hangover Severity Scale (AHSS; Penning et al., 2013) to assess hangover. Results indicated a negative relationship between resilience and hangover severity, and a positive relationship between avoidant coping and hangover severity, based on partial correlations controlling for the greatest number of drinks consumed. It is not clear, however, whether it was the greatest number of drinks that the participant consumed that was associated with the hangover reports, as the assessment was carried out with respect to the last 30 days. This may have obscured the strength of relationships between resilience and coping with hangover severity.

Ceballos et al. (2022) survey of hispanic and non-hispanic white participants also included an assessment of resilience, which was measured using the Connor-Davidson resilience scale (Connor & Davidson, 2003). Hangover severity measured on a single-item scale of 0-100 based on general experience of hangover in the past year. No differences were observed between Hispanic and non-Hispanic students on hangover severity or resilience, however, path analyses indicated that the competence/high standards/tenacity subscale of the resilience scale was positively related to hangover severity in Hispanic, but not non-Hispanic white, participants. It is proposed that this may be because Hispanic students who scored highly in competence/high standards/tenacity discount drinking consequences in competitive drinking environments (such as drinking games) both due to their need to perform in these environments, and in performing during the hangover state despite any discomfort. An alternative explanation may be related to results indicating a higher tendency to engage in binge drinking in non-Hispanic white students, as hangovers resulting from more consistent but lower-level drinking may interfere more often with daily activities, necessitating engagement of resilience resources. Those engaging in binge drinking may plan these ‘events’ such as to avoid activities during the hangover state, meaning their ability to resist the effects of hangover are of lesser importance.

Van De Loo et al. (2018) also examined resilience based on a retrospective survey, with a sample of 341 Dutch students. Participants were questioned regarding their most recent hangover experience, occurring in the last month, with the BRS used to assess

resilience and hangover severity assessed with a 1-item scale. Correlations indicated no significant relationship between scores for resilience and the 1-item hangover severity score. Verster et al's. (2023) online survey also assessed relationships between resilience (as measured using the BRS) and hangover severity on a 1-item hangover severity scale. Correlations indicated no significant relationship between hangover severity and resilience scores. Results addressing relationships between resilience and hangover severity are therefore mixed, with studies utilising a 1-item hangover severity indicator finding no relationship, but a study using the AHSS indicating a moderate partial correlation.

Comparatively, research has shown a more consistent association between hangover severity and emotion regulation. Gunn et al. (2021a) conducted a within participants naturalistic experiment with 45 participants investigating the effects of the hangover state on emotion regulation during hangover. Participants completed the 21-item version of the state difficulties in emotion regulation scale (DERS-21; Lavender et al., 2017) and a lab-based task for assessment of cognitive reappraisal based on an image rating task. This task required rating the emotional content of images in terms of valence and arousal, whilst instructed to either engage in strategies to control responses to the emotional content of the images, or just look at them. Hangover severity was assessed with both a 1-item hangover scale and the modified Alcohol Hangover Severity Scale (mAHSS; Hogewoning et al., 2016), however, no assessment of relationships between the 1-item hangover severity measurement and emotion regulation is presented. On average, participants reported drinking that would result in peak eBACs of 0.15g%. Results indicated that hangover had strong effects on emotion regulation as indicated by the DERS-21 overall score, with significant effects on subscales measuring non-acceptance, modulation, and clarity, but not awareness. Correlations were also observed between hangover severity measured on the mAHSS and overall score on the DERS-21, as well as scores on the modulation and clarity subscales. No significant correlation was observed between mAHSS score and the non-acceptance scale of the DERS-21. Comparatively, no differences were found in emotion regulation based on the image rating task between hangover and no-hangover states, though participants rated the valence of images lower in general during the hangover state.

Hudson & Gunn (2023) retrospective survey also assessed the relationship between emotion regulation, as measured by the 36 item difficulties in emotion regulation scale

(DERS-36; Gratz & Roemer, 2004) and hangover severity, as measured by the mAHSS (Hogewoning et al., 2016). Results indicated that there was a significant moderate correlation between total emotion dysregulation score and mAHSS score in participants experiencing mild to moderate hangover. Linear regression models showed significant associations between non-acceptance, impulse control, goals, strategies, and clarity subscales of the DERS with mAHSS score, however no association was found for awareness of emotions, consistent with the results of Gunn et al. (2021a).

Tellez-Monnery et al. (2023) survey-based investigation also assessed emotion regulation, as measured during baseline data collection, and based on the 16 item version of the difficulties in emotion regulation scale (DERS-16; Bjureberg et al., 2016). At the 2-week follow-up, participants who had reported hangover over the study period provided ratings of the severity of anxiety and depression symptoms during hangover based on a modified version of the Depression, Anxiety and Stress scale (DASS-21; Antony et al., 1998; Henry & Crawford, 2005). Participants also completed the perseverative thinking questionnaire (PTQ; Ehring et al., 2011) at follow-up, which provides a measure of repetitive negative thinking. Stepwise regression models indicated that emotion regulation scores were not related to hangover anxiety, however, emotion regulation was a significant predictor of hangover depression when scores for repetitive negative thinking were moderate to high. These results are, however, based on a general experience of hangover-related depression and anxiety over the two-week period, not a specific hangover experience. Assessments were also limited to anxiety and depression as potential symptoms of hangover, which may explain discrepancies with other research indicating a more general relationship between emotion regulation and hangover severity, and may indicate that emotion regulation is associated more strongly with response to the somatic symptoms of hangover. Collectively these results indicate a relationship between emotion regulation and hangover severity is likely, however future research will need to examine emotion regulation changes in relation to hangover symptomologies to assess the specificity of relationships.

1.6.2.6. Relationships between hangover severity and perceived performance.

Hangover is associated with a variety of cognitive decrements that effect performance in everyday tasks (Gunn et al., 2018). Perceived performance in hangover may

influence decision making about engagement with particular tasks, such as driving, which have implications for public safety and the economic impact of hangover.

Rohsenow et al., (2006) conducted a double-blind randomised mixed design experiment with 61 merchant marine cadets. Participants all received placebo on a first night, with half receiving beer at a second session. Participants completed the AHS the morning after each session and provided ratings of their impairment in the morning and at completion of the drinking sessions. These ratings were based around professional performance within the maritime context, with participants asked 'right now, would your ability to operate a vessel be better or worse than usual?', and 'How likely is it that you would operate a vessel the way that you feel right now?'. Answers were provided on a scale from 1 (much worse) to 5 (much better). Following completion of a simulated maritime operation test, participants also rated their own performance. They were asked 'compared to other times that you have used the simulator, how would you rate your performance today?' with responses on a scale of 1 (much better) to 5 (much worse), and 'do you think your performance today was affected by alcohol?', rated from 1 (yes, alcohol made my performance much worse), to 3 (no, my performance was not affected) to 5 (yes, alcohol made my performance much better). ANOVA analyses indicated that participants rated themselves as significantly less likely to operate a vessel after following alcohol consumption, but not placebo. No significant effects were found on ratings of ability to operate a vessel. All participants reported that their performance in the operations task was impaired following sessions, however, this was more pronounced for those who had received alcohol instead of placebo. Participants who received alcohol also indicated that alcohol affected their performance, compared to those who received placebo, who reported no effect on their performance.

van Schrojenstein Lantman et al. (2017) also included an assessment of the impact of hangover symptoms on performance in their survey. Participants rated the effects of the 22 measured hangover symptoms on both cognitive and physical performance using a 0-5 scale. As with mood results, all 22 symptom severity ratings correlated with ratings of impacts on physical and cognitive performance. The 'concentration problems' symptom had the greatest ratings for impact on cognitive performance, followed by 'tired', 'sleepiness',

and ‘headache’. For physical performance, symptoms with the highest ratings of impact were ‘tired’, ‘sleepiness’, ‘headache’, and ‘nausea’.

Van De Loo et al's. (2018) retrospective survey also included consideration of perceived human physical performance in the form of perceived immune function. Perceived immune function was rated on a single item with a 0 (very poor) to 10 (excellent) scale. No relationship was observed between perceived immune function and 1-item hangover severity in relation to the participants last hangover. van de Loo, Kerssemakers, et al's. (2020) retrospective survey regarding the last month heaviest drinking experience also addressed perceived immune fitness in relation to the 1-item hangover severity scale. Perceived immune fitness was rated on single-item 0-10 scale, with partial correlations controlling for estimated BAC’s associated with the drinking experience showing no relationship to hangover severity. Regression models did indicate that perceived immune fitness was a significant predictor of hangover severity, however, the proportion of variance explained was small (1%). Verster, Arnoldy, et al's. (2020) 3-day survey also included a 1-item perceived immune function measure, framed around immune function at the time of hangover. Perceived immune fitness was a significant predictor of hangover severity in regression models for females that had been recalled from 2 days before the data collection (but the not the day of, or the day preceding data collection), both when next day measurements were included in models and when they were excluded. Inclusion of next day variables did reduce the explanatory power of perceived immune fitness ratings from 9.1% to 2.3%, which may indicate any relationship was better explained by mood changes in hangover.

1.7. Discussion.

A variety of relationships between hangover severity and individual difference measures have been examined, however, limited measures have been reliably associated with the hangover experience. The strongest evidence exists for a relationship between hangover severity and subjective intoxication, with moderate to strong relationship evidenced across studies using both experimental and survey-based approaches. Subjective intoxication appears to be predictive of hangover, and as such may provide a useful target for research seeking to understand the mechanisms of hangover. Likewise, subjective intoxication has been linked with both local drinking behaviour (i.e. continuing to drink),

future drinking habits, and AUD (Waddell et al., 2022; Wycoff et al., 2022), which may provide some explanation as to the inconsistency in relationships between measures of alcohol consumption and BACs (Penning et al., 2010), as well as help to explain links between hangover and addiction. One possible explanation for links between feelings of intoxication and hangover is that both intoxication and hangover severity represent levels of homeostatic disturbance, in line with opponent-processes that are hypothesised to underly addiction (Koob, 2013; Koob & Volkow, 2010). Examinations of the factor structure of subjective intoxication have suggested that there are 3 components of the construct; stimulation and pleasant effects, sedation and unpleasant effects, and alleviation of tension and negative mood (Ray et al., 2009). Sedation and stimulation have shown independent associations with the reinforcing value of alcohol (Motschman et al., 2022) and are thought to be independently associated with risk for alcohol use disorder (Hendler et al., 2011). Investigations should target which components of subjective intoxication are related to hangover severity to inform understanding of links between hangover and addiction risk.

Subjective response to alcohol also appears to have a strong genetic component, with heritability of 0.60 in a sample of 99 twin pairs (Viken et al., 2003). Personality also shared genetic covariation with subjective intoxication, which may explain where links between personality and hangover severity have been found. Current evidence for links between personality variables and hangover severity are limited to inconsistent and small effects, which may be explained by indirect relationships between personality and hangover via subjective intoxication. A variety of personality traits have been investigated in relation to hangover, including; neuroticism, psychoticism, extraversion, openness, conscientiousness, agreeableness, honesty/humility, and emotionality, as well as personality-based risk for AUD. Of these, only neuroticism and agreeableness have shown significant relationships with hangover severity. Neuroticism was correlated with hangover severity on a measure of hangover that categorised severity based on incidence of symptoms (Harburg et al., 1993), and therefore may not actually capture the impact of symptoms. In research using validated measurements of hangover severity, no relationship was observed with neuroticism (Verster et al., 2023). Likewise, agreeableness was found to have a relationship with hangover severity in one study (Hudson & Gunn, 2023), however this effect was very small, and contrasted by another finding indicating no relationship (Terpstra et al., 2022).

Broad measures of traditional personality models do not seem, therefore, to provide a plausible explanation for variability in hangover severity, however, certain traits may still be useful in explaining the variability in hangover if selected based on established relationships with hangover symptomology. For example, no research has focused on aspects of pain responses such as sensitivity to pain, or pain catastrophising, in relation to hangover severity, despite the fact that prevalent symptoms of hangover include symptoms associated with pain, for example, headache, the experience of which has been associated with pain catastrophising (Drahovzal et al., 2006). Pain catastrophising has been shown to fully mediate links between neuroticism and pain behaviour (Spada et al., 2016), which may explain findings of a relationship between neuroticism and hangover severity. Pain catastrophising has also been shown to contribute to variation in both self-reported pain intensity and the neural processing of pain (Quartana et al., 2009).

Pain catastrophising is also a partial mediator of the effects of pain on mood (Goli et al., 2016). Evidence does indicate that mood is negatively impacted by experience of hangover, and relationships have been demonstrated between hangover severity and guilt, stress, and fatigue, however, mood disturbance is considered to be a symptom of hangover (Verster et al., 2020), so these relationships likely represent correlations between mood during hangover and the mood symptoms of hangover in hangover severity measures. Comparatively, relationships between mood states in general and hangover severity have not generally been found. The use of mood measures that assess mood over a period of time preceding hangover, as were used by Verster, Arnoldy, et al. (2020), Verster et al. (2023), van de Loo, Kerssemakers, et al. (2020), and Terpstra et al. (2022) are unlikely to capture moods directly associated with the hangover experience, given the transient nature of mood (Beedie et al., 2005). Less research has examined relationships between mood during intoxication and hangover severity, though there is positive indicators that depression or anger during drinking is associated with hangover severity. One explanation for these relationships is that the experience of negative emotions during drinking acts as a motivator for further drinking (Mc Hugh & McBride, 2020), leading to more severe hangover.

Drinking to cope with negative mood states has been hypothesised as a predicating factor for alcohol use problems, and broader coping measures have been associated with problem drinking (Corbin et al., 2013). Examinations of resources for responding to stress,

including coping strategies, have indicated that the use of avoidant coping is associated with more severe hangover, however this is based on one study (Terpstra et al., 2022). Evidence of a relationship between resilience and hangover severity is also inconclusive, with contrasting findings. Investigations utilising a 1-item hangover severity measure did not find correlations between hangover severity and resilience, whereas investigations utilising symptomatic ratings to form an overall hangover severity score have found associations. The 1-item hangover severity scale is supposed to capture the breadth of potential hangover symptoms (Verster et al., 2020), so it may be that resilience is particularly associated with somatic symptoms of hangover, which are featured prominently in symptomatic ratings. Emotion regulation measures show a more consistent relationship with hangover severity. Emotion regulation is associated with alcohol related consequences (Dvorak, Sargent, et al., 2014), and impulsivity in alcohol dependence (Jakubczyk et al., 2018). This may provide a link between the experience of hangover severity and alcohol-related health outcomes (Courtney et al., 2018; Vatsalya et al., 2019), but prospective research will be required to elucidate relationships between hangover severity, emotion regulation, and alcohol use disorder.

Finally, evidence indicates that hangover is associated with effects on perceived cognitive and physiological performance. Participants experiencing hangover report reduced immune fitness, however, it is unclear whether this represents a valid measure of actual immune function. Previous research has indicated that ratings of perceived immune function may be more closely related to mood than measurements of immune system activity (Petrie et al., 1999), and as has been established, mood is negatively affected by hangover. Likewise, perceptions of cognitive function do not necessarily correlate with actual performance (Middleton et al., 2006; Torrens-Burton et al., 2017), though it may still be important in understanding the effects of hangover on productivity and public safety (driving) as people may decide not to engage in tasks they do not feel capable of. Perceived cognitive function does appear to be reduced in hangover, but further research will be needed to relate perceptions of cognitive function to decision making during hangover.

1.8. Conclusions and directions for future research.

A variety of individual differences factors have been investigated in relation to hangover severity, including; subjective intoxication, personality, mood, resources for

responding to stress, and perceived functioning. Subjective intoxication appears to show relationships with hangover that may represent opponent-processes in intoxication and hangover, however research will be needed to examine the time-course of biological indicators of intoxication and hangover to establish opponent-processes in hangover. Further research should also explore whether different components of subjective intoxication are independently associated with hangover. This may have implications for understanding relationships between hangover and addiction.

In contrast, measures of personality have not shown consistent relationships with hangover severity. Results indicating relationships between hangover severity and personality traits may be indicative of a relationship between traits related to personality and hangover, such as those that describe pain response. Likewise, measures of baseline mood have not shown relationships with hangover severity, in contrast with measures of mood during intoxication and hangover. Relationships between mood during hangover and hangover severity are likely a product of negative mood as a symptom of hangover. Mood during drinking has been less explored but may have links to drinking behaviours that would benefit from contemporaneous study using methods such as ecological momentary assessment.

Perceived functioning also demonstrated relationships with hangover severity, though this may not be a reliable indicator of actual performance effects of hangover. It is possible that perceived functioning may guide behaviour during hangover and the economic and safety implications should be addressed as part of future work. Finally, resources for coping with stress have shown some relationships with hangover severity. Emotional regulation measures have consistently shown these relationships, whereas evidence of relationships between resilience and hangover severity are more mixed. This may be due to the hangover severity measurements utilised, and the weighting they give to different symptoms of hangover. Future research should explore whether individual difference measures are associated with specific symptomologies in hangover.

1.9. Chapter summary.

In this chapter, current knowledge regarding the biological mechanisms underlying hangover, and the cognitive effects of hangover, has been described. Further, a systematic review of individual difference factors associated with hangover severity has been

presented. This review revealed evidence of a relationship between subjective intoxication and hangover severity, as well as potential relationships between mood during drinking and hangover severity, both of which may be conceptualised within a framework of opponent processes, and may contribute to explanations of relationships between hangover and health outcomes (Išerić et al., 2024; Piasecki et al., 2010; Vatsalya et al., 2019). There is also tentative evidence that measures of resources for response to stress are associated with hangover, and may provide an explanation for results linking personality traits with hangover. Personality traits have generally been investigated based on popular models of personality (e.g. big 5 model of personality; Rammstedt & John, 2007), or based on associations with health outcomes (e.g. neuroticism; Lahey, 2009). No research, however, has approached relationships between individual traits and hangover based on pre-existing associations with common symptoms of hangover, such as headache. Hangover severity ratings are often based on the intensity of somatic symptoms based in the experience of pain, and therefore pain-related individual differences represent a promising area for investigations seeking to explain variability in hangover severity. Further, a number of differences in relationships have been noted based on the measurement tool used to assess hangover severity that may indicate certain symptomologies of hangover are associated with different factors.

In order to address potential roles of pain responses and specific hangover symptomologies, and meet the aims of this thesis; to develop understanding of alcohol hangover symptomology, the predictors of hangover severity, and the consequences of hangover; the subsequent sections of this thesis will attempt to meet 5 objectives; First, to characterise the symptomology of alcohol hangover; second, to examine individual difference factors that may be associated with hangover; third, to examine cognitive outcomes associated with the hangover state; fourth, to examine relationships between individual difference factors and the cognitive outcomes of hangover; and finally, to assess relationships between hangover symptomology and the cognitive outcomes of hangover.

Chapter 2: Pain catastrophising predicts alcohol hangover severity and symptoms.

2.1. Chapter introduction.

Literature considering relationships between individual differences and reports of hangover severity, explored in the previous chapter, have largely focused on subjective intoxication, mood, personality, and resources related to coping with emotional disturbance. No research has, however, focused on an individual's ability to respond (or not) to physical pain and discomfort, despite the symptomology of hangover including a range of somatic symptoms (e.g. headache). The objectives of this chapter are therefore to characterise the symptomology of hangover by examining covariance between symptoms, and assess relationships between symptom severity and participants capacity to cope with pain. This will be achieved through presentation of a cross-sectional survey assessing hangover severity and pain catastrophising. This research has been published in the Journal of Clinical medicine (Royle et al., 2020)[1]. Sections 2.2 through to 2.6 are a re-printing of this journal article.

2.2. Abstract

Alcohol hangover is a cause of considerable social and economic burden. Identification of predictors of alcohol hangover severity have the potential to contribute to reductions in costs associated with both absenteeism/presenteeism and health care. Pain catastrophising (PC) is the tendency to ruminate and describe a pain experience in more exaggerated terms. The current study examines the possibility that this cognitive coping strategy may influence experience of alcohol hangover. The aims of the current study were to (1) examine the relationship between hangover severity and PC, (2) explore and identify discreet factors within the Acute Hangover Scale (AHS) and (3) explore whether independent factors/dimensions of acute hangover are differentially predicted by PC. A retrospective survey (*n* = 86) was conducted in which participants completed the Acute Hangover Scale (AHS); the Pain Catastrophising Scale (PCS); a questionnaire pertaining to the amount of alcohol consumed; and a demographic information questionnaire. Regression analyses

[1] Royle, S., Owen, L., Roberts, D., & Marrow, L. (2020). Pain catastrophising predicts alcohol hangover severity and symptoms. *Journal of clinical medicine*, *9*(1), 280.

showed a significant relationship between PC and hangover severity scores and demonstrated that PC was, in fact, a stronger predictor of perceived hangover severity than estimated peak blood alcohol concentrations (eBACs). Factor analysis of the AHS scale, resulted in the identification of two distinct symptom dimensions; 'Headache and thirst', and 'Gastric and cardiovascular' symptoms. Regression analyses showed that both eBAC and PCS score were significantly associated with 'Headache and thirst'. However, only PCS score was associated with 'Gastric and cardiovascular' symptoms. These novel findings implicate a role for cognitive coping strategies in self-reports of alcohol hangover severity, and may have implications for understanding behavioural response to hangover, as well as suggesting that hangover and PC may be important factors mediating the motivation to drink and/or abuse alcohol, with potential implications in addiction research. Furthermore, these findings suggest that distinct alcohol hangover symptoms may be associated with different mechanisms underlying the experience of alcohol hangover.

2.3. Introduction

2.3.1. Alcohol Hangover, Symptoms and Economic Burden

Alcohol hangover is a phenomenon that occurs the day after the ingestion of alcohol, once the blood alcohol concentration (BAC) is approaching nil (Merlo et al., 2017), and it is associated with a wide variety of symptoms, such as headache, nausea, and concentration problems (Penning et al., 2012; Verster et al., 2013). Hangover is thought to be a considerable cause of economic loss through workplace absenteeism and lost productivity (Prat et al., 2009). Researchers have also speculated that the severity of alcohol hangover is linked to the development of alcohol use disorders (AUDs; Dudley, 2002; Piasecki et al., 2005), indicating that a better understanding of the individual hangover experience and its mediators may offset the associated financial and social burden of AUD.

A number of explanations for the variance seen in alcohol hangover presentation have been suggested, including gene associations of alcohol metabolism (Edenberg, 2007; Wall et al., 2005), gender differences (Seidl et al., 2000), inflammatory response to alcohol consumption (Kim et al., 2003; Verster et al., 2013), immunological functioning (Penning et al., 2010), and congener content of alcoholic drinks (Verster, 2006), as well as individual differences in psychosocial factors such as anxiety and mood (McKinney, 2010), or guilt

related to the actions carried out whilst drinking (Verster et al., 2013). There is, however, little consensus regarding the biological mechanisms that underpin the experience of alcohol hangover (Prat et al., 2009), and this is particularly true for psychosocial variables. Identification of mediating factors of alcohol hangover severity may thus inform mechanistic investigations of hangover, as well as having the potential to reduce costs associated with absenteeism/presenteeism and improve health care outcomes.

2.3.2. Hangover and Risk of Alcohol Abuse

Despite the lack of mechanistic explanations for the influence of predictor variables on the experience of hangover, and mixed findings regarding relationships between familial risk for addiction and experience of hangover (Piasecki et al., 2010; Stephens et al., 2017), there is some evidence that alcohol hangover experience may be a potential risk factor for alcohol use disorder (AUD; Piasecki et al., 2010). In this regard, hangover has been conceptualised as affecting cognitive control processes that influence local drinking behaviour. Evidence suggests that people who experience a more severe hangover will drink less, when they engage in drinking the day of a hangover (Huntley et al., 2015), and that hangover can increase the time before the next alcoholic drink is consumed in frequent drinkers (Epler et al., 2014), with hangover occurrence predicting a 6 hour delay to next drink when used as sole predictor in a survival model. It is notable, however, that hangover occurrence was only associated with a delayed time to next drink in multivariate models when interacting with the onset of financial stressors, or the presence of high levels of craving at the end of the drinking episode (pre-hangover). This may implicate a role for the hangover in the delay of further engagement with drinking, when experienced alongside a continued desire/motivation to drink. The investigation of differences in factors related to motivational and inhibitive processes, such as cognitive coping strategies, during hangover, therefore has the potential to contribute to understanding of possible relationships between the hangover experience and propensity for development of AUDs.

2.3.3. Alcohol Hangover and Pain Catastrophising

Pain catastrophising (PC) has been broadly defined as an exaggerated negative orientation towards actual or anticipated pain experiences (Sullivan et al., 1995) and has been described as the tendency to recall pain experiences in more exaggerated terms, to

feel helpless and ruminate over painful events. PC appears to be moderated, to some degree, by gender (Thorn et al., 2004), psychosocial and dispositional factors (Sullivan et al., 1995; Thorn et al., 2004). However, despite these moderating factors, PC contributes unique and significant variance to the prediction of self-reported pain intensity, as well as to neural processing of pain (Quartana et al., 2009). Evidence has shown that the relationship between PC and pain ratings is partially mediated by diminished diffuse noxious inhibitory controls (a measure of endogenous pain inhibition), indicating a disruption in pain inhibition and suggesting a relationship between PC and pain inhibition (Jensen et al., 2016). Neurological evidence (utilising functional magnetic resonance imaging) has demonstrated that PC predicts the experience of pain, in that, during exposure to a painful stimulus, pain specific response activation in the dorsolateral prefrontal cortex (dlPFC) and medial prefrontal cortex (mPFC) correlate negatively with PC (Henderson et al., 2016). The effect of PC on brain activity in the mPFC and dlPFC also seems to be mediated by the severity of pain experienced, with reduced activity during more intense pain (Seminowicz & Davis, 2006). Additionally, the dlPFC shows greater bilateral activation during response inhibition, in comparison to interference monitoring and suppression (Blasi et al., 2006), indicating some anatomical overlap between inhibitive processes and PC. It has been argued that PC may heighten pain experiences by reducing the efficiency of inhibitory pathways, though evidence for this position is indirect (Goodin et al., 2009).

Alcohol hangover is characterised by pain symptoms. Indeed, the medical term for alcohol hangover “veisalgia” comes from the Norwegian kveis, which refers to the uneasiness following debauchery, and algia, the Greek term for pain. Cytokines, proteins produced during immune response that are involved in both the initiation and persistence of pathologic pain (Zhang & An, 2007), are altered during hangover. Interleukin (IL-2; IL-10) and interferon (IFN-γ) cytokines have been shown to be elevated in blood during hangover (Kim et al., 2003). In saliva, elevations of IL-2, IL-4, IL-5, IL-6, IL-10, IFN-γ, and TNF-α have been observed during hangover, and in urine, elevations of IL-4 and IL-6, as well as decreases in IL-8 have been observed in comparison to non-hangover-days (Raasveld et al., 2015). These differences in cytokine levels between hangover and non-hangover days do not, however, appear to explain variance in the experience of hangover, with similar changes observed in both those reporting hangover, and those reporting hangover resistance (Bø et al., 2009).

Headache, a continuous pain in the head which has also been associated with changes in cytokine levels (Bø et al., 2009; Zhu et al., 2017), represents the 3rd most common symptom of alcohol hangover (Slutske et al., 2003) and symptomatic ratings of headache severity have large statistical effects in measures of hangover severity (Rohsenow et al., 2007). PC therefore presents a good candidate for potentially explaining some of the variance in self-reported hangover severity scores. Consequently, the current study hypothesises that greater PC will be associated with elevated hangover severity scores.

It has also been argued that hangover lacks in mechanistic explanations (Prat et al., 2009), despite the wide variety of symptoms associated with the hangover experience (Penning et al., 2012). Certainly, dehydration is thought to represent one potential mechanism, with thirst being one of the most commonly reported hangover symptoms (Penning et al., 2012; Slutske et al., 2003), due to the diuretic effects of alcohol (Hobson & Maughan, 2010). Vasopressin levels, a biological marker of dehydration, do not, however, necessarily correlate with overall hangover severity (Penning et al., 2010). It is possible that this is due to dehydration representing a mechanism of hangover that explains only a particular symptom cluster. Factor analysis of measures of hangover severity may therefore provide some direction for investigations of the mechanisms that give rise to symptom clusters. Furthermore, certain symptom clusters may be independently moderated by PC and may represent better predictors of alcohol abuse risk.

The current retrospective survey was therefore designed with three main aims: (i) to examine whether increased PC scores are associated with elevated hangover severity scores, (ii) to explore the factor structure of the acute hangover scale (AHS), and (iii) to explore whether different dimensions of the AHS are independently associated with PC.

2.4. Materials and Methods

2.4.1. Participants

Participants were recruited through opportunity sampling—both at a university in the north-west United Kingdom, and online via social media. Ninety-one participants completed the survey, with 3 participants excluded from analysis because they reported a non-binary gender, which presents issues for calculating blood alcohol concentrations. A

further 2 participants were excluded from analyses based on age, with one reporting an age of 5 years, violating exclusion criteria, and one reporting an age of 80 years, representing an extreme outlier in the current sample (+6.24 SDs from the mean). The remaining sample of 86 had an overall mean age of 25.93 years (SD: 6.03, range: 18–46), with 51 female respondents (59%). No incentive was provided for participation. Exclusion criteria for the study were: below 18 years of age (not of legal drinking age for the area in which they reside); having not experienced hangover in the last 6 months. Exclusion was based on self-report: independent verification of these criteria was not possible with an online survey. Ethnicity was not analysed as a variable as the majority of participants (88%) self-identified as white.

2.4.2. Materials

Participants were required to complete an online survey that included the Acute Hangover Scale (AHS; Rohsenow et al., 2007), to measure hangover severity retrospectively, and the Pain Catastrophising Scale (PCS; Sullivan et al., 1995), to measure PC associated with the experience. The PCS consists of 13 items addressing the experience of catastrophic thoughts related to the experience of pain, rated on a scale from 0 (not at all) to 4 (all the time), with total score calculated as the sum of all items. The PCS has shown a high level of reliability, with Cronbach's α scores typically exceeding 0.8 (Jang et al., 2018; Sullivan et al., 1995; Thorn et al., 2004), and the PCS has been validated in a variety of samples, including those 'seeking treatment' (vs. not seeking treatment) (Osman et al., 1997), pain outpatients (vs. community participants) (Osman et al., 2000), those with back pain (Norwegian version) (Fernandes et al., 2012), and those with chronic pain (Korean and Brazilian-Portuguese versions; Cho et al., 2013; Sehn et al., 2012). The AHS consists of 9 items addressing the severity of 8 hangover symptoms, plus an overall hangover severity rating, all given on a scale from 0 (None) to 7 (Incapacitating), with AHS total score calculated as the mean of all items. The AHS has been validated for concurrent hangover severity measurement, but also shows very high correlations with scales designed for measurement of the most recent (retrospective) hangover experience (Stephens et al., 2014), as well as having been utilised for recent hangover severity measurement in other research (Vatsalya et al., 2018). The AHS was selected due to its popularity as a measure for hangover severity, and because it addresses specific symptoms of hangover, allowing for the consideration of relationships

between hangover symptoms. Participants reported the drinking that led to their most recent hangover using the items from McKinney & Coyle's (2006) investigation, which asks about the number of a variety of standardised drinks consumed (e.g., pints of beer, bottles of beer, alcopops, etc.), and allows for the number of units of ethanol consumed to be calculated (McKinney & Coyle, 2006). Demographics were also collected, including age (which was recorded for use as a covariable since previous evidence has suggested a role in the experience of hangover; Tolstrup et al., 2014), height and weight, (for the calculation of estimated blood alcohol concentrations), and ethnicity. Estimated blood alcohol concentrations were calculated using the method from Seidl et al. (2000), resulting in the estimated peak blood alcohol concentration assuming no elimination (eBAC), and assuming a 15% elimination rate (eBAC15%). Both the AHS and PCS were adapted to reference how the participants felt during their most recent hangover.

2.4.3. Procedure

Participants, recruited via social media (Twitter, Reddit) and posters located around a university in the north-west, UK, completed an online survey hosted on Online Surveys by Jisc (**https://www.onlinesurveys.ac.uk/**). Participants completed the survey during their own time, and were asked to rate the symptomology of their most recent hangover. No timeframe was placed on the hangover experience being assessed. PC was assessed as a trait, based on ratings of general responses to pain. The total time to complete the study was approximately 15 min. No incentives were offered for participation.

2.4.4. Ethics

The materials and methods utilised in this procedure were approved by the University of Salford Health Sciences Research ethics board (HSR1617-15), and all participants provided informed consent. The use of Online Surveys for data collection allowed for participant anonymity, and the system adheres to high ethical standards (e.g., no use of 'cookies' which store files to the local PC used to complete the survey).

2.5. Results

All analyses were carried out in IBM SPSS 25.0.0.1 (IBM Corp., Armonk, NY, USA).

2.5.1. Factor Analysis

A dimension reduction procedure was carried out on responses to the items of the AHS to establish whether symptom clusters existed. The item 'hangover' was excluded from this analysis, as this is non-symptomatic and thought to capture a broad rating of hangover severity (Rohsenow et al., 2007). Descriptive statistics for the remaining items are presented in Table 1. Inter-item correlations are presented in Table 2.

Table 1. Descriptive statistics for ratings of hangover symptom severity on the acute hangover scale (AHS).

					95% CI	
Item	Mean	SD	Median	Normality	Lower	Upper
Tired	5.94	1.240	6	<.001****	5.68	6.21
Thirsty	5.31	1.528	5	.001***	4.99	5.64
Headache	4.71	2.057	5	<.001****	4.27	5.15
Nausea	3.66	2.433	3	<.001****	3.14	4.18
Loss of appetite	3.33	2.078	3	<.001****	2.88	3.77
Dizziness/faintness	3.22	2.008	3	<.001****	2.79	3.65
Stomach ache	3.06	2.054	2	<.001****	2.62	3.50
Heart racing	2.72	2.096	2	<.001****	2.27	3.17

SD—standard deviation; normality—*p*-Value for Shapiro–Wilk analysis of normality. The *n* for all items was 86. Significant results indicated by *** $p < 0.01$, **** $p < 0.001$.

Table 2. Correlations (and significance) of items included in factor analysis of AHS.

	Thirsty	**Headache**	**Nausea**	**Loss of appetite**	**Dizziness/ faintness**	**Stomach ache**	**Heart racing**
Tired	0.239 (0.013)*	0.312 (0.002)***	0.192 (0.038)*	0.176 (0.052)	0.156 (0.075)	0.223 (0.020)*	0.161 (0.069)
Thirsty		0.276 (0.005)**	0.140 (0.100)	0.112 (0.152)	-0.031 (0.390)	0.084 (0.221)	0.226 (0.018)*
Headache			0.208 (0.027)*	0.344 (0.001)***	0.241 (0.013)*	0.182 (0.047)*	0.183 (0.046)*
Nausea				0.473 (<0.001)****	0.497 (<0.001)****	0.529 (<0.001)****	0.434 (<0.001)****
Loss of appetite					0.369 (<0.001)****	0.211 (0.026)*	0.305 (0.002)***
Dizziness/ faintness						0.251 (0.010)*	0.409 (<0.001)****
Stomach ache							0.362 (<0.001)****

Significant correlations indicated by * $p < 0.05$, ** $p < 0.01$, *** $p < 0.005$, **** $p < 0.001$.

As all items failed to meet at least parametric assumption of normality in univariate analyses, principal axis factor analysis was utilised for dimension reduction (Costello & Osborne, 2005). Reduction was carried out using a direct obliminal rotation with a delta of 0, given the likelihood of correlations between dimensions of hangover, and in line with the recommendations of Costello & Osborne (2005). Factors with an eigenvalue above 1 were retained, with results checked visually using the Scree test. Results indicated a solution with 2 dimensions, one factor consisting of symptoms linked to dehydration, and one to stress responses. Kaiser–Meyer–Olkin statistics indicated good sampling adequacy (KMO = 0.722), though KMO values for individual variables indicated a potential issue with the item 'nausea' (KMO = 0.495; removal of this item did not result in changes to the factor structure). Bartlett's test of sphericity indicated acceptable deviance from an identity matrix ($\times^2(28) = 138.762$, $p < 0.001$), and 35% of residuals between observed and reproduced correlations had absolute values above 0.05, indicating moderate model fit. The factor model is summarized in Table 3.

Table 3. Factor loadings of AHS items based on principal axis factoring.

Item	Headache & thirst	Gastric & cardiovascular symptoms
Headache	**0.587**	0.082
Thirsty	**0.506**	-0.069
Tired	**0.456**	0.072
Nausea	-0.102	**0.894**
Dizziness/faintness	-0.065	**0.641**
Heart racing	0.088	**0.535**
Stomach ache	0.024	**0.532**
Loss of appetite	0.164	**0.470**
Eigenvalues	1.252	2.906
Factor correlation	0.452	

Composite scores were calculated for each factor based on the mean of the items which had their primary loadings on each factor (Headache and thirst: mean = 5.32, SD = 1.17; Gastric and cardiovascular symptoms: mean = 3.20, SD = 1.53) with higher scores indicating greater severity of symptoms within the cluster. The bold indicates most relevance.

2.5.2. Regression Models

Three initial regression models of the AHS score were formed, with PCS score and age used as predictor variables in all three models, and the contribution of 'measures of drinking' assessed across separate models. A further two regression models were formed to assess dimensions of the AHS identified in factor analysis. Descriptive statistics for the variables included across these regression models are presented in Table 4. To minimize overfitting of the data, rather than utilize an automated variable selection method, for each model, each variable was entered into the regression concurrently (Babyak, 2004), with a model formed for each of the three 'measures of drinking' obtained; units consumed, eBAC, and eBAC15%. Gender was also entered into the model with the number of units consumed, since this is controlled for in the calculations used to derive eBAC and eBAC15% scores and approximates differences in the body fat composition of different genders which influences alcohol distribution through body water during consumption.

Table 4. Descriptive statistics for variables included across the five regression models constructed.

					95% CI	
Variable	**Mean**	**SD**	**Median**	**Normality**	**Lower**	**Upper**
Acute Hangover Scale (AHS)	4.10	1.20	4.11	0.101	3.85	4.36
Pain Catastrophising Scale (PCS)	28.81	11.64	26.50	<0.001****	26.32	31.31
Age	25.93	6.03	25	<0.001****	24.64	27.22
Total units	15.62	8.64	13.40	<0.001****	13.77	17.48
eBAC	0.26	0.14	0.22	<0.001****	0.23	0.29
eBAC15%	0.18	0.13	0.14	<0.001****	0.15	0.21
Headache & thirst	5.32	1.17	5.33	0.06	5.07	5.57
Gastric & cardiovascular symptoms	3.20	1.53	3.00	0.002***	2.87	3.53

Variables: AHS—acute hangover scale; PCS—pain catastrophising scale; total units—units of alcohol consumed, calculated from self-report; eBAC—the estimated blood alcohol concentration assuming no elimination; eBAC15%—the estimated blood alcohol concentration assuming 15% elimination rate; Headache and thirst—mean score for items identified within dimension 1 of the factor analysis; Gastric and cardiovascular symptoms—mean score for items identified within dimension 2 of the factor analysis; SD—standard deviation; normality—significance of Shapiro–Wilk analysis. The *n* for all measures was 86, *** $p < 0.005$, **** $p < 0.001$.

Results indicated that eBAC represented the drinking measure that explained the most variance in AHS scores (power = 0.50, calculated post-hoc), and as such the model containing this variable was carried forward for regression analyses of factor scores calculated during factor axis analysis. A regression model containing eBAC, PCS score, and age, as predictor variables, was therefore formed for each of the two factor scores derived. Summaries of regression models are presented in Table 5, with a summary of individual variable contributions presented in Table 6.

Table 5. Summary of model statistics for regression analyses.

Model	DV	IV	R	R^2	Adj R^2	F	F Sig.	Durbin-Watson
1	Acute hangover scale (AHS)	Units consumed Gender PCS score Age	0.432	0.187	0.147	4.656	0.002***	1.789
2	AHS	eBAC15% PCS score Age	0.397	0.158	0.127	5.118	0.003***	1.771
3	AHS	eBAC PCS score Age	0.429	0.184	0.154	6.163	0.001***	1.802
4	Headache & thirst	eBAC PCS score Age	0.307	0.094	0.061	2.844	0.043*	1.612
5	Gastric & cardiovascular symptoms	eBAC PCS score Age	0.398	0.158	0.128	5.141	0.003***	1.906

DV (dependent variable): AHS—Acute hangover scale; Headache and thirst—mean score for items identified within dimension 1 of the factor analysis; Gastric and cardiovascular symptoms—mean score for items identified within dimension 2 of the factor analysis. R—value of r for model; R2—value of r squared for model; Adj R2—adjusted r squared for model; F—F value for model; F Sig.—Significance of the F value for the model; Durbin-Watson—Durbin-Watson statistic for the model. Significant results indicated by *, * $p < 0.05$, *** $p < 0.005$.

Tolerance, variance inflation factors (VIFs), and collinearity diagnostics indicated no issues with multicollinearity. Manual examination of standardized residuals plotted against standardized predicted values suggested no issues with heteroscedasticity in the data, and multivariate normality was present in all models. Durbin–Watson statistics indicated

Table 6. Summary of statistics determining independent variable contributions to regression effects.

								95% CI		Correlations					
Model	**DV**	**IV**	**B**	**SE B**	**β**	**t**	**t Sig.**	**Lower**	**Upper**	**Zero-order**	**Partial**	**Part**	**Tolerance**	**VIF**	**Pratt**
1	Acute Hangover Scale (AHS) score	Constant	2.955	0.709		4.170	<0.001****	1.545	4.365						
		Units consumed	0.033	0.014	0.239	2.342	0.022*	0.005	0.061	0.175	0.252	0.235	0.967	1.034	0.042
		Gender	0.366	0.250	0.151	1.460	0.148	-0.133	0.864	0.186	0.160	0.146	0.939	1.065	0.028
		PCS score	0.032	0.011	0.314	3.038	0.003***	0.011	0.053	0.326	0.320	0.304	0.940	1.063	0.102
		Age	-0.02	0.020	-0.1	-0.991	0.324	-0.060	0.020	-0.148	-0.109	-0.099	0.981	1.019	0.015
2	AHS score	Constant	3.255	0.695		4.682	<0.001****	1.872	4.637						
		eBAC15%	1.867	0.954	0.200	1.957	0.054	-0.030	3.765	0.209	0.211	0.198	0.982	1.018	0.042
		PCS score	0.033	0.011	0.317	3.106	0.003***	0.012	0.054	0.326	0.324	0.315	0.985	1.015	0.103
		Age	-0.017	0.020	-0.083	-0.809	0.421	-0.057	0.024	-0.148	-0.089	-0.082	0.968	1.033	0.012
3	AHS score	Constant	3.005	0.700		4.292	<0.001****	1.612	4.398						
		eBAC	2.262	0.881	0.257	2.568	0.012*	0.510	4.014	0.260	0.273	0.256	0.990	1.010	0.067
		PCS score	0.033	0.010	0.321	3.189	0.002***	0.012	0.054	0.326	0.332	0.318	0.984	1.016	0.105
		Age	-0.017	0.020	-0.085	-0.839	0.404	-0.057	0.023	-0.148	-0.092	-0.084	0.976	1.025	0.013
4	Headache & thirst	Constant	4.288	0.721		5.943	<0.001****	2.852	5.723						
		eBAC	1.876	0.907	0.218	2.067	0.042*	0.070	3.681	0.216	0.223	0.217	0.990	1.010	0.047
		PCS score	0.022	0.011	0.216	2.039	0.045*	0.001	0.043	0.214	0.220	0.214	0.984	1.016	0.046
		Age	-0.003	0.021	-0.015	-0.141	0.888	-0.044	0.038	-0.062	-0.016	-0.015	0.976	1.025	0.001
5	Gastric & cardiovascular symptoms	Constant	2.323	0.908		2.559	0.012*	0.517	4.129						
		eBAC	2.258	1.142	0.201	1.978	0.051	-0.013	4.529	0.208	0.213	0.200	0.990	1.010	0.042
		PCS score	0.039	0.013	0.299	2.931	0.004***	0.013	0.066	0.311	0.308	0.297	0.976	1.025	0.093
		Age	-0.032	0.026	-0.128	-1.245	0.217	-0.084	0.019	-0.183	-0.136	-0.126	0.976	1.025	0.023

DV (dependent variable): AHS—Acute hangover scale; Headache and thirst—mean score for items identified within dimension 1 of the factor analysis; Gastric and cardiovascular symptoms—mean score for items identified within dimension 2 of the factor analysis. B—Beta coefficient; SE B—Standard error of beta coefficient; β—standardized beta coefficient; t—t-statistic value for parameter; t Sig.—significance of t-statistic for parameter; VIF—Variance inflation factor; Pratt—Pratt statistic for parameter. Significant results indicated by *, * $p < 0.05$, *** $p < 0.005$, **** $p < 0.001$.

independence of errors. Some issues were identified in casewise diagnostics, with a small number of cases indicating issues with either problematic covariance ratios or high leverage values in regression models.

Given that a number of cases presented potential issues with covariance and leverage, and in line with recommendations made by Babyak (2004), validation of the final models (those containing the eBAC drinking measure) was carried out using bootstrap methods with 2000 random resamples drawn. Bootstrapped models are summarised in Table 7.

Table 7. Summary of bootstrapped regression model coefficients.

Model	DV	IV	B	Bias	SE	Sig. (Two-tailed)	Bca 95% CI Lower	Bca 95% CI Upper
3	Acute hangover scale (AHS) score	Constant	3.005	0.009	0.725	<0.001****	1.612	4.491
		eBAC	2.262	0.027	0.959	0.022*	0.483	4.28
		PCS score	0.033	<0.001	0.009	<0.001****	0.015	0.051
		Age	-0.017	<0.001	0.020	0.401	-0.058	0.021
2	Headache & thirst	Constant	4.288	0.046	0.658	<0.001****	2.975	5.84
		eBAC	1.876	0.032	0.950	0.046*	0.049	3.812
		PCS score	0.022	<0.001	0.010	0.026*	0.003	0.040
		Age	-0.003	-0.002	0.022	0.890	-0.047	0.035
3	Gastric & cardiovascular symptoms	Constant	2.323	-0.002	0.922	0.014*	0.577	4.119
		eBAC	2.258	0.007	1.233	0.066	-0.060	4.654
		PCS score	0.039	<0.001	0.013	0.004***	0.013	0.064
		Age	-0.032	<0.001	0.024	0.165	-0.080	0.015

DV—dependent variable; IV—independent variable; B—beta weight; SE—standard error; BCa 95% CI—bias-corrected accelerated 95% confidence interval. Bootstrap results based on 2000 bootstrap samples. Significant results indicated by *,* $p < 0.05$, *** $p < 0.005$, **** $p < 0.001$.

Results of bootstrap analyses have a fairly high level of agreement with original regression models, with significant predictor variables remaining constant. Both eBAC and total PCS score demonstrated significant relationships with total AHS score, and a composite score based on symptoms of the AHS related to 'Headache and thirst'. Only total PCS score demonstrated a relationship with a composite score based on 'Gastric and cardiovascular' symptoms. eBAC approached significance in this model. However, bootstrapping did indicate some bias toward significance of this variable with this sample.

2.6. Discussion

2.6.1. Summary of the Main Findings

Hangover, the mental and physical symptoms experienced the day after drinking and once BAC is approaching 0, has previously been associated with a variety of other factors, including genetic influences on alcohol metabolism (Edenberg, 2007; Wall et al., 2005), gender (Seidl et al., 2000), inflammatory responses (Kim et al., 2003; Verster et al., 2013), immunological function (Penning et al., 2010) and congeners (Verster, 2006). However, few psychosocial predictors of hangover have been identified so far.

The three main aims of the current study were: (i) to examine whether increased PC scores are associated with elevated hangover severity scores, (ii) to explore the factor structure of the acute hangover scale (AHS), and (iii) to explore whether different dimensions of the AHS were independently associated with PC. The current study demonstrated that PC was a predictor of perceived hangover severity and was, in fact, a stronger predictor than the estimated peak blood alcohol concentration (eBAC). Exploration of the dimensions of the AHS revealed two distinct symptom dimensions; 'Headache and thirst'; and 'Gastric and cardiovascular' symptoms. While both eBAC and PC were significantly associated with 'Headache and thirst', only PC was associated with 'Gastric and cardiovascular' symptoms.

2.6.2. Relationships between Pain Catastrophising and Hangover Severity

Relationships between PC and AHS scores were investigated using multiple linear regression. Initial models indicated that, of the drinking measures, a calculated blood alcohol concentration that did not account for elimination (eBAC) was the best predictor of the AHS score. One potential explanation is that the preferential metabolism of ethanol limits downstream action to eliminate ethanol metabolites leading to a build-up of biologically active compounds (Cederbaum, 2012). This would be consistent with the time course of alcohol hangover, with symptomology extending beyond the period of acute ethanol intoxication.

Regression models (and calculated product measures; Nathans et al., 2012) indicated PC was a better predictor of perceived hangover severity than eBAC. Given relationships between PC and other psychosocial variables such as depression and anxiety

(Quartana et al., 2009; Thorn et al., 2004), PC could provide a mechanism through which other psychosocial variables influence self-report hangover severity scores. Furthermore, given links between PC and inhibitive processes (Goodin et al., 2009), this cognitive strategy may influence motivational responses to hangover, providing a potential link between hangover experience and local behaviour, such as engagement with further drinking. Such effects could have implications in addiction research (Piasecki et al., 2010).

The results of the current investigation may also have implications for the measurement of hangover, given its reliance on self-report measures, such as the AHS (Rohsenow et al., 2007). This issue has been largely ignored in hangover research for purposes of practicality, with a lack of other approaches available. Results from the regression models developed as part of this investigation indicate a moderate effect of PC on AHS score, comparable to the effect observed for measures of alcohol consumption, and support the view that self-report hangover questionnaires contain a significant subjective element. This may reinforce the need for an objective measure of hangover. However, research into biomarkers of hangover severity has yet to find a reliable indicator (Merlo et al., 2017; Raasveld et al., 2015). An alternative approach to measuring hangover severity in a more objective manner may be to examine the cognitive effects of hangover. A meta-analytic examination of the next-day cognitive effects of hangover published in 2018 suggested that effects can be seen during hangover on short- and long-term memory, sustained attention, and psychomotor speed (Gunn et al., 2018). Differences in performance on tasks examining these functions between hangover and non-hangover days could therefore present a measure of functional hangover severity.

Questions can be raised regarding the value of any of these measurement approaches. Arguably, the subjective experience of hangover is likely to influence the behavioural response to the experience, and may provide value over 'objective' measurements of hangover, such as cognitive performance measures or biomarkers, in particular contexts (e.g., the investigation of absenteeism/presenteeism and other acute behaviours). In comparison, objective measures may be more useful in investigations examining the biological correlates of alcohol hangover. Further research will need to examine the comparative value of different measurement approaches in relation to different

outcomes. However, controlling for PC in future analyses may also aid in understanding the hangover experience, particularly with regard to the investigation of biomarkers.

2.6.3. Dimensions of the AHS

A recent review of the physiology of hangover identified alcohol metabolites, neurotransmitter alterations, inflammatory factors, and mitochondrial (metabolic) dysfunction as the most likely factors involved in hangover symptomology (Palmer et al., 2019). PC has also been associated with alterations to immune responses, with heightened reactivity of cytokine IL-6 related to increased levels of PC as measured immediately after painful stimulation (Edwards et al., 2008). This relationship between PC and IL-6 also appeared to be independent of pain ratings given during stimulation. Likewise, immune responses during hangover have been shown to include increases in IL-6 levels (Raasveld et al., 2015), with IL-6 thought to have particular importance as a messenger molecule that connects peripheral regulatory processes with the central nervous system during responses to both physiological and psychological stress (Edwards et al., 2008).

In this study, factor analysis of AHS responses resulted in two symptom dimensions; (1) Headache and thirst ('headache', 'tired', 'thirsty'), and (2) Gastric and cardiovascular symptoms ('nausea', 'dizziness/faintness', 'heart racing', 'loss of appetite', and 'stomach ache'). The 'Headache and thirst' symptom cluster could be related to the diuretic properties of alcohol (Bø et al., 2009), which can lead to dehydration. Dehydration has been linked to headache (Blau et al., 2004), with tiredness and thirst being considered common symptoms. Headache may also be the result of cytokine release prompted by physiological stress associated with alcohol consumption (Bø et al., 2009; Zhu et al., 2017), or indeed physiological stress may be caused by dehydration. However, there is potential for overlap in the causes of symptom clusters. Speculation regarding the biological mechanisms underlying symptom cluster experience is, however, not possible based on the current investigation. Future work will be needed to identify specific biological associations with the experience of hangover symptom clusters. Penning et al.'s factor analysis also identified dehydration ('disturbed water balance') as a dimension of the hangover experience (Penning et al., 2012). However, in their investigation, the item 'headache' was not loaded on this dimension. Dehydration causes physiological changes, e.g., to electrolytic balance, which have proposed associations with hangover. However, evidence for relationships between

physiological changes and hangover severity is lacking (Penning et al., 2010), though they have not been investigated in relation to specific symptom clusters. One potential explanation for the 'Gastric and cardiovascular' symptom cluster emerging is that they can all be linked to physiological stress responses. Effects of stress response on the autonomic nervous system are well established (Chrousos, 2009), and acute physiological stress can also induce various responses in the gastrointestinal system (Söderholm & Perdue, 2001).

An alternative explanation of the factor structure of the AHS identified in this investigation relates to the prevalence of symptoms. Tiredness, thirst and headache, the items loaded within the 'Headache and thirst' dimension, represent the three most commonly reported hangover symptoms (Slutske et al., 2003). It is possible that these symptom clusters are thus representative of different groups that either experience one or both of the symptom clusters. An extension of this reasoning, given the prevalence of headache and thirst symptoms in hangover, could be that less severe hangovers consist of symptoms included within the 'Headache and thirst' symptom cluster, with more severe hangovers including 'Gastric and cardiovascular' symptoms.

2.6.4. Dimensions of the AHS Independently Associated with PC

Composite scores based on 'Headache and thirst' symptoms, and 'Gastric and cardiovascular' symptoms, identified during factor analysis of AHS responses, were also assessed using regression. Both eBAC and PCS score significantly predicted 'Headache and thirst' symptom scores with approximately equal contributions. The observation of PC score as a significant predictor in this model is possibly due to the inclusion of headache severity ratings in the construction of this score, with PC having previously been linked with both the presence of weekly headache (Drahovzal et al., 2006), and the severity of migraine symptoms, a phenomenon associated with headache (Hubbard et al., 2014). Given the diuretic effects of alcohol (Hobson & Maughan, 2010), it follows that measures of alcohol consumption would be related to symptoms associated with dehydration.

Finally, only PCS score significantly predicted composite scores based on 'Gastric and cardiovascular' symptoms, though eBAC was only marginally non-significant. Product measures supported the interpretation that PC was more strongly related with 'Gastric and cardiovascular' symptoms than eBAC, and robust regression provided some validation of this

model. PC has been related to activity in the mPFC (Seminowicz & Davis, 2006), an anatomical area that has also been shown to mediate stress response (Yang et al., 2018). This may provide a link through which this cognitive strategy can influence stress responses occurring as a result of hangover. The exclusion of eBAC from this model may indicate that these symptoms are not direct products of alcohol consumption, or that this symptom set is not associated linearly with the volume of alcohol consumed (e.g., threshold effects). It has, however, been previously suggested that increased levels of fatty acids seen during hangover are products of a stress response concurrent with hangover (Penning et al., 2010), which could indicate that 'Gastric and cardiovascular' symptoms in hangover are somewhat independent of the amount of alcohol consumed.

2.6.5. Conclusions and Directions for Future Research

Hangover represents a considerable economic toll due to its influence on local behaviour, such as lost productivity and workplace absenteeism (Prat et al., 2009). Furthermore, the experience of hangover may be related to downstream health consequences by promoting deviant drinking practices (Penning et al., 2010). The current investigation revealed, for the first time, that PC predicts alcohol hangover severity and that this effect occurs in a symptom specific manner. PC may also provide a cognitive strategy through which other psychosocial variables can influence hangover.

Exploratory factor analysis provided evidence of two distinct sub-structures of the AHS, 'Headache and thirst', and 'Gastric and cardiovascular' symptoms. Results of this investigation could be interpreted as suggesting that dehydration and physiological stress responses represent areas that warrant further examination, with differences in regression models based on composite hangover scores for symptom clusters providing some evidence that symptom clusters are somewhat independent. This may provide an explanation for why markers of dehydration have not always correlated with overall hangover severity (Penning et al., 2010), as well as why thirst had the lowest item-total correlation during development of the AHS (Rohsenow et al., 2007). Further research will be required to establish whether particular covariables correlate with symptom clusters either derived from dimension reduction procedures or theoretical mechanistic relationships. The AHS also measures a somewhat limited sample of hangover symptoms, and recent research has adopted the approach of combining the symptoms identified in a number of validated hangover

measures, in order to capture the diversity of the hangover experience (van Schrojenstein Lantman et al., 2017). These measures consist largely of different symptoms, but show high correlations, and further research will be needed to examine whether the dimensions of the hangover experience suggested here are evident within this broader context, as well as their relationships with PC.

As noted previously, hangover has also been associated with effects on local drinking behaviour (Epler et al., 2014; Huntley et al., 2015), with an ecological momentary assessment conducted by Epler et al. in 2014 indicating that the presence of hangover delayed the onset of the next drinking episode when interacting with either the onset of financial stressors, or the presence of craving at the end of the drinking episode (Epler et al., 2014). Epler et al.'s (2014) sample consisted of participants with a reasonably low risk of alcohol problems (average AUDIT score = 12.21), but no research has addressed this relationship in high-risk or clinical groups. Evidence has suggested relationships between craving and AUD symptomology in a sample containing a high proportion of participants meeting criteria for diagnosis of AUD. However, no relationship was found between craving and drinking habits in this sample (MacKillop et al., 2010). This may suggest that interactions between craving, hangover, and local drinking behaviour do not exist in those at a high risk for AUD. Greater craving in the high-risk sample also showed a relationship with increased impulsive discounting (a devaluation of future reward; MacKillop et al., 2010), which may provide a mechanism for observed losses of inhibitory response control in alcohol disorders, as well as other disorders, such as depression (Dick et al., 2010). Weaker inhibition processes have also been noted in those with a family history of AUD (Nigg et al., 2006), and in young-adult binge drinkers (Czapla et al., 2015), a form of drinking associated with an increased incidence of hangover. Inhibition is also inherently linked with impulsivity (Bari & Robbins, 2013), which has itself been strongly associated with AUD (Dick et al., 2010). Given the links between PC and motivational/inhibitive processes (Goodin et al., 2009; Verhoeven et al., 2010), future research should consider PC and hangover alongside factors related to motivation/inhibition, such as performance on inhibition dependent tasks, and craving. Vatsalya et al.'s (2018) investigation found no relationship between hangover severity (as measured by the AHS) and a single item measure of craving (Vatsalya et al., 2018). However, this craving measurement is unlikely to capture the theoretical complexity of the

phenomenon and future research would benefit from the use of context appropriate, validated craving measures (Sayette et al., 2000).

Future research should therefore seek to elucidate the potential interaction between PC and cognitive processing systems mediating inhibitory control and the craving response during alcohol hangover.

2.7. Chapter summary.

This chapter aimed to characterise the symptomology of hangover, and assess relationships between hangover severity and capacity to cope with pain. This was achieved via a retrospective cross-sectional survey assessing alcohol hangover severity and pain catastrophising.

With regard to the characterisation of hangover symptomology, factor analysis of the severity of reported hangover symptoms indicated the presence of 2 symptom clusters in hangover; 'headache and thirst symptoms', which consisted of symptoms headache, tiredness, and thirst; and 'gastric and cardiovascular symptoms' which consisted of symptoms dizziness/faintness, loss of appetite, stomach ache, nausea, and increased heart rate. These symptom clusters may be associated with different physiological mechanisms, and different effects on performance during hangover.

Assessment of relationships between the severity of symptom clusters and pain catastrophising indicated a significant positive relationship, such that those who had a greater tendency to catastrophise in response to pain reported greater hangover severity. Zero-order correlations indicated that the relationship between pain catastrophising and hangover severity was moderate in strength for the overall AHS score, and for 'gastric and cardiovascular symptoms'. In contrast, the relationship between pain catastrophising and 'headache and thirst symptoms' was weak. Catastrophising is associated with inhibitive and motivational processes (Goodin et al., 2009; Verhoeven et al., 2010), and has been related to alcohol-cue elicited neural response (Nieto et al., 2022) as well as craving in individuals with AUD (Kneeland et al., 2019). Catastrophising is also associated with other negative affect constructs, including anxiety and depression, as well as alterations to the physiological response to stress (Quartana et al., 2009). These changes to stress response may interact

with alterations of stress response that are observed following drug use (Wemm & Sinha, 2019). Collectively, this may suggest that catastrophising plays a role in relationships between hangover and AUD (Piasecki et al., 2010; Vatsalya et al., 2019).

Since this research was published, it has been partially replicated, with the rumination sub-scale of the PCS showing a relationship with hangover severity in a larger sample (Saeed et al., 2021). Rumination has itself been shown as a predictor of classification as a problem drinker (Caselli et al., 2008), and is associated with future drinking behaviour in those with AUD (Caselli et al., 2010). Future research may therefore benefit from focusing on the rumination aspect of catastrophising in alcohol hangover, as well as relationships with stress responses.

Chapter 3: Psychological distress and hangover symptomology.

3.1. Chapter introduction.

In the previous chapter, evidence was presented establishing a 2-factor structure of the AHS, as well as a relationship between pain catastrophising, a maladaptive coping strategy employed in response to real or anticipated pain (Quartana et al., 2009), and the severity of specific clusters of alcohol hangover symptoms. It was proposed that the use of pain catastrophising as a coping strategy may provide a link to other psychological factors that have been associated with hangover, such as craving, anxiety, and depression, as well as providing a link to stress responses.

Results indicating a relationship between pain catastrophising and hangover severity have since been partially replicated (Saeed et al., 2021). Pain catastrophising has been conceptualised within transactional models of stress and coping (Quartana et al., 2009), which emphasise the role of cognitive processes in responding to stress. These cognitive processes include the use of coping strategies as part of a dynamic interaction between a person and their environment or situation. Given the results indicating relationships between hangover experience and pain catastrophising (Royle et al., 2020; Saeed et al., 2021), this may therefore suggest that broader conceptualisations of coping (i.e. conceptualisations that are not specifically framed around the experience of pain), are associated with the reported severity of hangover experienced. The investigation reported in this chapter therefore expands on the research reported in Chapter 2 by examining a broader conceptualisation of coping responses than the pain catastrophising measure utilised in the previous study, to examine whether more generalised aspects of coping are associated with the experience of hangover symptoms. Coping responses are also inherently linked to the experience of stress, providing a potential mechanism by which coping may mediate hangover experience, as physiological stress and immune response mechanisms have been proposed as a cause of alcohol hangover (Turner et al., 2024).

The onset of the COVID-19 pandemic in the UK and subsequent imposition of lockdowns and other social controls, as well as the economic impacts of these controls, provided a unique opportunity to explore these links between hangover, depression, anxiety, coping, and financial stress caused by the circumstances of the pandemic. The following

study was undertaken in an attempt to exploit this opportunity to further develop understanding of the role that stress, distress, and coping responses play in alcohol hangover. The aims of this chapter are therefore to characterise the symptomology of hangover by confirming the hangover symptom clusters observed in chapter 2, and examine relationships between stress and distress, coping responses, and hangover symptom severity. The write-up of this investigation is in preparation for submission.

3.2. Abstract.

Alcohol hangover, which follows single episodes of alcohol consumption and includes physical and psychological symptoms, has been associated with pain catastrophising. Negative orientations towards pain and stress (e.g. catastrophising) may alter the experience of hangover through interactions with immune responses, which are also affected by experience of psychological distress, and contribute to hangover experience. Relationships between hangover experience, coping, and psychological distress may have implications for drinking behaviours and future health outcomes. The COVID-19 pandemic is thought to have caused increases in psychological distress due to both the economic and social impacts of 'lockdowns', and may therefore have also altered peoples experience of hangover. This study investigated relationships between income loss during the COVID-19 pandemic, psychological distress, maladaptive coping, and hangover symptom cluster severity using cross-sectional survey data. Confirmatory factor analyses confirmed the presences of 'headache and thirst' and 'gastric and cardiovascular' symptom clusters in hangover symptomology. Structural equation models did not indicate a relationship between income loss during the COVID-19 pandemic and psychological distress, however this may be due to a lack of income loss observed in the sample. Likewise, no relationship was indicated between psychological distress or maladaptive coping with hangover symptom cluster severity. In contrast, a direct relationship was observed between psychological distress and a single item measure of hangover severity, as well as an indirect relationship between psychological distress and 1-item hangover severity via maladaptive coping. Counter to expectations, maladaptive coping had a negative relationship with 1-item hangover severity, which may indicate a protective effect of maladaptive coping on hangover. Relationships between psychological distress and hangover severity may be due to effects of distress on levels of inflammation and oxidative stress, which are thought to underly hangover. The

differences in relationships observed for hangover symptom cluster severity measurements and the 1-item measure of hangover severity may be explained by the inclusion of broader symptomology in participants response to the 1-item measure that is not captured by the measurement of specific somatic symptoms. Collectively, results provide novel insight into the intricate relationships between psychological distress, coping, and hangover severity measures, as well as informing debate surrounding hangover severity measurement. Future research should seek to develop understanding of the observed relationships in broader samples, as well as investigate biological and cognitive outcomes associated with hangover severity measurements.

3.3. Introduction.

The alcohol hangover is a collection of both physiological and psychological symptoms that occur following acute alcohol consumption, when blood alcohol concentration is approaching zero (Palmer et al., 2020). The severity of hangover symptoms, which include headache, stomach pain and gastrointestinal complaints, and increased anxiety, have been associated with the psychological response to acute stress/pain, in the form of pain catastrophising (Royle et al., 2020; Saeed et al., 2021). Catastrophising is a maladaptive coping strategy described as an exaggerated negative orientation towards actual or anticipated pain and has been considered within the frameworks of stress appraisals (Quartana et al., 2009). Catastrophising is associated with altered physiological responses to pain, with elevated pain catastrophising associated with greater levels of pro-inflammatory markers (Edwards et al., 2008), and indicators of oxidative stress in participants undergoing knee arthroplasty (Bruehl et al., 2022, 2024). Royle et al., (2020) found that catastrophising in hangover was associated with both headache and thirst, and gastric and cardiovascular symptoms, based on a 2-factor model of the Acute Hangover Scale (Rohsenow et al., 2007). In contrast, estimated measures of blood alcohol concentration (BAC) were only related to headache and thirst symptoms. Coping strategies have been associated with levels of psychological distress in participants who have experienced trauma (Littleton et al., 2007), cancer patients (Morris et al., 2018; Shin et al., 2020), and the general population (Eisenbarth, 2004; Nielsen & Knardahl, 2014). Increases in maladaptive coping strategies, such as catastrophising (Hori et al., 2010) have also been positively associated with increased psychological distress. Catastrophising has been

indicated as a mediator of the effects of psychological distress on pain experience in a variety of circumstances including for irritable bowel symptoms (Cassar et al., 2018), orofacial pain (Jang et al., 2018), and in Parkinson's disease (Zimmers et al., 2023). Evidence indicating that the severity of hangover symptoms are related to coping strategies involved in the processing of pain, such as catastrophising, may therefore suggest that psychological distress is associated with the experience of hangover.

Psychological distress can be conceptualised as a potential product of several factors: sociodemographic (e.g. age, gender, and genetic factors), stress-related (e.g. stress, anxiety, and depression), and personal resources (e.g. self-esteem, and social support); and represents a mental state that drives both physiological and behavioural responses (Drapeau et al., 2012). Increased psychological distress is associated with poorer health-related behaviour (McKenzie & Harris, 2013), including increased alcohol consumption in a variety of cultures (Balogun et al., 2014; Chang et al., 2022; Deasy et al., 2015; Mathiesen et al., 2012; McKenzie & Harris, 2013; Thandi et al., 2015), and risk for addiction (Geisner et al., 2004; Lechner et al., 2021a; Thandi et al., 2015). Psychological distress has been associated with various markers of inflammation, including increased white blood cell counts in general populations (Baek et al., 2019), and fibrinogen in healthy young adults (Goldman-Mellor et al., 2010), indicating increased immune system activity. Likewise, oxidative stress has been associated with psychological distress in both clinical and healthy populations (Aschbacher & Mason, 2019; Hassan et al., 2016). Oxidative stress represents a disruption to homeostasis (Sies, 2019) that may also contribute to addiction (Koob & Volkow, 2010). Psychological distress is then associated with both inflammation and oxidative stress, which are also thought to contribute to the experience of hangover symptomology (Mackus et al., 2020; Turner et al., 2024; van de Loo, Mackus, et al., 2020).

Recently, particular attention has been paid to psychological distress associated with the COVID-19 pandemic (Burke et al., 2020; Daly & Robinson, 2022; Gómez-Salgado et al., 2020; Hamza et al., 2021; Heath et al., 2020; Mazza et al., 2020; Petzold et al., 2020; Pink et al., 2021; Prout et al., 2020; Qiu et al., 2020; Roma et al., 2020), as the restrictions imposed by national and local lockdowns have implications for population wellbeing (Rossi et al., 2020; Torales et al., 2020). Financial insecurity during the pandemic has been associated with increased depressive symptoms in a north American sample (Zheng et al., 2021), and increases in psychological distress between pre-pandemic and during-pandemic

measurements were associated with income (Breslau et al., 2021). Similar results have shown that reduced income is associated with higher risk of psychological distress in a socio-economically vulnerable sample from Brazil (Santana et al., 2021), and that income loss leads to financial distress and poorer well-being in a sample from Chile (Borrescio-Higa et al., 2022). Likewise, In the UK, psychological distress was observed to increase from pre-pandemic measures to measures of distress during the pandemic (Patel et al., 2022). Further, mental distress has been associated with financial worries, with financial worries related to changes in the number of hours being worked during the pandemic (Wolfe & Patel, 2021), indicating that income loss acts as a stressor that promotes psychological distress. Research conducted during the period of the COVID-19 pandemic has also shown a relationship between increased psychological distress and increased engagement with drinking behaviours (Lechner et al., 2020; Rodriguez et al., 2020), with increases in risky drinking behaviour observed over time in both US (Lechner et al., 2021b), and Finnish samples (Oksanen et al., 2021). Financial stress has also been implicated in relationships between hangover and future drinking behaviour (Epler et al., 2014).

Psychological distress has been associated with the occurrence and exacerbation of somatic symptoms (Clarke et al., 2008; Kozlowska, 2013; Seto & Nakao, 2017), including headache (Aaseth et al., 2011; Hoge et al., 2007; Kristoffersen et al., 2018) and stomach pain or nausea (Hoge et al., 2007; Koloski et al., 2003; Levy et al., 2006). These symptoms have a high prevalence in hangover (Penning et al., 2012) and may be exacerbated during hangover as physiological effects of distress overlap with proposed hangover mechanisms (Mackus et al., 2020; Turner et al., 2024; van de Loo, Mackus, et al., 2020). Despite these overlaps, no research has sought to model the relationships between distress, coping, and hangover experience.

Collectively the extant literature may suggest that increased psychological distress, such as that precipitated by income loss during the COVID-19 pandemic, may also have exacerbated the hangover experience, with the potential for further negative consequences as a product of changed drinking behaviour that may have downstream effects on health outcomes(Išerić et al., 2024; Piasecki et al., 2010). Furthermore, these relationships may be mediated by the adoption of maladaptive coping strategies.

The current investigation was therefore designed in order to; (1) confirm the 2 factor structure of the acute hangover scale observed in Royle et al., (2020); (2) examine the

relationship between psychological distress associated with income loss during the Covid-19 pandemic and severity of hangover symptomology; and (3) investigate whether any relationship between psychological distress and hangover symptom severity was mediated by tendencies toward maladaptive coping. It was hypothesised that; (1) headache, tiredness, and thirst symptoms would load significantly on to a factor representing headache and thirst symptoms, and that dizziness/faintness, loss of appetite, stomach ache, nausea, and heart racing symptoms will load on to a second factor representing gastric and cardiovascular symptoms of hangover; (2) income loss associated with the COVID-19 pandemic will be associated with greater psychological distress; psychological distress will be positively associated with the adoption of maladaptive coping strategies and hangover symptom cluster severity; maladaptive coping will be positively associated with hangover symptom cluster severity; and (3), that maladaptive coping will mediate the relationship between psychological distress and hangover symptom severity.

3.4. Methods.

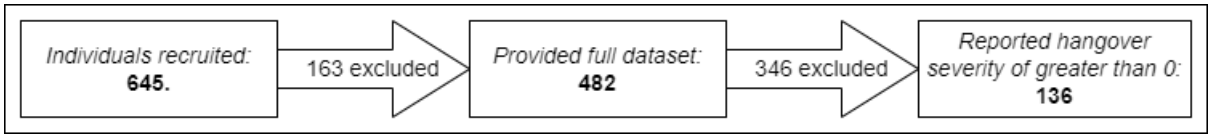
3.4.1 Participants.

A total of 645 UK-based participants aged 18 and over were recruited via social media advertising. Participants completed surveys as part of a multi-wave investigation. The current study presents a cross-sectional analysis of data drawn from wave 1 of the investigation. Wave 1 of data collection ran from 31st of May 2020 till the 7th of November 2020. During this time, UK citizens were under instructions to work at home (aside from keyworkers), mandated wearing of masks, and socialising in groups of no more than six individuals (Institute for Government, 2022). Participants were entered into a prize draw for Amazon vouchers for each wave of the investigation they completed (£10 at wave 1, £20 for wave 2, £30 for wave 3, and £50 for wave 4). Ethical approval for the study was granted by the School of Health & Society Ethics Committee at University of Salford, UK (HSR1920-089). All participants provided informed consent and participants were free to withdraw at any time without revealing the reason for discontinuing.

Of the 645 participants that completed the first wave of the survey, 482 provided full datasets, of which 136 reported at least some level of hangover symptomology associated with the greatest amount of alcohol they had consumed in the last week. 7 further participants were removed as outliers during analysis based on Mahalanobis

distance probabilities of <.001 (for p1 and p2; Collier, 2020), resulting in a sample of 129 participants. These participants had an average age of 30.01 years (SD: 11.86 years), and were predominantly female (21 males, 108 females).

Figure 1. Flowchart of exclusions.



3.4.2. Materials.

3.4.2.1. Demographics & income.

Participants were asked for their age, gender, height, weight, and which of 10 possible options best described their occupation (Health and social care, Education, Retail, Hospitality and leisure, Manufacturing, Professional services, Construction, Transport and storage, or Student). Participants were also asked to indicate their income (in GBP), both prior to the COVID-19 pandemic and at the time of completing the survey (during the period of COVID lockdowns in the UK). Specifically, participants were asked "prior to the COVID-19 situation, how much did you earn after taxes?". Participants completed a free-text response to indicate a number and selected from 'weekly', 'fortnightly', 'monthly', or 'yearly' to indicate a frequency. For measures of current income participants were asked "how much do you currently earn after taxes?", with the same response format.

3.3.2.2. Psychological distress – Stress, depression, anxiety, and loneliness.

The 21-item self-report depression, anxiety, and stress scale (DASS; Henry & Crawford, 2005) was used to assess psychological distress. Participants responded on a scale of 0 (did not apply to me at all) to 3 (applied to me very much or most of the time) to statements assessing depression (e.g. "I couldn't seem to experience any positive feeling at all"), stress (e.g. "I found it hard to wind down"), and anxiety (e.g. "I felt I was close to panic"). Scores for depression, anxiety, and stress calculated as the sum of responses on each subscale multiplied by 2 (to normalize scores against the DASS-42), with higher scores indicating a greater level of depression/anxiety/stress. Each subscale therefore has a range of possible scores of 0 – 42. Each subscale has also been shown to have high reliability, with Chronbach's alphas of .94 for depression, .87 for anxiety, and .91 for stress (Antony et al., 1998).

Participant loneliness was assessed using both the UCLA loneliness scale (Russell, 1996), and a separate single item that addressed loneliness explicitly, with both addressing loneliness in the past week. The UCLA loneliness scale is a 3-item measure, with participants responding on a 3-point scale to questions regarding feelings of loneliness (e.g. “How often do you feel left out?”). Overall scores were calculated as the sum of items, resulting in a range of possible scores from 3 – 9, with higher scores indicating greater loneliness. The 3-item UCLA loneliness scale has shown fair reliability (Chronbach’s alpha = .72; Hughes et al., 2004). The single further item included was ‘During the past week, how often have you been lonely?’, and this was included as part of a broader questionnaire addressing the participants experience of the COVID-19 pandemic. Responses to this item were collected on a 5-point scale (often/always, some of the time, occasionally, hardly ever, or never), with lower scores indicating greater loneliness.

3.4.2.3. Coping.

The use of coping strategies was assessed using the brief Coping Orientation to Problems Experienced Inventory (COPE; Carver, 1997). The COPE scale consists of 28 items measured on a scale from 1 (‘I haven’t been doing this at all’) to 4 (‘I’ve been doing this a lot) and assesses how often participants adopt approaches to coping with hardships (e.g. “I’ve been giving up trying to deal with it”, or “I’ve been learning to live with it”). The brief-COPE can be assessed in a variety of ways, for example, it may be scored to consider 14 facets of coping (e.g. active coping, planning, and venting, etc.), or these facets may be mapped to 3 broader approaches to coping (problem-focused, emotion-focused, and avoidant coping; Carver, 1997). There is, however, inconsistencies in the factor structure of the brief-COPE across different samples (Solberg et al., 2022), as such, this factor structure will be assessed in the current investigation.

3.4.2.4. Alcohol consumption and hangover symptomology.

General alcohol drinking habits were assessed using an adapted version of the Quick Drinking Screen (QDS; Sobell et al., 2003). For this measure, participants are presented with information on what constitutes a ‘standard drink’ or ‘unit’ of alcohol (for our UK based sample, one unit is equivalent to 8 grams of ethanol). In order to characterise their drinking habits, participants were then asked; ‘How often do you have a drink containing alcohol?’ (response options; never, monthly or less, 2-4 times a month, 2-3 times

a week, 4 or more times a week), ‘How many standard alcohol units do you have on a typical day when drinking?’ (response options for 1 to 9 units, with the option to specify higher numbers); ‘how often do you have 7.5 or more standard units on one occasion?’ (response options; never, less than monthly, monthly, weekly, daily or almost daily), ‘in the past week, how many days did you drink alcohol?’ (response options; 0 to 7), ‘in the past week, how many days did you get drunk?’ (response options; 0 to 7), ‘in the past week, how many times did you have more than 5 units (if female) / 6 units (if male) on one occasion?’ (response options; 0 to 7). For the calculation of estimated peak BAC’s on the heaviest drinking occasion in the past week, participants were asked; ‘in the past week what was the greatest number of alcoholic drinks you had on one occasion?’ (response options; 0 to 30, with the option to specify higher numbers), and ‘on that occasion (previous question), over how many hours did you consume alcohol?’ (response options; 1 to 24).

Alcohol hangover symptoms were measured retrospectively in relation to the heaviest drinking episode in the past week, using the Acute Hangover Scale (AHS; Rohsenow et al., 2007). The AHS consists of 8 items representing symptoms of the hangover experience (e.g. “headache”) as well as a single item addressing ‘hangover’, with participants rating the severity of those symptoms on a scale of 0 (none) to 7 (incapacitating). The AHS has shown good reliability (Chronbach’s alpha = 0.84; Rohsenow et al., 2007). Total score on the AHS is calculated as a mean of items, resulting in a possible score range of 0 – 7, with higher scores indicating a more severe hangover, however, analysis in the current investigation will be based on the factors identified in Royle et al. (2020). The AHS was selected as a measure of hangover severity due to both its symptomatic approach to assessment of hangover, and its popularity within hangover literature. A single-item hangover score can also be assessed based on the recommendations of Verster et al. (2020), who argue that single-item measures capture greater variation in the experience of hangover due to a holistic approach that incorporates all symptoms experienced by an individual, in comparison to the specific symptoms measured in other hangover measures such as the AHS. As such, single-item measures of hangover may display differing relationships with predictors of hangover experience.

3.4.2.5. Unused measures.

A number of other questionnaires were completed by participants that are not included as part of analyses in the current report. These included; COVID-19 related

questions addressing the participants experience of the pandemic (e.g. whether their work situation had changed, and how much time they spent engaging with COVID-19 related media), and the Acceptance and Action Questionnaire version 2 (AAQ-2; Bond et al., 2011), which was used to assess psychological flexibility. Resilience was measured using the 6-item Brief Resilience Scale (BRS; Smith et al., 2008). The BRS addresses the participants perceived ability to recover from stress, with items responded to on a scale of 1 (strongly disagree) to 5 (strongly agree). Total score was calculated as a sum of all items with higher scores indicating greater resilience. Data related to these measures is reported elsewhere (Keenan et al., 2024).

3.4.3 Procedure

The survey was presented on Gorilla.sc™ (www.gorilla.sc; Anwyl-Irvine et al., 2021; Anwyl-Irvine et al., 2019; Tomczak et al., 2023) and accessed via weblink. After presentation of an information sheet and completion of a consent form, questionnaires were completed in a set order: demographics, COVID-19 related questions, alcohol consumption, AHS, BRS, DASS, COPE, AAQ-2, and the loneliness scale. Alcohol hangover severity ratings were provided for the heaviest drinking occasion in the past week, and information on this drinking was collected as part of the alcohol consumption questionnaire to allow for estimation of BACs.

3.4.4. Data analysis.

Three structural equation models were created to test the hypotheses that a decrease in income resulting from the COVID-19 pandemic would be indirectly associated with increases in the severity of hangover, via distress and maladaptive coping. Three models were constructed to separately predict the 2 hangover symptom clusters (headache and thirst, and gastric and cardiovascular symptoms), as well as the 1-item hangover severity score. Because a change score was being used as a primary predictor variable, the baseline value for each individual's income prior to the lockdowns caused by the COVID-19 pandemic was included as a control variable.

A range of indices were used to evaluate model fit. The standardised root mean residual (SRMR) was considered indicative of good fit when values were less than 0.06, and indicative of acceptable fit when values were greater than 0.06 but less than 0.08. The root mean square error of approximation (RMSEA) parsimony adjusted measure was considered

indicative of good fit when the value was less than 0.06, with values between 0.06 and 0.08 being considered indicative of an acceptable fit. The Tucker Lews index (TLI) and Comparative Fit index (CFI) were both considered as indicative of good fit when values were greater than 0.95, and acceptable fit when values were less than 0.95 but greater than 0.90 (Hu & Bentler, 1999).

As multiple measures of distress were taken (including DASS stress, depression, and anxiety scores, as well as measures of loneliness), a confirmatory factor analysis (CFA; Bollen, 1989) was performed to establish how these might load on to a latent variable for psychological distress. Likewise, two latent variables have been proposed to account for measurements provided by the AHS. These were also assessed using CFA. Finally, as multiple structures have been proposed for the brief-COPE (Solberg et al., 2022), a split sample approach using participants excluded from the main analysis was adopted, and exploratory factor analysis (EFA) used to develop an appropriate model for the brief-COPE in this context. These results were confirmed using CFA with the sample used for structural modelling. Maximum likelihood estimators were used to validate these models.

3.5. Results

3.5.1. Demographics and Descriptive Statistics.

Participants included in the structural analysis were predominantly students (46.5%). Participants also reported working in education (17.8%), health and social care (17.8%), retail (5.4%), hospitality (4.7%), professional services (2.3%), manufacturing (0.8%), and other fields (4.7%). 23.3% of participants reported that there had been no change to their work situation as a product of the COVID-19 pandemic, 7.8% reported working from home some of the time, 33.3% reported working from home all of the time, 3.9% reported working reduced hours, and 31.0% reported no longer working, with one participant not responding. For the question addressing loneliness in the past week, 14.0% reported often/always feeling lonely, 26.4% reported some of the time, 20.2% reported occasionally, 17.8% reported hardly ever, and 21.7% reported never.

For questions addressing drinking habits, 14.0% reported drinking 4 or more times a week, 45.7% reported drinking 2 – 3 times a week, 30.2% reported drinking 2 – 4 times a month, and 10.1% reported drinking monthly or less. Participants also reported the frequency with which they drank 5 units (for females) or 6 units (for males), with 1.6%

reporting this level of drinking on a daily or almost daily basis, 19.4% reporting weekly, 28.7% reporting monthly, 36.4% reporting less than monthly, and 14.0% reporting that they never drank in this volume. See Table 1 for further descriptives.

Table 1. Descriptive Statistics.

	Mean	Standard deviation	range
Wage loss % change	-10.52	39.10	-100 - 200
Prior income (£ per annum)	16,723	23,742	0 - 192,000
DASS - Depression	14.12	10.85	0 - 40
DASS - Anxiety	10.23	7.92	2 - 34
DASS - Stress	15.98	10.14	0 - 40
Resilience	18.63	5.26	6 - 30
UCLA Loneliness	5.40	1.90	3 - 9
AHS	1.04	0.92	0.11 - 4.22
eBAC (g‰)	0.70	0.46	0.15 - 2.60

AHS = Acute hangover scale, eBAC = Estimated blood alcohol concentration in g‰.

3.5.2. Characterisation of latent variables.

Prior to assessment of structural models, latent variables representing distress, coping, and hangover symptom clusters were validated.

3.5.2.1. Latent variable for distress.

As a variety of measurements of wellbeing were taken, including depression, anxiety, and stress (using the DASS), as well as 2 measures of loneliness (the UCLA loneliness scale, and a further item addressing loneliness), a confirmatory factor analysis was performed to examine whether these measurements loaded on to the same latent variable (psychological distress). As there is a theoretical link between loneliness and depression, a covariance was added between the error terms for these variables. A covariance was also added between the 2 measurements of loneliness included. This model provided a good fit to the data (CFI = .995, TLI = .984, RMSEA .065, SRMR = .024) and each measurement loaded significantly on to the 'psychological distress' latent variable (all β's > .47, *p's* < .003).

3.5.2.2. Latent variables for hangover severity.

Previous research has indicated a potential 2 factor structure of hangover symptoms included in the AHS (Royle et al., 2020). A confirmatory factor analysis was

therefore carried out to confirm this dataset fit with a 2-factor model including 'headache & thirst', and 'gastric and cardiovascular' symptoms, with a correlation between these two latent variables. This model provided an acceptable fit to the data (CFI = .949, TLI = .925, RMSEA = .073, SRMR = .057). Each measurement loaded significantly on to its corresponding factor; headache, tiredness, and thirst, on 'headache & thirst'; dizziness/faintness, appetite loss, stomach ache, nausea, and heart racing, on 'gastric and cardiovascular' symptoms (all β's > .54, *p*'s < .001).

3.5.2.3. Latent variables for coping.

A number of structures have been proposed for the brief-COPE (for a review, see Solberg et al., 2022), however there is large variation in the number of factors proposed (ranging from 2 to 15). As there is currently no consensus on the factor structure of the brief-COPE, we opted to utilise a split sample approach to determining an appropriate structure for inclusion in further modelling. An exploratory factor analysis (EFA) was carried out on data derived from participants who were excluded from the structural equation analysis (exclusions due to reporting no hangover symptomology following their heaviest drinking episode in the past week). The total sample of participants excluded from the primary analysis, but with complete data on the brief COPE scale, consisted of 283 participants (mean age: 29.54, SD: 12.67) with 232 females, 47 males, and 4 participants who reported their gender as 'other'. The EFA was carried out in JASP (0.18.1) using principal axis factoring and a parallel analysis approach. Results indicated a 6-factor solution, with factors indicating; Reframing, social support, maladaptive coping, humour, spirituality, and drug use. Table 2 shows each factor and the items included, along with loadings.

Confirmatory factor analysis in our investigation sample was carried out with correlations between each factor. Covariances were added between a number of items of the brief-COPE, based on both a theoretical basis and modification indices exceeding a value of 8. These covariances and theoretical justifications are indicated in Table 3.

Table 2. Item loadings in exploratory factor analysis of brief-COPE in split sample.

Factor	Brief-COPE item no.	Brief-COPE item:	Item loading
Factor 1: Reframing	7	I've been taking action to try to make the situation better.	0.674
	2	I've been concentrating my efforts on doing something about the situation I'm in.	0.639
	14	I've been trying to come up with a strategy about what to do.	0.634
	12	I've been trying to see it in a different light, to make it seem more positive.	0.553
	25	I've been thinking hard about what steps to take.	0.546
	1	I've been turning to work or other activities to take my mind off things.	0.536
	17	I've been looking for something good in what is happening.	0.452
	24	I've been learning to live with it.	0.427
	20	I've been accepting the reality of the fact that it has happened.	0.402
Factor 2: Social support	10	I've been getting help and advice from other people.	0.875
	5	I've been getting emotional support from others.	0.837
	15	I've been getting comfort and understanding from someone.	0.742
	23	I've been trying to get advice or help from other people about what to do.	0.657
Factor 3: Maladaptive	13	I've been criticizing myself.	0.805
	6	I've been giving up trying to deal with it.	0.585
	26	I've been blaming myself for things that happened	0.571
	16	I've been giving up the attempt to cope.	0.428
Factor 4: Humour	28	I've been making fun of the situation.	0.917
	18	I've been making jokes about it.	0.871
Factor 5: Spirituality	27	I've been praying or meditating	0.726
	22	I've been trying to find comfort in my religion or spiritual beliefs	0.725
Factor 6: Drug use	11	I've been using alcohol or other drugs to help me get through it.	0.752
	4	I've been using alcohol or other drugs to make myself feel better	0.714

Table 3. Covaried items in brief-COPE CFA.

Covaried items	Basis
14, 25 & 23	All items relate to planning
13 & 26	Self-blame facet of the brief-COPE
10 & 23	Informational support facet of the brief-COPE
24 & 20	Acceptance facet of the brief-COPE
17 & 24	Relate to reframing of a stressor (looking for good/learning to live with)
12 & 17	Positive reframing facet of the brief-COPE
5 & 23	Relate to social support.

Model fit estimates were calculated using a maximum likelihood approach, and indicated acceptable fit (CFI = .939, TLI = .925, RMSEA .057, SRMR = .082). Each measurement loaded significantly on to the latent variables for each factor (all β's > .29, *p* <= .025). As previous research has indicated a relationship between maladaptive coping strategies and hangover symptom cluster severity (Terpstra et al., 2022), this factor of the brief-COPE was used in structural models.

3.5.3. Structural model evaluations.

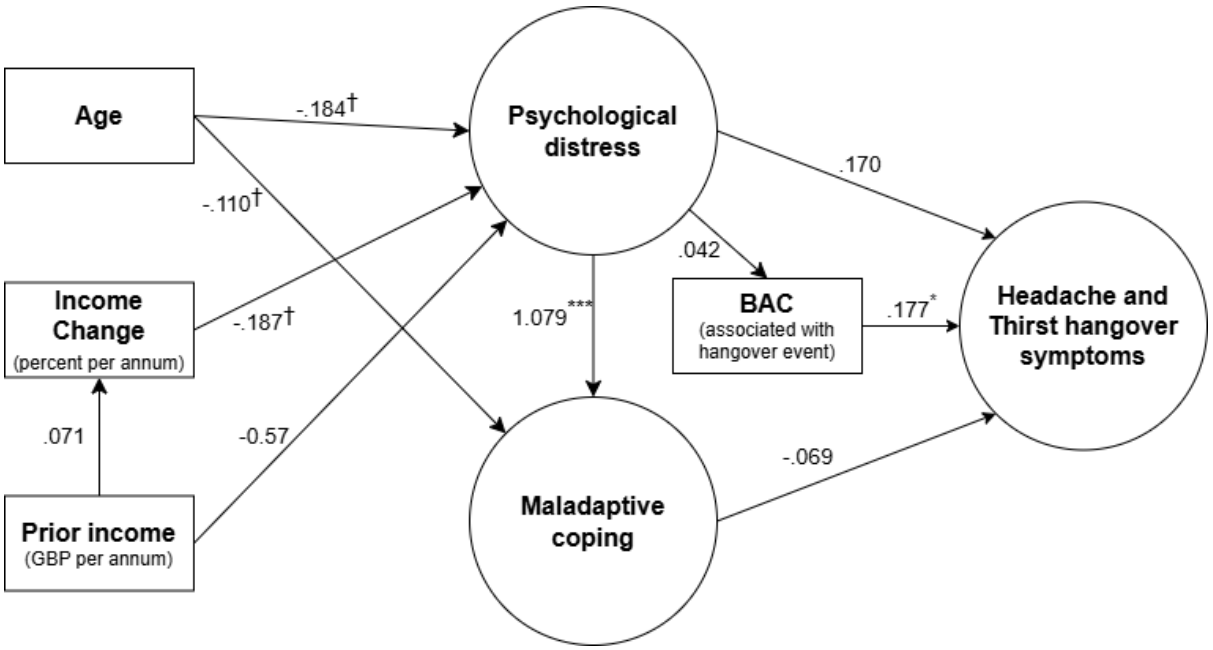
Testing of the hypothesised indirect effects between income change associated with the COVID-19 pandemic and hangover severity indicators, via psychological distress and maladaptive coping, was achieved with bias corrected bootstrapping with 95% confidence intervals (N = 2,000). Maximum likelihood estimators were used to validate these models. For direct effects between variables, standardised regression coefficient values are presented within figures, with unstandardised regression coefficient values provided in tables.

Prior to analysis, relationships between age and variables of theoretical interest (distress, hangover symptom cluster severity, prior income and income change, and maladaptive coping) were investigated via correlations. As these correlations indicated a relationship between age and prior income (r = .219, *p* = .010), a covariance between these variables was included in all models. Age also correlated with psychological distress (r = -0.211, *p* = 0.013) and maladaptive coping (r = -0.258, *p* = .002), for which age was treated as a predictor. No correlation was observed between age and headache and thirst symptoms (r = 0.007, *p* = .935), gastric and cardiovascular symptoms (r = -0.002, *p* = 0.979), or income change (r = 0.094, *p* = .274).

3.5.3.1. Headache and Thirst symptoms.

The model for headache and thirst symptoms was a good fit for the data (CFI = .963, TLI = .952, RMSEA = .048, SRMR = .063).

Figure 2. Model for associations between COVID-19 related income-loss, distress and the 'headache and thirst' hangover symptom cluster severity.



Values are standardised regression coefficients; † p <.1 * p <.05, ** p<.01, ***p<.001, significance indicated is for bias-corrected bootstrapped analyses. For ease of interpretation, residuals and covariances are not visually represented. BAC = estimated blood alcohol concentration.

Bias corrected confidence intervals and unstandardized regression weights for direct effects are reported in table 4, and regression weights for indirect effects are reported in table 5. Results indicated no direct or indirect relationships of income change on distress, coping, or hangover. Likewise, no direct or indirect relationships were found for distress, coping, and headache and thirst hangover symptoms.

Table 4. Hypothesised direct effects for 'headache and thirst' model.

Association	b (SE)	*p*	95% CI
Prior income → Income change	<.001 (<.001)	.164	>-.001 to <.001
Prior income → Distress	<.001 (<.001)	.485	>-.001 to <.001
Income change → Distress	-.044 (.023)	.061	-.057 to .028
Age → Distress	-.142 (.076)	.062	-.297 to -.007
Distress → Maladaptive coping	.043 (.009)	<.001	.028 to .059
Distress → BAC	.002 (.004)	.528	-.005 to .010
Age → Maladaptive coping	-.003 (.003)	.131	-.009 to .000
Maladaptive coping → Headache & thirst	-.165 (5.203)	.629	-18.959 to 1.898
BAC → Headache & thirst	.333 (.220)	.035	.001 to .869
Distress → Headache & thirst	.016 (.209)	.439	-.054 to .787

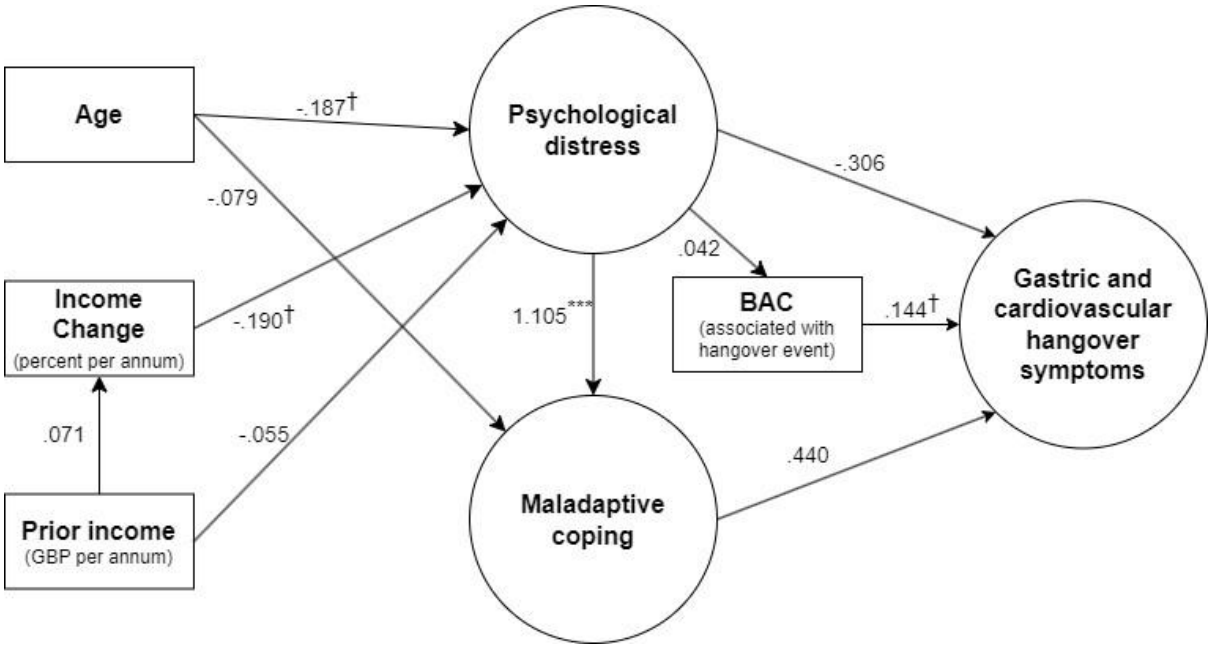
Table 5. Hypothesised indirect effects for 'headache and thirst' model.

Association	b (SE)	*p*	95% CI
Income change → Distress → Coping → Headache & thirst.	<.001 (.011)	.562	-.003 to .026
Income change → Distress → BAC → Headache & thirst.	<.001 (<.001)	.272	-.001 to .000
Distress → Coping → Headache & thirst.	-.007 (.208)	.635	-.528 to .097
Distress → BAC → Headache & thirst	.001 (.002)	.310	-.001 to .007

3.5.3.2. Gastric and cardiovascular symptoms.

The model for gastric and cardiovascular symptoms was an acceptable fit for the data (CFI = .939, TLI = .925, RMSEA = .056, SRMR = .072).

Figure 3. Model for associations between COVID-19 related income-loss, distress and the 'gastric and cardiovascular' hangover symptom cluster severity.



Values are standardised regression coefficients; † p <.1 * p <.05, ** p<.01, ***p<.001, significance indicated is for bias-corrected bootstrapped analyses. For ease of interpretation, residuals and covariances are not visually represented. BAC = estimated blood alcohol concentration.

Bias corrected confidence intervals and unstandardized regression weights for direct effects are reported in table 6, and for indirect effects are reported in table 7. In line with the model of headache and thirst symptoms, no direct or indirect effects of income change were found, and there were no direct or indirect effects of distress and coping on gastric and cardiovascular symptoms.

Table 6. Hypothesised direct effects for 'gastric and cardiovascular' model.

Association	b (SE)	*p*	95% CI
Prior income → Income change	<.001 (<.001)	.165	>-.001 to <.001
Prior income → Distress	<.001 (<.001)	.526	>-.001 to <.001
Income change → Distress	-.044 (.023)	.056	-.090 to .002
Age → Distress	-.143 (.075)	.054	-.284 to .003
Distress → Maladaptive coping	.043 (.009)	<.001	.029 to .063
Distress → BAC	.002 (.004)	.549	-.006 to .011
Age → Maladaptive coping	-.002 (.002)	.279	-.008 to .002
Maladaptive coping → Gastric & Cardio	.699 (4.194)	.198	-.913 to 18.364
BAC → Gastric & Cardio	.178 (.146)	.060	-.006 to .620
Distress → Gastric & Cardio	-.019 (.173)	.276	-.894 to .039

Table 7. Hypothesised indirect effects for 'gastric and cardiovascular' model.

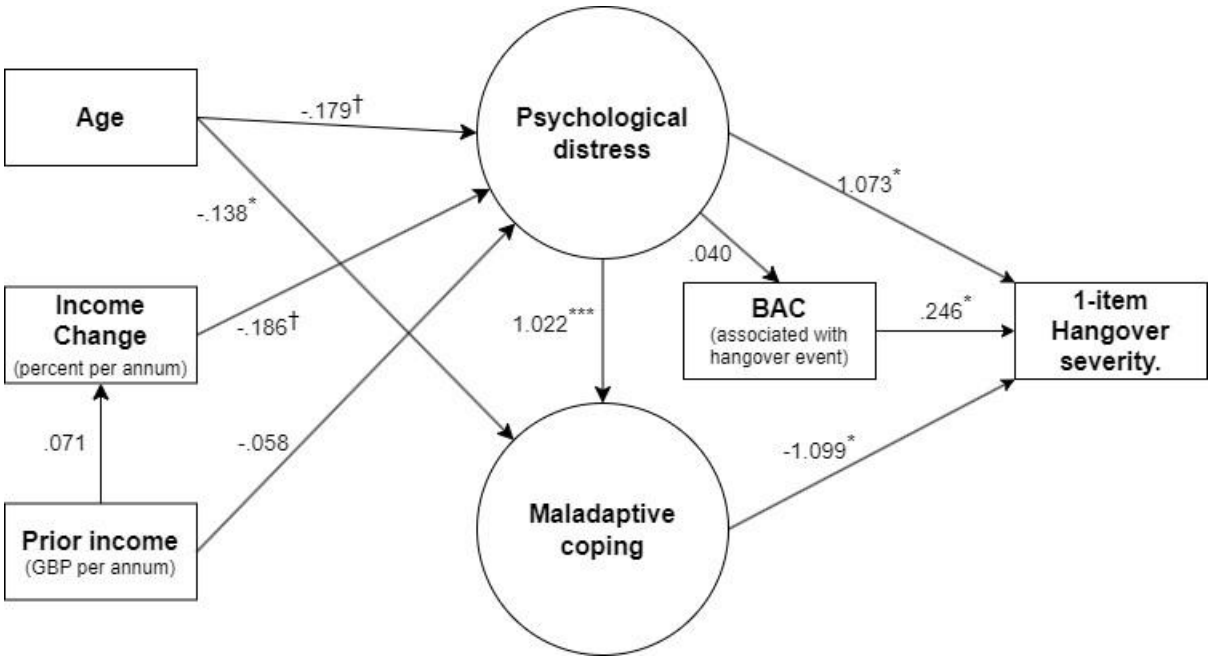
Association	b (SE)	*p*	95% CI
Income change → Distress → Coping → Gastric & Cardio	-.001 (.009)	.132	-.094 to .001
Income change → Distress → BAC → Gastric & Cardio	<.001 (<.001)	.241	>-.001 to <.001
Distress → Coping → Gastric & Cardio	.030 (.174)	.193	-.030 to .774
Distress → BAC → Gastric & Cardio	<.001 (.001)	.287	-.001 to .005

3.5.3.3. 1-item hangover severity.

The model for the 1-item hangover severity score was a good fit for the data (CFI = .973, TLI = .964, RMSEA = .045, SRMR = .053).

Bias corrected confidence intervals and unstandardized regression weights for direct effects are reported in table 8, and for indirect effects are reported in table 9. In contrast to models of the headache and thirst and gastric and cardiovascular hangover symptoms, indirect effects of income on hangover severity were indicated in this model via distress and coping. No direct effect of income change on distress was found, however this relationship did trend toward significance. Direct effects were also found for relationships between distress and maladaptive coping, distress and 1-item hangover severity, and maladaptive coping and 1-item hangover severity.

Figure 4. Model for associations between COVID-19 related income-loss, distress and the '1-item hangover symptom severity.



Values are standardised regression coefficients; † p <.1 * p <.05, ** p<.01, ***p<.001, significance indicated is for bias-corrected bootstrapped analyses. For ease of interpretation, residuals and covariances are not visually represented. BAC = estimated blood alcohol concentration.

Table 8. Hypothesised direct effects for '1-item hangover' model.

Association	b (SE)	*p*	95% CI
Prior income → Income change	<.001 (<.001)	.165	>-.001 to <.001
Prior income → Distress	<.001 (<.001)	.485	>-.001 to <.001
Income change → Distress	-0.44 (.023)	.059	-.088 to .003
Age → Distress	-.138 (.076)	.065	-.283 to .008
Distress → Maladaptive coping	.041 (.008)	.001	.028 to .059
Distress → BAC	.002 (.004)	.560	-.006 to .011
Age → Maladaptive coping	-.004 (.002)	.010	-.010 to -.001
Maladaptive coping → 1-item hangover	-4.426 (19.909)	.028	-55.888 to -.258
BAC → 1-item hangover	.797 (.345)	.011	.160 to 1.498
Distress → 1-item hangover	.174 (.788)	.037	.005 to 2.520

Table 9. Hypothesised indirect effects for '1-item hangover' model.

Association	b (SE)	*p*	95% CI
Income change → Distress → Coping → 1-item hangover	.008 (.036)	.033	<.001 to .155
Income change → Distress → BAC → 1-item hangover	<.001 (<.001)	.351	-.001 to <.001
Distress → Coping → 1-item hangover	-.182 (.786)	.022	-2.506 to -.015
Distress → BAC → 1-item hangover	.002 (.004)	.462	-.004 to .011

3.6. Discussion.

This study sought to explore relationships between income loss associated with the COVID-19 pandemic, psychological distress, coping, and hangover symptom severity. The three primary aims of the investigation were to; Confirm the 2 factor model of the AHS found by (Royle et al., 2020); examine the relationship between psychological distress associated with income loss during the Covid-19 pandemic and severity of hangover symptomology; and investigate whether any relationship between psychological distress and hangover symptom severity was mediated by tendencies toward maladaptive coping. It was hypothesised that; (1) headache, tiredness, and thirst symptoms would load significantly on to a factor representing headache and thirst symptoms, and that dizziness/faintness, loss of appetite, stomach ache, nausea, and heart racing symptoms will load on to a second factor representing gastric and cardiovascular symptoms of hangover; (2) income loss associated with the covid-19 pandemic would be associated with greater psychological distress; psychological distress would be positively associated with the adoption of maladaptive coping strategies and hangover symptom cluster severity; maladaptive coping would be positively associated with hangover symptom cluster severity; and (3), that maladaptive coping would mediate the relationship between psychological distress and hangover symptom severity. Hypothesis 1 was confirmed, with the predicted symptom clusters supported by confirmatory factor analysis. Mixed results were obtained with regards to hypotheses 2 & 3; covid-19 related income loss did not predict increased psychological distress in this sample, counter to hypotheses. Likewise, distress and maladaptive coping were not predictors of hangover symptom cluster severity in structural models, and thusly, maladaptive coping did not act as a mediator, indicating hypotheses 2 and 3 were not confirmed for models assessing hangover symptom clusters. Comparatively, hypotheses 2 and 3 were confirmed (with the exception of income loss effects) for models examining a single-item measure of hangover severity. This model did indicate relationships between psychological distress and hangover severity, as we as between maladaptive coping and hangover severity, though the relationship between maladaptive coping and hangover severity was in the opposite direction to that expected. Maladaptive coping also acted as a mediator of the relationship between distress and 1-item hangover severity in this model.

3.6.1. AHS symptom clusters.

Confirmatory factor analysis indicated that the 2-factor model of the AHS, consisting of 'headache and thirst symptoms' and 'gastric and cardiovascular symptoms', was an acceptable fit for the data, in line with the results of Royle et al., (2020). The presence of these symptom clusters may be examined from several non-exclusive perspectives. First, symptoms included in the 'headache and thirst' cluster are highly prevalent in hangover, being the 3 most reported symptoms across several studies (Penning et al., 2012; Rohsenow et al., 2007; Slutske et al., 2003). Second, the symptom clusters may be representative of classes of hangover, where more severe hangovers are indicated by the presence of 'gastric and cardiovascular' symptoms. This approach was taken to the classification of hangover severity in early research (Harburg et al., 1993), however, no validated scales of hangover based on this approach currently exist. Finally, these symptom clusters may be related to overlapping but distinct mechanisms, such as alternate alcohol metabolism pathways, and may also be associated with distinct behavioural outcomes.

3.6.2. Psychological distress, coping, and hangover severity.

Counter to the study hypotheses, no significant relationship was observed between income change and distress across the models for participants who had reported hangover in the last week, though a reduction in income was associated with increased psychological distress across the whole UK sample (Keenan et al., 2024). A possible explanation for the lack of observed relationships in this sample is that, contrary to our initial expectations, average income had in fact increased for participants between the time prior to Covid-19 restrictions and the point of data collection. This may have been driven by the inclusion of participants starting from a relatively low income, including a high proportion of students (46.5%) who did have a significantly lower income than participants across other professions ($t(127)=3.53$, $p < .001$). Mean income prior to the pandemic was reported as £16,723, which is considerably below the median income in the UK of £32,300 (ONS, 2023). These participants may also have been less exposed to the impacts of income loss due to reduced costs (e.g. if living with parents). Participants on lower incomes may have also benefitted from support schemes implemented by the UK government, such as furlough payments. Indeed, it has been noted that the implementation of job support programs and an expanded welfare system during the COVID-19 pandemic may have actually reduced disposable income inequality (Blundell et al., 2024), which may have limited effects of

income loss on psychological distress. Students do tend to be employed in roles that have more unstable income, as evidenced by reliance on seasonal work (Save the Student, 2022), so furlough may have actually reduced uncertainty for them. Alternatively, given the observation of a relationship between income loss and distress across the whole UK sample (Keenan et al., 2024), the lack of relationship observed in those who reported hangover in the past week may have been because those who continued drinking to levels that produced hangover during the pandemic were those less exposed to income losses, and were therefore more able to afford alcohol. These factors may explain differences between the current investigation and other investigations assessing the impact of the COVID-19 pandemic on income and factors of psychological distress, which have indicated that income loss does lead to increases in distress in those who are employed (de Miquel et al., 2022) or older samples (Hertz-Palmor et al., 2021; Shevlin et al., 2020).

Whilst previous research has indicated that there is a relationship between stress/distress and general drinking habits (Balogun et al., 2014; Chang et al., 2022; Deasy et al., 2015; Mathiesen et al., 2012; McKenzie & Harris, 2013; Thandi et al., 2015), eBAC's indicating circulating alcohol in the body for the specific drinking session associated with the reported hangover were not predicted by levels of distress. eBAC's were significantly associated with the severity of headache and thirst symptoms, as well as with a 1-item hangover severity measure, however, eBAC did not reach significance as a predictor of gastric and cardiovascular symptoms. This result is in line with previous research on symptom clusters of the AHS (Royle et al., 2020). Results for the relationship between eBAC and gastric and cardiovascular symptom severity did approach significance, however, and may be indicative of a non-linear relationship between alcohol consumption and these symptoms of hangover, given that alcohol consumption is a prerequisite of the hangover state. If gastric and cardiovascular symptoms are more likely to occur at higher eBAC's, then the lack of relationship observed in the current sample may be due to the relatively low eBAC's reported.

As predicted, psychological distress was associated with maladaptive coping across all models, however, neither distress nor coping were associated with headache and thirst or gastric and cardiovascular hangover symptom cluster severity. In contrast, both psychological distress and maladaptive coping were associated with a 1-item hangover severity score. The

relationship between increased distress and more severe hangover may be explained by biological links with oxidative stress and inflammation. Psychological distress is associated with elevated indicators of inflammation and oxidative stress (Aschbacher & Mason, 2019; Baek et al., 2019; Goldman-Mellor et al., 2010; Hassan et al., 2016), which are also thought to underly hangover symptomology (Mackus et al., 2020; Turner et al., 2024; van de Loo, Mackus, et al., 2020). Increased psychological distress may therefore increase baseline levels of oxidative stress and inflammation that are further exacerbated by hangover.

In the model of 1-item hangover severity, maladaptive coping acted as a partial mediator of the relationship between distress and hangover severity. Interestingly, the relationship between maladaptive coping and 1-item hangover severity score in this investigation was negative, with increases in maladaptive coping associated with reduced hangover severity. This contrasts with past findings indicating a positive relationship between use of avoidant coping and hangover severity (Terpstra et al., 2022), as well as results indicating that higher tendency toward catastrophising is associated with greater hangover severity (Royle et al., 2020; Saeed et al., 2021). The finding that maladaptive coping was negatively associated with hangover severity may represent a protective effect of tendencies toward maladaptive coping in alcohol hangover, if maladaptive coping tendencies are related to negative expectancies of alcohol consumption consequences. It has been proposed that avoidant coping and alcohol expectancies interact in the prediction of drinking behaviour and development of alcohol abuse disorder (Hasking & Oei, 2008), with alcohol expectancies acting as a mediator of alcohol consumption habits (Hasking et al., 2011). If a tendency toward maladaptive coping is associated with negative alcohol expectancies, this may limit alcohol consumption as research has found that expectations of cognitive impairment are associated with reduced alcohol consumption in participants aged over 25 (Pabst et al., 2014), thus reducing the severity of hangover experienced.

One potential explanation for the discrepancy in results between symptom clusters and the 1-item hangover severity score, is that the hangover symptom clusters derived from the AHS measure the severity of somatic symptoms, but do not capture broader variance in unassessed hangover symptoms that are considered by participants as part of single-item measures (Verster et al., 2020). This may suggest that distress and maladaptive coping strategies are associated with non-somatic symptoms of hangover such as hangover anxiety

and depression, but not symptoms associated with the experience of physical pain or discomfort. Past research has indicated that general measures of anxiety and depression, components of psychological distress, are associated with anxiety and depression during hangover (Tellez-Monnery et al., 2023). This difference in hangover severity measurements may also explain why associations between maladaptive coping and hangover symptom cluster severity were not observed in the current study. Previous research has shown that pain catastrophising, a maladaptive coping strategy involving an exaggerated orientation toward pain, is positively associated with hangover severity (Royle et al., 2020; Saeed et al., 2021), however pain catastrophising is a construct specifically associated with the experience of pain and discomfort (Quartana et al., 2009). Comparatively, the maladaptive coping measure deployed in the current study is predicated on the brief-COPE, which measures broader emotional response to sources of stress and distress.

3.6.3. Limitations and future research.

Results of the current study suggest that only one-item hangover severity measurements are associated with psychological distress and maladaptive coping, whereas the severity of somatic symptom clusters are not, which may be interpreted as suggesting that the one-item hangover severity measure captures a broader view of the hangover experience. This does not, however, indicate which hangover measures may have associations with cognitive effects, or physiological mechanisms. Indeed, indications that one-item hangover severity are related to distress and coping may indicate that it is likely a poorer predictor of objective outcomes. Broader symptomatic measures of hangover severity, including one-item measures, have not always shown relationships with reductions in cognitive performance (Gunn et al., 2020), or have shown relationships with only limited tasks within cognitive batteries (Alford, Martinkova, et al., 2020a). Evidence has indicated that some specific hangover symptoms are associated (or not) with performance in some tasks (Ayre et al., 2021), and as such, further research should investigate relationships between both somatic symptom and symptom cluster severity ratings, one-item hangover severity ratings, and cognitive outcomes across different domains.

Results also indicated that maladaptive coping was, counterintuitively, a negative predictor of 1-item hangover severity. This may indicate that a tendency toward maladaptive coping is protective with regard to experience of alcohol hangover severity, potentially due

to a relationship with negative alcohol outcome expectancies. Relationships between coping and alcohol expectancies, however, has not been directly tested, and warrants confirmation in a broader sample. Alternatively, since analyses only reveal associations, it may be that reductions in maladaptive coping are caused by increased experience of transient negative states such as hangover, rather than increases in maladaptive coping causing reduced hangover severity. The current exploratory study was derived from a relatively small sample of predominantly female participants. Given potential gender differences in hangover symptom severity at higher BACs between male and female participants (van Lawick van Pabst et al., 2019b), results of the structural models need confirmation in broader samples, particularly given that this sample is unlikely to be representative with greater numbers of students than in the general population. Approximately 5% of the UK adult population are students, in comparison to 46.5% in the current sample (Higher Education Statistics Agency, 2023).

3.6.4. Conclusion.

The current study sought to confirm the 2-factor structure of the AHS observed by (Royle et al., 2020), and explore whether income loss associated with the Covid-19 pandemic was associated with psychological distress, coping, and hangover severity. Results confirmed the 2-factor structure of the AHS, consisting of 'headache and thirst' and 'gastric and cardiovascular' symptoms. Results did not reveal increases in psychological distress associated with income loss during the Covid-19 pandemic, nor was distress and coping associated with somatic symptom clusters of the hangover included in the AHS. Distress, however, was associated with a single-item hangover measure that may capture the broader hangover experience, including psychological effects such as hangover mood effects, and this relationship was partially mediated by maladaptive coping. These results provide novel insight into the intricate relationships between psychological distress, coping, and hangover severity, as well as informing debate surrounding hangover severity measurement.

3.7. Chapter summary.

The aims of this chapter were to characterise the symptomology of hangover by confirming the hangover symptom clusters observed in chapter 2, and examine relationships between stress and distress, coping responses, and hangover symptom severity. Confirmatory factor analysis of hangover symptom severity ratings confirmed the 2

hangover symptom clusters observed in chapter 2; headache and thirst symptoms, and gastric and cardiovascular symptoms. This has implications for the measurement of hangover severity in research addressing the biological correlates and cognitive outcomes of hangover, as certain symptom clusters may have independent relationships with other measures. Likewise, relationships between hangover and drinking habits (Piasecki et al., 2010; Vatsalya et al., 2019) may be driven by particular symptomologies of hangover and thus represent suitable targets for identification of at risk individuals.

Modelling of the relationships between changes in income precipitated by the COVID-19 pandemic, psychological distress, maladaptive coping, and hangover severity measures failed to find predicted effects of income loss on distress. Likewise, no relationships were observed between psychological distress and hangover symptom cluster severity, nor between maladaptive coping and hangover symptom cluster severity. In contrast, relationships were observed between psychological distress and 1-item hangover severity, and between maladaptive coping and 1-item hangover severity, with maladaptive coping partially mediating the relationship between distress and 1-item hangover severity. These results may be a product of the broader nature of 1-item hangover severity measurements (Verster et al., 2020), and demonstrates the differences between hangover measurements in assessing both predictors and outcomes of hangover severity. Future research should seek to explore whether the health (Išerić et al., 2024) and cognitive (Gunn et al., 2018) outcomes of hangover are associated with specific hangover symptomologies.

Chapter 4: Considerations for the feasibility of a novel remote methodology for experimental investigation of hangover.

4.1. Chapter Introduction.

In Chapters 2 and 3, research has been presented that raises questions regarding alcohol hangover severity measurement in the presence of symptom clusters. It is important to understand how these different measurements of the severity of hangover symptoms and symptom clusters may be associated with cognitive outcomes, as these relationships may also provide insight in to links between alcohol hangover and health outcomes such as addiction (Piasecki et al., 2010; Vatsalya et al., 2019) or other immune-system-related chronic diseases (Išerić et al., 2024).

Though the Covid-19 pandemic provided a unique opportunity to examine the impact of a societal stressor on hangover, it also created several barriers to experimental research on hangover, with participants unable to attend labs for interventions or testing due to requirements to reduce social contact, or prohibiting contact entirely. These limitations necessitated the development of novel methodologies for experimental hangover research that did not require face-to-face interactions. A benefit of the development and use of remote online methodologies for experimental hangover research may also provide an alternative deployment route for future research that enables access to more diverse samples (Buhrmester et al., 2011; Casler et al., 2013; Palan & Schitter, 2018), helping to address the reliance on student samples in hangover research (Devenney et al., 2019a). This chapter will therefore address the development of an online remote method for experimental hangover research, and assess the feasibility of the method with regards to participants' experience of the methodology. Specific details for the tasks completed and results of this testing will be provided in Chapter 5.

4.2. Abstract.

Experimental research on alcohol hangover, and other alcohol challenge research, has relied on participants attending labs to complete alcohol consumption and testing, however, regulations during the COVID-19 pandemic precluded this extended social contact. These limitations on social contact had the effect of preventing research on topics of psychological, social, economic, and medical importance. Recent developments in the

provision of online platforms for teleconferencing and behavioural testing enable alternate approaches to be taken, that may also benefit research by providing access to more diverse populations, and by allowing testing to occur in a more ecologically valid environment – the participants home. This report therefore addresses the development and participant experience of a novel, remote, online investigation into the cognitive effects of hangover, that may act as a template for future research. A survey was conducted of participants who had taken part in this remote alcohol challenge research in order to assess; 1) whether participants felt comfortable with the procedure of the online investigation and quantity of alcohol to be consumed, 2) whether participants would be more or less likely to participate in equivalent lab-based research, and 3) to identify areas for potential further development of online remote experimental hangover research. Participants rated their experience of taking part in the investigation very positively, with results indicating that participants were comfortable with the online observation of drinking, and that 1.5g/Kg body water was a reasonable dose of alcohol to consume. 50% of participants who took part in this study indicate that they would have been less likely to participate in lab-based research, suggesting that this remote approach to hangover research would enable participation of more diverse samples. This novel approach to experimental alcohol hangover investigation was considered appropriate by participants and represents a feasible approach to the recruitment of more diverse samples in future research.

4.3. Approaches to experimental data collection in hangover research.

Experimental research on alcohol hangover, particularly with regards to the effect of hangover on cognition, has been conducted utilizing both naturalistic and controlled experimental approaches. In natural experiments, participants will complete testing following a chosen night of drinking. That is, the participant will complete testing following a drinking occasion that would have occurred regardless of the experiment, and little to no control is usually applied over how much, or what, drinks are consumed (e.g. Devenney et al., 2019a; Finnigan et al., 2005; Grange et al., 2016; Gunn et al., 2020, 2021b; Howse et al., 2018; McKinney et al., 2012; McKinney & Coyle, 2004, 2007), nor where the activity takes place. This often results in participants drinking more than would be administered within a laboratory setting due to safety considerations (Gunn et al., 2018; Stephens et al., 2008), and also allows participants to engage with a more ecologically valid environment. For

example, participants may engage in activities (e.g. dancing) that wouldn't necessarily be possible, or desirable to the participant, in a laboratory setting, but may have effects on the experience of hangover (Penning et al., 2010).

In contrast, controlled experimental research has traditionally involved the participants drinking within a laboratory setting, either consuming a specific amount of alcohol, or consuming alcohol until a certain BAC is achieved, as indicated by breath alcohol measurements. Other methods of administration are possible, for example, intravenous (e.g. Vatsalya et al., 2018), however these have rarely been applied to research on alcohol hangover, possibly due to the requirements to conduct such research safely, but also as this approach is less representative of how hangover typically occurs (i.e. by drinking alcohol).

For research in controlled settings, participants first undergo a screening, typically in the form of an interview, to ensure that there is minimal risk of acute or longer-term health effects related to the consumption of alcohol in the study. Participants later consume alcohol in a controlled setting, and this may be done either with an individual, or groups of participants. Entertainment is typically provided in some form, and a time limit is placed on the duration of the drinking. Following the drinking session, participants may then either be provided accommodation for the night (e.g. within a sleep lab), or alternatively, the researcher may ensure the participant is provided with transportation home (e.g. Berghäuser et al., 2020; Howland et al., 2010; Kruisselbrink et al., 2006; Opitz et al., 2019, 2020, 2021; Rohsenow et al., 2006, 2010; Stock et al., 2017; Zink et al., 2018). This approach allows researchers to control the quantity and type of alcohol consumed, but also creates logistical requirements and financial costs for the research team (e.g. participant expenses, and provision of alcoholic drinks).

For both controlled and naturalistic approaches, testing has typically been conducted in laboratory settings, requiring the participant to attend the lab in the morning following their drinking. Comparisons are generally made within-participants to baseline (non-hungover) testing sessions, which are conducted on a morning where participants report having not drunk alcohol the previous evening, and these testing sessions are often counterbalanced such that half of the participants complete their baseline measures before hungover testing, and half at a point after hungover testing, in order to control for order effects (Stephens et al., 2008).

Both naturalistic and controlled experimental approaches therefore have considerable demand on researchers and participants, typically requiring attendance at the labs at multiple points. Though some approaches have been adopted to reduce burden on participants such as attending the participants home for testing (Alford, Martinkova, et al., 2020a), social distancing requirements made such approaches impossible during the UK's COVID-19 pandemic lockdowns, and can still create barriers to research participation. For example, participants may be limited to a catchment area to which the researchers are able to travel, which is likely to be in the vicinity of a university or research institution, and thus a certain demographic population is likely to be present within this catchment area (e.g. populations high in students). Demographic data from the UK indicates towns and cities with universities have a higher proportion of the population aged between 16 and 24 (ONS, 2021). Barriers to participation in controlled hangover research may contribute to the dependence seen on student samples (Devenney et al., 2019a). The development of approaches to remote, online, experimental methodologies for hangover research will allow for an expansion of research in the area by reducing barriers to participation that allow for more diverse samples and may allow for faster project timelines.

4.4. Online research tools.

The Covid-19 pandemic lockdowns accelerated the use of online tools to conduct research in a variety of areas (Gagné & Franzen, 2023), with the pandemic acting as a catalyst for the 'onlineification of research' (Braun et al., 2020). Within the area of hangover research, however, the adoption of remote technologies seems to have been limited to naturalistic designs (e.g. Ayre et al., 2021; Scholey et al., 2019), despite their potential to make participation in such research more accessible and more ecologically valid (Englund et al., 2022). The use of online research tools allows for access to more demographically diverse samples (Buhrmester et al., 2011; Casler et al., 2013; Palan & Schitter, 2018), and can save time and financial costs associated with research (Mason & Suri, 2012), allowing for easier completion of replication research (Rodd, 2024) that can help to address the replication crisis in psychology (Open Science Collaboration, 2015). Online tools have been shown to be effective for the collection of reaction time data, though some variability in the precision is present dependent on operating system and browser combinations that are being used by the participants. Online tools do achieve reasonable precision across a range of operating system and browser combinations (Anwyl-Irvine et al., 2021; Anwyl-Irvine et

al., 2019; Bridges et al., 2020). Established tools can achieve precision of less than 3.5 milliseconds, adequate for research designs that do not require millisecond precision for timing of stimuli presentation and responses.

Similar progress has been seen in the development and utilization of remote conferencing tools such as Zoom and Microsoft Teams. These tools have been deployed both for interviewing single participants and conducting focus groups, with literature available on the considerations of conducting online qualitative data collection (Chia et al., 2021; Tuttas, 2015). In combination, these technologies allow for the stages of an experimental alcohol hangover investigation to be completed remotely. Participant screening and supervision of alcohol consumption can be completed with online conferencing software, with outcome measures completed using online testing platforms.

4.5. Alcohol hangover research design for remote participation.

The COVID-19 pandemic had a number of effects on research activities. As well as limiting the ability to conduct research using traditional approaches, 40% of researchers indicated they felt that the pandemic impaired their ability to apply for grants for non-pandemic research, and that other projects received reduced priority (Walker et al., 2022). Though the pandemic represents a biopsychosocial crisis with ongoing implications that require thorough research consideration (O'Connor et al., 2020), research in other areas of psychological, social, economic, and medical importance still needs to continue. The development of novel methodologies that allow for research to continue during periods with abnormal requirements will provide resilience within key research areas. This report addresses a novel, remote approach to hangover research that has been developed to address the challenges of the pandemic, and will provide an extra option for the delivery of future experimental research on the consequences of alcohol hangover.

In contrast to other online research, alcohol hangover research presents a number of specific considerations to ensure the safety of participants, as well as maximising compliance with protocols. This is, of course, alongside typical considerations for experimental rigour in online testing (which will be addressed in chapter 5). A primary consideration in terms of managing participant safety in remote alcohol administration-based investigations is managing the quantity of alcohol that should be consumed by

participants, and ensuring robust adverse events procedures are in place should any issues arise during the alcohol consumption.

Alcohol administration in hangover research needs to be of an adequate quantity to produce hangover effects, whilst also limiting the possibility of alcohol toxicity. Adverse events associated with alcohol poisoning, such as nausea and vomiting, would be expected to occur at BACs of 0.20 – 0.30g% (Jung & Namkoong, 2014). BACs approaching this level should therefore be avoided. Estimates of BACs achieved during natural drinking (i.e. free alcohol consumption in a typical nightlife environment) in the UK indicate median peaks of 0.13g% for females and 0.17g% for males (Hughes et al., 2011). Comparatively, literature on cognitive effects of hangover indicate that, on average, BACs of 0.11g% are achieved in investigations showing significant cognitive effects of hangover (Howland et al., 2010; Kruisselbrink et al., 2006; Opitz et al., 2019, 2020; Roehrs et al., 1991; Rohsenow et al., 2010; Scholey et al., 2019; Stock et al., 2017; Verster et al., 2003; Zink et al., 2018). Achieving BACs of this level should therefore be sufficient for the production of hangover related cognitive effects with limited risk of adverse events, and without exceeding the BACs achieved in natural drinking. In order to ensure BACs of this level are reached, factors that limit the bioavailability of consumed alcohol must be considered. These include potential for a resorption deficit, representing the proportion of consumed alcohol that does not reach systemic circulation following consumption, and elimination of alcohol via metabolism over the course of the drinking episode. Resorption has generally been estimated at 10% of the consumed quantity of alcohol (Seidl et al., 2000), whilst the average ethanol elimination rate in humans 0.15g per litre per hour (Jones, 2019). Given these parameters, administrations of alcohol aiming to achieve a maximum possible 0.15g% BAC (1.5g of alcohol per kilogram of body water) should on average result in BACs of approximately 0.12g% given a 2-hour consumption period, which should be appropriate for production of cognitive effects of hangover whilst minimising risk of adverse events. Indeed, research using this BAC as the basis for calculation of alcohol consumption has produced cognitive effects of hangover (Stock et al., 2017). For this investigation, drinks were provided pre-mixed consisting of vodka and sugar-free lemonade, which was mixed in a ratio of 2 parts to 5 respectively. Sessions during which the alcohol was consumed were conducted between 8 and 10pm, with participants instructed to begin testing between 7 and 9am. This put testing

approximately 9-11 hours following completion of the alcohol consumption, which is during the peak of average hangover symptom severity (Verster et al., 2018).

Even with alcohol administrations designed to minimise risks of adverse events, it is important to ensure that appropriate procedures are put in place to respond to emergencies that occur during remote supervision of alcohol consumption. For this purpose, a tiered approach was developed. First, it was emphasised to participants at all stages of the investigation that they should drink at a pace they were comfortable with, and that they were not obligated to finish the drinks that were provided. Participants were also instructed to report any feelings of nausea during the online alcohol consumption. If this occurred, participants would be instructed to stop drinking, and would be kept in the online meeting until the researcher was satisfied they could leave the online meeting without posing a danger to themselves. At this point the participant would be able to log-off, but would be encouraged to go to bed. In case participants became unresponsive or left the online meeting, contact information was collected, including the participants mobile number, and the address of where they would be completing the consumption session. Participants also provided an emergency contact who would be able to access them during the alcohol consumption, with contact information. Any participant that left the online session would first be contacted directly. If this failed, then the participants emergency contact would be phoned to ensure the safety of the participant. If this failed, or where the participant appeared to be at risk, emergency services would be contacted. In order to ensure participants were safe the morning following alcohol consumption, participants were requested to log in to the testing site to report their safety, even if they wished to withdraw from testing at that point. This was achieved with a checkbox response prior to beginning the testing.

Given the novel methodology of this investigation, the potential for remote investigations to expand populations that can take part in hangover research, and the need to develop future-proof approaches to research on hangover, an evaluation of the participant experience of engaging in this research was warranted. A survey was therefore conducted with the aims of 1) identifying whether participants felt comfortable with the procedure of the online investigation and quantity of alcohol to be consumed, 2) identifying whether participants would be more or less likely to participate in equivalent lab-based

research, and 3) identifying areas for potential further development of online remote experimental hangover research.

4.6. Method for the evaluation of participant experience in remote online experimental hangover research.

4.6.1. Design

In order to assess the participants' experience of the novel methodology, a cross-sectional survey was conducted following completion of the experimental hangover study.

4.6.2. Participants.

Of the 26 participants who completed the alcohol hangover research, 20 completed the participant experience survey (response rate = 76.9%). These participants had an average age of 25.6 (SD = 7.03), and consisted of 8 males, 9 females, and 3 participants who identified as an 'other' gender.

4.6.3. Materials

Following completion of participation in the study, participants were asked to complete a short survey assessing their experience of taking part in the investigation. Questions and possible responses are presented in table 1.

4.6.4. Procedure.

Participants completed the cross-sectional survey in the days following completion of the testing. Participants were asked not to complete the survey on the day of their hangover testing session so that any hangover would not directly impact their responses. All participants who responded answered the survey within 7 days following completion of the testing.

4.7. Results.

The frequency of responses to multiple choice participant experience questions are presented in table 2. Overall, participants reported their experience of taking part in the investigation very positively, with ratings of their experience averaging 9.3 on a scale of 0 to 10 (SD = 0.84). Participant comments about their experience of taking part in the investigation are presented in table 3.

Table 1. Participant experience questionnaire questions and responses.

Question	Response options
Did the information sheet for the investigation prepare you for what to expect during the study, or did you require clarification from the researcher?	The information sheet prepared me for what to expect during the study I required clarification from the researcher to understand what would be required for the study
Was the consent form written in a way that you could understand, or did you require clarification from the researcher?	The consent form was written in a way I could understand I required clarification from the researcher to understand the consent form
Did the information and discussions you had before participating in the research study prepare you for your experience in the study?	No Yes, somewhat Yes, mostly Yes, completely
Did you know how to contact the research team if you had a question?	No Yes
Were you comfortable with being observed by the researcher during the virtual drinking session?	No Yes
Were you comfortable participating in the virtual drinking session with other people?	No Yes
Were you able to comfortably consume the amount of alcohol you were given during the course of the drinking session?	No, I didn't consume all of the alcoholic drink provided No, I was uncomfortable during or following the drinking session Yes
Did the online tasks you completed include enough information for you to feel you could complete the tasks to the best of your ability?	No Yes
Would you have been more or less likely to participate in the investigation if it had been conducted in a lab?	Less likely Equally likely More likely
Please use the scale to rate your overall experience in the research study, where 0 is the worst possible experience and 10 is the best possible experience.	Rating 0 (worst experience) to 10 (best possible experience)
Do you have any further comments about your experience of participating in the investigation? For example, was there anything about the experience that you thought was positive, or anything that could have been done to improve your research experience?	Free text response

Table 2. Response frequencies for multiple choice questions on the participant experience survey.

Question	Response options	Frequency
Did the information sheet for the investigation prepare you for what to expect during the study, or did you require clarification from the researcher?	The information sheet prepared me for what to expect during the study	20
	I required clarification from the researcher to understand what would be required for the study	0
Was the consent form written in a way that you could understand, or did you require clarification from the researcher?	The consent form was written in a way I could understand	20
	I required clarification from the researcher to understand the consent form	0
Did the information and discussions you had before participating in the research study prepare you for your experience in the study?	No	0
	Yes, somewhat	0
	Yes, mostly	1
	Yes, completely	19
Did you know how to contact the research team if you had a question?	No	0
	Yes	20
Were you comfortable with being observed by the researcher during the virtual drinking session?	No	0
	Yes	20
Were you comfortable participating in the virtual drinking session with other people?	No	0
	Yes	20
Were you able to comfortably consume the amount of alcohol you were given during the course of the drinking session?	No, I didn't consume all of the alcoholic drink provided	2
	No, I was uncomfortable during or following the drinking session	0
	Yes	18
Did the online tasks you completed include enough information for you to feel you could complete the tasks to the best of your ability?	No	0
	Yes	20
Would you have been more or less likely to participate in the investigation if it had been conducted in a lab?	Less likely	10
	Equally likely	10
	More likely	0

Table 3. Responses to open question about positive/negative aspects of participating in remote hangover research.

No.	Comments.
1	Kind of feel like I might of preformed better hungover not the "X I X I X" task, I felt like my reduced cognitive capacity made it easy to focus on the task since less capacity to get distracted.
2	I thought being able to complete the experiment from home was very convenient and made the experience far more positive than completing it in a lab.
3	Everything was made extremely clear, every step on the study.
4	I enjoyed taking part in the study, I felt fully informed throughout the process and comfortable with all the arrangements. My only comment I could make for improvements was that during one of the online tests, on the second occasion (so the morning after the alcohol consumption), there was the odd typo in the instructions for the longer test (the really long one with the sequence of red and green letters) and it was a little confusing. I think it was something like the order of colours was wrong or the wrong letter was given in the instructions, something like that but I can't remember exactly. Regardless, it was easy enough to figure it out anyway using common sense but it did throw me a bit when I was doing it. This would have been easy enough to comment on if the experiment was done in person, but as it was done remotely and I was alone I was left to figure it out the best I could. Otherwise, it was a good experience with clear instructions and information and I felt looked after as a participant throughout.
5	having an informal conversation with the researcher for a bit.
6	An excellent-made research with clear instructions that assisted me in every step. The researcher made clear from the beginning that my safety was the primary concern and he was with me for the entirety of our drinking session. I would happily participate in any future research with them, as professionalism was at the highest level and the study was very interesting.
7	good experience, looking forward to results
8	found the word memory task very difficult
9	The drinks may have benefited from being multiple, slightly less strong drinks (overall same alcohol content) to make drinking them easier
10	It was a great experience
11	It was well organised and I knew what to expect
12	Super thorough - good informed consent and well-communicated experiment
13	Thank you for the opportunity and enjoyed it.
14	Thank you <<RESEARCHERS NAME>> for making a comfortable environment during the consumption session!

4.8. Discussion.

4.8.1. Evaluation of remote online research methodology.

This report has addressed the design of an investigation to remotely assess the cognitive effects of alcohol hangover, and examined participants experience of taking part in the investigation. The aims of the survey were to 1) identify whether participants felt comfortable with the procedure of the online investigation and quantity of alcohol they had

to consume; 2) identify whether participants would be more or less likely to participate in equivalent lab-based research; and 3) identify areas for potential further development of online remote experimental hangover research. Participants indicated that the experience was very positive (average rating of 9.3 out of 10), and that participants had adequate information to understand the investigation with no participants reporting that they did not feel prepared, or that they did not have enough information to complete the cognitive tasks, though one participant did comment on the difficulty of tasks. Whilst the technical considerations of conducting online cognitive testing have received consideration in literature (Anwyl-Irvine et al., 2021; Anwyl-Irvine et al., 2019; Bridges et al., 2020), no research has examined the participant experience of engaging with online testing. The current project therefore provides novel insight into participant engagement with online testing, and indicates that participants are comfortable completing complex online tasks when given full explanations of the requirements, and are enabled to practice the tasks prior to experimental data collection.

With regards to the quantity of alcohol used in the study, 90% of participants reported consuming all the alcohol provided, indicating that the quantity of 1.5g per kilogram of total body water was not excessive for the majority of participants. Participants further indicated that they were comfortable with the virtual observation of alcohol consumption, and participating with other people, though these groups were mostly self-selected, and thus the majority participated with people they knew. No directly comparable remote alcohol challenge research is available to assess whether participation in non-self-selected groups could create issues in social dynamics, however, researcher experiences of conducting online focus groups suggest that participants who engage in online research treat each other with respect and professionalism (Tuttas, 2015).

Concerning accessibility of experimental hangover research, it is notable that none of the participants indicated that they would have been more likely to take part in the research if it had been conducted in a lab. Half of the participants reported that they would be equally likely to participate in the research if it had been conducted in a laboratory, with the other half reporting they would be less likely to participate. This result indicates that remote approaches can provide improved accessibility to hangover research that may help alleviate the dependence on student samples (Devenney et al., 2019a). It is possible that

those who did not respond to the participant experience survey were those who least enjoyed their participation, had greater struggles with the demands of participation, or would have been more likely to participate in a lab setting, however, they would still represent a minority of participants.

Given the positive ratings of participant experience and indication that participants would be equally or more likely to participate in hangover research conducted remotely, this approach to remote experimental hangover research has potential to enhance both the accessibility and ecological validity of hangover research (Englund et al., 2022). The adoption of varied methods including remote research will further enhance the resilience of research to deal with abnormal circumstances such as occurred during the COVID-19 pandemic, and the pressures these extraordinary situations may create for researchers (Walker et al., 2022).

4.8.2. Future development.

Whilst participants rated their experience of taking part in this research highly, a number of considerations were put forward in verbatim comments. Firstly, one participant reported that they felt it would have been beneficial to have weaker drinks in terms of the alcohol to mixer ratio. In this case, a ratio of 2 parts vodka to 5 parts lemonade was used, partially in consideration of the overall volume of drink that participants would be required to drink across the 2-hour consumption period, and the potential need to distribute the drinks via mail. A more dilute ratio could however be employed (e.g. 1 parts vodka to 3 parts lemonade).

Secondly, an early participant raised an issue with the clarity of instructions due to a spelling error. Though the spelling error was rectified for future participants, the participant did raise that this is something they felt they would have clarified during an in-lab study. Though a researcher was available during testing times, and email details had been provided to participants with instructions to contact the researcher if there were any issues, it may be that participants were reluctant to use this means of communication. An alternative approach for future online research may be to provide an online meeting space that is occupied by a researcher and accessible to participants during the period testing is being completed. This would provide a more immediate form of communication between participant and researcher.

4.8.3. Conclusion.

Whilst online approaches to research necessitate some loss of control over participant engagement, the adoption of remote, online methods can reduce the time and cost associated with data collection (Mason & Suri, 2012), as well as providing access to more demographically diverse samples (Buhrmester et al., 2011; Casler et al., 2013; Palan & Schitter, 2018). The use of online data collection approaches can also enhance the ability of researchers to complete replications, both by providing access to these broader samples, and providing tools for the sharing of materials (Rodd, 2024), helping to address issues of replicability in psychological science (Open Science Collaboration, 2015). The development of remote methodologies for research will also enable research to continue if future situations were to occur that placed limitations on social contact, as COVID pandemic restrictions did. In this report, a novel methodology for remote, online alcohol hangover research has been presented, and the participants experience of engaging with the investigation has been evaluated. The protocol detailed for this approach to experimental hangover research may be used as a template for forthcoming research, having been ethically evaluated and approved. Participants indicated they were comfortable with the approach, including the quantities of alcohol administered and virtual supervision of alcohol consumption. Participants evaluated their experience of taking part in this remote hangover investigation very highly, and indicated that they were equally or more likely to participate in such research remotely in comparison to hangover research conducted in a lab. Experimental alcohol-challenge-based research can also benefit from adopting this approach. Given the positive feedback obtained, the methodology presented would be a feasible approach for future hangover and alcohol research, and should be considered to complement laboratory-based alcohol administration investigations.

4.9 Chapter summary.

In this chapter the participant experience of a novel remote online experimental hangover investigation has been investigated, with the aim of assessing the feasibility of this approach for future research. This online approach has the potential to provide more diverse samples, addressing the reliance on student samples in hangover research (Devenney et al., 2019a), as well as allowing for participation in a more ecologically valid environment. Individuals experiencing hangover will not usually be asked to perform within the controlled

laboratory environment, and as such completing testing from home may provide a more valid representation of the effects of hangover on cognitive performance. Assessment of participant responses to a survey addressing their experience of taking part in an remote hangover investigation involving virtual observation of drinking and online testing was provided, with participants reporting a highly positive experience. 50% of participants indicated that they would have been less likely to participate in a lab-based investigation, demonstrating the extra reach this approach may have for obtaining more diverse samples. Overall, evidence suggests that online remote methodologies for experimental hangover research, and more broadly alcohol challenge research, are feasible and likely to be beneficial.

Chapter 5: A remote experimental investigation of the effects of alcohol hangover on cognition.

5.1. Chapter introduction.

In chapter 2, exploratory factor analysis revealed two symptom clusters in the Acute hangover scale, consisting of 'headache and thirst' symptoms, and 'gastric and cardiovascular' symptoms. These symptom clusters were independently associated with pain catastrophising and BAC, such that both BAC and pain catastrophising predicted 'headache and thirst' symptoms, but only catastrophising predicted 'gastric and cardiovascular' symptoms. In chapter 3, confirmatory factor analysis affirmed the existence of the 'headache and thirst' and 'gastric and cardiovascular' symptoms clusters in the AHS, however the severity of these symptom clusters was not associated with levels of psychological distress, or the tendency to engage with maladaptive coping. In contrast, a single-item measure of hangover severity showed relationships with both psychological distress and maladaptive coping. The discrepancy in relationships between hangover severity and symptom cluster severity measures may be due to the broader symptom base that contributes to 1-item ratings of hangover severity, including psychological effects such as depression, anxiety, and changes to cognition (Verster et al., 2020), in comparison to the symptom clusters derived from the AHS which are based in ratings of somatic symptoms. Whilst a 1-item measure of hangover severity may capture broader considerations of symptoms, it may also capture symptoms that are not necessarily a product of hangover mechanisms such as oxidative stress and gut permeability or microbiome effects (Turner et al., 2024), but rather symptoms that are products of what are considered to be co-occurring processes, such as sleep disturbances (Penning et al., 2013; Rohsenow et al., 2007; Van Schrojenstein Lantman et al., 2017) and dehydration (Mackus et al., 2024). An area in need of investigation, therefore, is what hangover symptoms, symptom clusters, and measures, are associated with both physiological mechanisms of hangover and neurocognitive effects of hangover. Developing an understanding of relationships between hangover symptomology and cognitive outcomes may help to explain links between hangover with addiction and disease (Išerić et al., 2024; Piasecki et al., 2010).

In order to explore whether the severity of symptom clusters in hangover and overall hangover severity measurements are associated with different outcomes, chapter 4 presented information on the development, and participant experience, of a novel methodology for the remote online investigation of cognitive effects of hangover. Participants indicated the feasibility of this approach to conducting hangover research with regards to feeling comfortable participating in the research, with a 1.5g/Kg of body water dose of alcohol. Participants further indicated that they would be equally likely, or more likely, to participate in hangover research using this remote methodology than lab-based research, with implications for broadening samples included in hangover research. In this chapter, detail will be provided on the experimental aspects of this remote investigation, including performance on cognitive tasks and associations between changes in cognitive performance and alcohol hangover symptom severity. The objectives of this chapter are to explore cognitive outcomes associated with the hangover state; explore relationships between individual difference factors and the cognitive outcomes of hangover; and assess relationships between hangover symptomology and the cognitive outcomes of hangover.

5.2. Abstract.

Alcohol hangover, the collection of negative symptoms experienced after a single episode of drinking, is associated with a variety of changes to cognitive performance. Changes in cognitive performance during hangover have, however, not been reliably associated with the reported severity of hangover. Failure to detect reliable associations between hangover severity and alterations to cognitive performance in hangover may be due to the nature of self-report hangover severity measurements, and the particular symptoms assessed by those measures. Previous research has indicated the presence of symptom clusters in hangover that may have independent associations with physiological mechanisms and outcomes for performance in various cognitive domains. Alternatively, individual difference factors associated with hangover experience may mediate the cognitive effects of hangover. Changes to emotion regulation have been observed in hangover, and are also associated with varying effects on domains of cognition. Relationships between emotion regulation changes in hangover, hangover severity, and cognitive performance changes in hangover, may have implications for the aetiology of addiction and other alcohol-related health outcomes. This investigation therefore took an exploratory approach to

investigation of the relationships between changes in cognition, changes in emotion regulation and resilience, and changes in hangover symptomology between sober and hangover states. This was achieved based on a pre- post-alcohol-intervention methodology that was deployed online, with participants consuming 1.5g per Kg total body water. Participants completed questionnaire-based measures of emotion regulation (cognitive reappraisal and expressive suppression), rumination, and alcohol hangover symptom severity both in sober and hungover states, as well as completing emotional free recall tasks, emotional Stroop tasks, and an information processing task based on the response-distractor binding paradigm (the Moeller task). Results showed significant increases in hangover symptoms following the alcohol intervention, though no significant change in emotion regulation or resilience measures between sober and hangover state were observed. No significant effects of hangover state were observed on emotional free recall or performance on the emotional Stroop task. On the Moeller task, changes to task-irrelevant distractor information significantly increased reaction time in hungover testing, but not sober testing, indicating increased distractibility in hangover that may explain reductions in performance on everyday tasks. Exploratory correlations of delta scores for hangover severity, emotion regulation measures, and rumination, showed relationships with different measures of cognitive performance. Preliminary results indicated that changes in expressive suppression between sober and hangover states correlated negatively with reaction times on the Moeller task for a number of conditions, such that reaction times were faster in hangover when expressive suppression was increased. Expressive suppression can have acute benefits to cognition but is also associated with negative health outcomes. Correlations between performance on the Moeller task in hangover and expressive suppression may therefore have implications for the development of alcohol-related disease. Previously identified symptom clusters were not correlated in exploratory analyses, suggesting independence of these specific hangover symptomologies. Different measures of hangover severity were also associated with different cognitive performance measures in exploratory analyses, which may indicate different physiological mechanisms that underly specific hangover symptomologies and the associated cognitive effects. Whilst the exploratory nature of this investigation warrants caution in interpretations, and replication of findings will be required, future research examining the physiological mechanisms of

hangover, and the cognitive outcomes associated with hangover, should account for varying hangover symptomologies.

5.3. Introduction.

Alcohol hangover, the collection of negative physical and psychological symptoms experienced after a single episode of alcohol consumption (Verster, Scholey, et al., 2020), is associated with decrements in performance in everyday activities, for example, driving (Alford, Broom, et al., 2020; Høiseth et al., 2015; Verster, Bervoets, et al., 2014; Verster, Van Der Maarel, et al., 2014), or performance in professional settings (Howland et al., 2010; Rohsenow et al., 2010). Such effects have the potential to impact public safety and provide an indication of broader cognitive effects of alcohol hangover that may relate to both the economic impact of hangover (Bhattacharya, 2019), and contribute to links between hangover and alcohol-related health outcomes (Courtney et al., 2018; Išerić et al., 2024).

5.3.1. Cognitive effects of hangover.

Various cognitive domains have been shown to be impacted by alcohol hangover, that may contribute to associated health outcomes and daily-life disturbance. A narrative review indicated potential effects of hangover on divided attention, with meta-analysis indicating evidence for effects of hangover on; short- and long-term memory, sustained attention, and psychomotor speed (Gunn et al., 2018). Further research has indicated effects of hangover on inhibitory control (Devenney et al., 2019a; Gunn et al., 2021c), selective attention (Alford, Martinkova, et al., 2020a; Devenney et al., 2019b), and information processing (Opitz et al., 2020). Opitz et al. (2020) investigated the effect of hangover on a task based in the theory of event coding which describes response features as a product of the binding of both task relevant and task irrelevant features of processed stimuli. This response-distractor binding paradigm (or Moeller task; Moeller et al., 2014) orthogonally manipulates the properties of stimuli across prime and probe stimuli presentations. Task irrelevant information is either changed (distractor change or ‘DC’ trials), or remains (distractor remain or ‘DR’ trials) between the prime and the probe. Likewise, task relevant information is either changed such that a new response is required (response change or ‘RC’ trials), task relevant information is changed such that the same response is required (response remain or ‘RR’ trials), or task relevant information remains identical (response remains identical or ‘RRi’ trials), between the prime and probe presentations. Results

indicated that distractor repetition between prime and probe stimuli were beneficial to accuracy in sober testing, but significantly less beneficial during hangover testing, indicating a reduced effect of distractor information in hangover. It is proposed this may indicate that distractor information processing is reduced during hangover, or that this task-irrelevant information may be more effectively suppressed.

Though a variety of effects of hangover on cognition have been demonstrated, these have rarely been associated with reported severity of hangover, indeed, Opitz et al. (2020) did not find any relationship between 1-item hangover severity and accuracy on DR or DC trials, or a calculated measure of the distractor effect (DC trial accuracy minus DR trial accuracy). Hangover severity has been related to decrements in performance on psychomotor vigilance tasks (Howland et al., 2010; Rohsenow et al., 2010), as well as speed in a trail making task (Scholey et al., 2019). Hangover severity has also, however, been associated with improved performance. Increased hangover severity was associated with increased speed and reduced errors on a serial sevens task (Alford, Martinkova, et al., 2020a), as well as reduced mean driving speed and reduced speed deviation in simulator driving (Alford, Broom, et al., 2020). Further, research has failed to find correlations between hangover severity and choice reaction time performance (Grange et al., 2016), flanker effects (Alford, Martinkova, et al., 2020a; Zink et al., 2018), continuous performance measurements (Alford, Martinkova, et al., 2020a; Gunn et al., 2020), performance for task switching and the n-back task (Gunn et al., 2020), as well as commission errors in a go/no-go task and attentional bias measures in a visual dot probe task (Gunn et al., 2021c). Failure to detect reliable associations between alcohol hangover severity and cognitive impairment may be due to the sensitivity of hangover severity measurement tools. Hangover has been associated with a wide variety of symptoms (Penning et al., 2012) with certain symptom demonstrating covariance (Penning et al., 2012; Royle et al., 2020) and suggesting that symptoms can be clustered. These symptom clusters may be the product of different physiological mechanisms and may be associated with differing effects on cognitive performance. Alternatively, the failure to observe reliable relationships between hangover severity and cognitive performance may be due to other mediating factors such as catastrophising. Hangover severity has been related to catastrophising (Royle et al., 2020), in particular the aspect of rumination (Saeed et al., 2021). Negative relationships have been

demonstrated between rumination and inhibitory control (Yang et al., 2017), and cognitive control (Beckwé et al., 2014). It has been proposed that this is caused by ruminative thoughts placing demands on cognitive resources (van Vugt & van der Velde, 2018).

5.3.2. Emotion regulation and cognitive effects of hangover.

Like rumination, emotion regulation is associated with demands on cognitive resources (McRae, 2016). Alcohol hangover has been shown to impair self-reported emotion regulation (Gunn et al., 2021b), and emotion regulation has been associated with the severity of depression experienced during hangover when repetitive negative thinking (akin to rumination) is high (Tellez-Monnery et al., 2023). The use of different emotion regulation strategies may also differentially affect specific cognitive processes, for example, expressive suppression, an emotion regulation strategy in which people consciously inhibit the outward expression of emotion (Gross & John, 2012) is associated with decrements in memory (Gross, 2002), but improved performance on a visual search task (Bendall et al., 2022). Comparatively, cognitive reappraisal, a strategy involving the reframing or reinterpretation of events or stimuli to alter their emotional impact, is not associated with decrements in memory (Gross, 2002) or effects on visual search performance (Bendall et al., 2022). Associations between emotion regulation and cognitive performance have also shown valence-specificity in memory (Erk et al., 2007) and attentional control (Loeffler et al., 2019).

Emotion regulation is associated with cognitive control (Pruessner et al., 2020), as well as being associated with inhibition in samples experiencing depression (Joormann, 2010; Joormann & Gotlib, 2010). Neurologically, it is unsurprising that emotion regulation and depression hold some mediation over cognitive control (such as inhibition and attentional control), in addition to rumination (Cooney et al., 2010), since these functions are all associated with activity in the dorsolateral prefrontal cortex (dlPFC; Chen et al., 2023). The dlPFC is prone to dysfunction caused by oxidative stress and inflammation (Joyce et al., 2024), which have been proposed as physiological mechanisms responsible for the experience of hangover symptoms (Mackus et al., 2020; Turner et al., 2024; van de Loo, Mackus, et al., 2020). Oxidative stress plays a critical role in the behavioural impairments associated with alcohol toxicity, including reduced cognitive control (Tobore, 2019), with the effects of chronic oxidative stress on the prefrontal cortex, and subsequently on executive function, thought to play a role in the aetiology of addiction (Abernathy et al., 2010; Fowler

et al., 2014). Patients with substance use disorders report poorer emotion regulation capabilities, including increased nonacceptance of emotional responses, a greater lack of emotional clarity, and increased beliefs that one cannot engage with strategies to regulate emotional and behavioural response (Stellern et al., 2023). Self-reports of non-acceptance of emotional response are also elevated in hangover, whilst clarity of emotional state and ability to regulate emotional response are decreased during hangover (Gunn et al., 2021a). In summary, hangover affects emotion regulation (Gunn et al., 2021a), and the use of different emotion regulation strategies differentially affects cognitive performance (Bendall et al., 2022; Gross, 2002), with valence-specific effects on memory and cognitive control (Erk et al., 2007; Loeffler et al., 2019). Hangover may, therefore, affect cognition via emotion regulation, with the potential for valence-specific effects. Elucidating effects of hangover on relationships between emotional regulation and cognitive performance during hangover may help to explain links between hangover and addiction (Piasecki et al., 2010; Vatsalya et al., 2019), but no research has evaluated changes in cognitive performance for tasks that incorporate both neutral and emotional stimuli. Hangover is associated with increases in the use of maladaptive emotion regulation and coping strategies (Gunn et al., 2021a; Royle et al., 2020; Saeed et al., 2021; Terpstra et al., 2022) which may bias attention and memory to negatively valenced stimuli. This could also be conceptualised as a mood-congruence effect (L. Faul & LaBar, 2022; Gaddy & Ingram, 2014) with hangover inducing negative mood (Alford, Martinkova, et al., 2020a; Devenney et al., 2019a; van Schrojenstein Lantman et al., 2017) which may bias attention to negative stimuli (Gilboa-Schechtman et al., 2000; Mitterschiffthaler et al., 2008).

The current exploratory investigation has therefore been designed to: assess the effects of hangover on affective cognition and information processing; to assess the relationship between hangover induced cognitive performance changes (delta scores for affective cognition and information processing) with rumination; to assess the relationship between hangover induced cognitive performance changes and alterations to emotion regulation (cognitive reappraisal and expressive suppression); and to assess the relationship between affective cognition and information processing changes in hangover with the severity of symptom clusters in hangover. This will be achieved by assessing both sober and hungover performance on an emotional free recall task, an emotional Stroop task, and an

information processing task (the Moeller task) that separates the effects of response changes, psychomotor response, and changes in distractor information (Moeller et al., 2014). Exploratory correlational analyses will also be conducted between delta scores indicating changes in performance between sober and hangover states, with measures based on the emotion regulation questionnaire (ERQ; Gross & John, 2012), the brief state rumination inventory (BSRI; Marchetti et al., 2018), and different hangover severity ratings, with a total score based on 24 indicators (Hogewoning et al., 2016), a 1-item hangover severity score (Verster et al., 2020), and composite scores based on symptom clusters identified in Royle et al. (2020). It is hypothesised; (i) that accuracy on the emotional Stroop task will be negatively affected by hangover, with an interaction with emotional valence of words such that the attentional interference of negatively valenced words will be greater during hangover in comparison to positive and neutral words; (ii) that reaction time on the emotional Stroop task will be increased in hangover, with an interaction with emotional valence such that reaction times for negative stimuli will be greater when hungover; (iii) that number of words recalled in the free recall task will be reduced during hangover, with an interaction with emotional valence of the stimuli such that a greater number of negative words are recalled during hangover in comparison to positive and neutral words; (iv) for the Moeller task, based on the results of Opitz et al. (2020) which showed a decrease in the detrimental effect of changing distractor information between a prime and probe on performance in the hangover state, it is predicted that the effect of changing distractor information on accuracy will be reduced in a hangover state compared to sober state; (v) that hangover severity difference scores between sober and hangover testing will be correlated with increases in suppressive expression on the ERQ during hangover, and increases in rumination on the BSRI during hangover, as well as with reductions in cognitive reappraisal on the ERQ during hangover; and (vi) that hangover severity difference scores will be related to different measures of performance change between sober and hangover states on the cognitive tasks.

5.4. Method

5.4.1. Design.

This investigation utilised a within-subjects design with outcomes measured at 2 time points (pre- and post-alcohol intervention), with data collection carried out online.

Screening interviews and consumption sessions were completed using video conferencing software, with testing hosted online using Gorilla.sc (www.gorilla.sc; Anwyl-Irvine et al., 2019).

5.4.2. Participants.

A priori power calculations were performed for each task using G*Power (version 3.1.9.7; Faul et al., 2007), with alpha error probability of 0.05 and power of 0.8, to determine required sample sizes. Correlation among repeated measurements for ANOVA main within-subject effects was set as 0.5. Whilst this may underestimate the correlation between cognitive performance measures collected close together in time, the use of a greater correlation coefficient would result in greater power and therefore a lower estimate of the needed sample. The use of a 0.5 correlation will therefore result in an underestimation of power, and thusly a more robust estimation of the required number of participants. For the emotional free recall task, the effect size (Cohen's f) was calculated from reported information on the free recall task employed by Devenney et al. (2019b) of 0.246, resulting in a required sample size of 36. For the emotional Stroop task, the effect size was based on the Stroop task employed in Devenney et al. (2019a) of 0.350 (Cohen's f), resulting in a required sample size of 21. For the Moeller task, effect size was based on the task implemented in Opitz et al. (2020) of 0.385 (Cohen's f), resulting in a required sample size of 18. Recruitment was therefore aimed at 40 participants, to meet the requirements for all tasks and assuming a 10% rate of attrition, however, due to time constraints a total of 26 participants were recruited. Participants were recruited locally via email and poster advertisements, as well as snowball sampling.

Participants were recruited via opportunity and snowball sampling using poster advertisements displayed at the university, as well as using an online research participation system (Sona Systems, n.d.). Students at the university received course credit in return for completion of the investigation. Participants were informed that multiple people could complete the session during which the alcohol would be consumed at the same time, and as such if they wished to complete this part of the participation with anyone they knew, who may also be interested in participating, this could be arranged.

A copy of the participant information sheet was hosted on a webpage for participants to access, with a link included that allowed participants to access an online

booking system. The booking system allowed participants to book an online screening interview for a convenient time, with this interview hosted in Microsoft Teams. Microsoft Teams was selected as the platform for the screening interview as it met requirements for data security.

The participant screening interview served two primary purposes; firstly, to ensure it was appropriate and safe for participants to participate in the investigation, and secondly, to collect information for the calculation of the quantity of alcohol the participant would need to consume as part of the investigation – specifically, the participants height, weight, and gender information were requested. Participants were also required to provide a recognized form of identification by showing this on camera, and an image of the identification was retained by the researcher.

To ensure it was appropriate for participants to take part in the research, inclusion/exclusion criteria were pre-defined, and assessed during the screening interview. Participants were excluded from the investigation if; they were not between the ages of 18 and 40 years; had a body mass index lower than 18.5, or greater than 30; had a history of heart disease, high blood pressure, or diabetes; had a diagnosis of anxiety or depression; had been diagnosed with alcohol or other drug abuse conditions; had chronic, somatic, or neurological illness; or took medication that affects the central nervous system, kidney, or liver function. Female participants were also excluded if they were known to be pregnant or lactating. These criteria were all applied based on self-report. The minimum age criteria was applied so as to ensure participants could legally be provided with alcohol, whereas the maximum age criteria was applied to limit potential effects of age-related cognitive decline. BMI criteria were applied to ensure the validity of eBAC calculations, as extreme BMI's may influence alcohol metabolism. Exclusion criteria related to medical status (i.e. mental and physical health) were applied to limit potential risks associated with the consumption of alcohol.

Participants also completed the Alcohol Use Disorder Identification Test (AUDIT; Saunders et al., 1993) and the Quick Drinking Screen (QDS; Sobell et al., 2003) as part of the screening interview, and were excluded if; their overall score on the AUDIT was less than 2, or greater than 19; If their score on questions 3 (binge drinking), 5 (failure to meet responsibilities), or 8 (alcohol associated memory loss) of the AUDIT was the maximum; if

their score on question 3 of the QDS (frequency of binge drinking in the last year) was less than 12; or if the amount of alcohol the participant was going to be asked to consume was greater than they reported as the greatest amount of alcohol they had voluntarily drunk in the last year, on question 4 of the QDS. These criteria were applied both to limit risks associated with participant AUD propensity, as well as risks associated with low-level drinkers being asked to consume comparatively large amounts of alcohol. Participants were also required to have access to a computer with a webcam and microphone to take part in the study.

If participants met all criteria for inclusion in the study, they were then informed about the amount of alcohol that they would be asked to consume in the investigation. If the participant was happy to continue, informed consent was taken, and both participant and emergency contact details were collected. It was requested that this emergency contact be someone who could access the participant at their location if intervention was needed during alcohol consumption. Information was also collected on any allergies, particularly those associated with a snack (protein bar) that was to be provided for participants to eat during the alcohol consumption. The progression of the study was explained to participants, and they were provided opportunities to ask any questions about the process. Finally, arrangements were made for the participant to collect the experimental materials (drinks, a protein bar snack, and a participant information pack) from the researcher, though these also could have been delivered using age-verification mail services.

The participant information pack included a physical copy of the participant information sheet for the study (including information on sources of support for issues related to alcohol), information on how and when testing would be required and how it could be accessed, information on the drinks that were included, a snack for when the alcohol consumption was being completed, and pre-mixed vodka & diet lemonade drinks.

5.4.3. Materials.

5.4.3.1. Intervention materials.

Participants were required to consume an alcoholic beverage, calculated per individual as 1.5g of alcohol per Kilogram of total body water (TBW; as calculated according to Seidl et al., 2000; using self-reported values for height and weight). A review of the literature on cognitive effects of hangover indicated that, on average, blood alcohol concentrations (BACs) of 0.11g% were achieved in investigations showing significant

cognitive effects of hangover (Howland et al., 2010; Kruisselbrink et al., 2006; Roehrs et al., 1991; Rohsenow et al., 2010; Opitz et al., 2019; Zink et al., 2018; Opitz et al., 2020; Stock et al., 2017; Verster et al., 2003; Scholey et al., 2019). Maximum estimated BAC based on this quantity of alcohol would be 0.15g%, with estimates assuming either an elimination rate of 0.15mg/g/hr, or resorption rate of 10%, indicating participants would achieve BACs of between 0.120 and 0.135g%. Drinks were provided for the investigation in the form of pre-mixed Smirnoff Vodka with Sainsbury's diet lemonade, mixed at a ratio of 2 parts to 5.

5.4.3.2. Outcome measures.

Cognitive tasks for the study were selected to investigate affective cognition and information processing. Participants completed cognitive tasks and questionnaires prior to, and after, the alcohol consumption; An emotional free recall memory task, a questionnaire rating the severity of hangover symptoms, an emotional Stroop task, an information processing task (Moeller et al., 2014), the emotion regulation questionnaire (ERQ; Gross & John, 2003), and the brief state rumination inventory (BSRI; Marchetti et al., 2018).

5.4.3.2.1. Free recall task.

A free recall task was employed using emotionally valenced stimuli. Stimuli for the task were drawn from the EMOTE database (Grühn, 2016), limited to adjectives. Words were classified across emotional valence categories based on deviation from the overall mean of valence ratings for adjective words in the database, with words with a valence rating greater than 1 SD above the mean classified as positive, words with a valence rating between 0.5 SDs below the mean, and 0.5 SDs above the mean being classified as neutral, and words with a valence rating of less than 1 SD below the mean being classified as negative. A total of 20 words were selected for each of the 3 valence categories, and these lists were then further divided into 2 sets for counterbalanced pre-post testing.

A series of two-way ANOVA (2 testing sets x 3 valence groups) analyses were conducted to assess stimuli. Analyses indicated significant differences in the valence ratings for the valence groups of words ($F(2,54) = 607.828$, $p < .001$). Pairwise comparisons indicated significant differences between positive words (mean: 5.75, SD: 0.33) and neutral (mean: 3.65, SD: 0.49) words ($t(54) = -18.446$, $p < .001$), between neutral and negative (mean: 1.81, SD: 0.18) words ($t(54) = -16.311$, $p < .001$), and between positive and negative words ($t(54) = -34.844$, $p < .001$). In order to ensure that any differences observed in

performance were due to varying valence across the words sets, a number of other characteristics of the word groups were controlled. No significant differences were observed between positive, negative and neutral words on; Arousal (F (2,54) = 0.059, *p* = 0.943), number of letters in each word (F (2,54) = 1.418, *p* = 0.251), number of syllables in each word (F (2,54) = 1.807, *p* = 0.174), frequency of appearance in the British National Corpus (F (2,54) = 0.710, *p* = 0.496), Concreteness (F (2,54) = 0.636, *p* = 0.533), Meaning (F (2,54) = 1.878, *p* = 0.163), or Emotionality (F (2,54) = 2.284, *p* = 0.112).

Analyses also indicated no significant differences between the different testing sets on; Valence (F (2,54) = 0.018, *p* = 0.893), Arousal (F (2,54) = 0.269, *p* = 0.606), number of letters in each word (F (2,54) = 0.789, *p* = 0.378), number of syllables in each word (F (2,54) = 0.087, p = 0.769), frequency of appearance in the British National Corpus (F (2,54) = 0.263, *p* = 0.611), Concreteness (F (2,54) = 0.195, *p* = 0.661), Meaning (F (2,54) = 3.712, *p* = 0.059), familiarity (F (2,54) = 0.460, *p* = 0.500), emotionality (F (2,54) = 0.277, *p* = 0.601), likeableness (F (2,54) = <0.001, *p* = 0.993), desirability (F (2,54) = 0.008, *p* = 0.930), or control (F (2,54) = 2.339, *p* = 0.132).

During the presentation phase of the free recall task, participants were presented with a series of 30 words (10 per emotional valence condition) in a random order. Words were displayed on screen in 20 point Arial font, in white text on a black background. Words were presented for 1 second, with an interstimulus interval (fixation cross) of 1 second.

The recall phase of the task allowed participants 2 minutes to enter as many of the remembered words as they could by typing into a free response box, and submitting each word by pressing the 'Enter' key on the keyboard. A button was also presented on screen that the participant could press to end the recall phase if they were unable to remember any other words.

5.4.3.2.2. Emotional Stroop Task.

An emotional Stroop task was employed in testing. This task requires participants to respond to the colour of words presented on screen, with the emotional variant allowing examination of affective components of information processing. Stimuli for the task was drawn from the EMOTE database (Grühn, 2016) and limited to nouns.

Words were classified across emotional valence categories based on deviation from the overall mean of valence ratings for noun words in the database, with words with a valence rating greater than 1 SD above the mean classified as positive, words with a valence

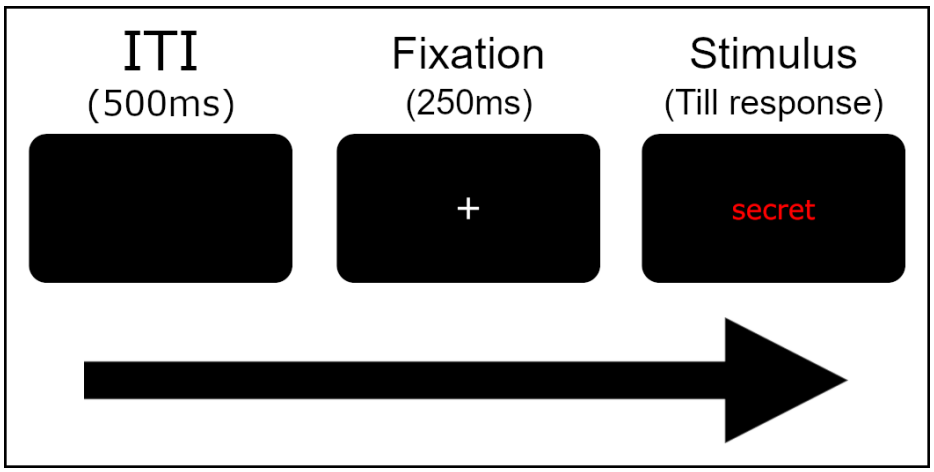
rating between 0.5 SDs below the mean, and 0.5 SDs above the mean being classified as neutral, and words with a valence rating of less than 1 SD below the mean being classified as negative. A total of 10 words were selected for each of the 3 valence categories (positive/neutral/negative). All words appeared in both pre- and post-intervention testing, but stimuli were not presented with the same colouring (i.e. with the same responses), for both pre- and post-testing.

One-way ANOVA's were conducted to assess stimuli, with analyses indicating that word groups showed significant differences in ratings of valence ($F(2,27) = 359.470$, $p = <0.001$). Pairwise comparisons indicated significant differences between ratings of positive (mean: 5.56, SD: 0.29) and neutral (mean: 3.74, SD: 0.29) words ($t(27) = 14.587$, $p < .001$), between neutral and negative (mean: 2.23, SD: 0.25) words ($t(27) = 12.191$, $p < .001$), and between positive and negative words ($t(27) = 26.777$, $p < .001$). In order to ensure that any differences observed in performance were due to varying valence across the words sets, a number of other characteristics of the word groups were assessed. Analyses of word groups indicated no significant differences in ratings of; arousal ($F(2,27) = 1.793$, $p = 0.186$), imagery ($F(2,27) = 0.638$, $p = 0.536$), concreteness ($F(2,27) = 0.034$, $p = 0.967$), meaningfulness ($F(2,27) = 0.325$, $p = 0.725$), familiarity ($F(2,27) = 1.724$, $p = 0.197$), and emotionality ($F(2,27) = 1.589$, $p = 0.223$). No significant differences were also found in the number of letters per word ($F(2,27) = 1.674$, $p = 0.206$), number of syllables per word ($F(2,27) = 0.533$, $p = 0.582$), or the frequency of appearance of words in the British National Corpus ($F(2,27) = 0.214$, $p = 0.809$).

During the task, words were presented on screen in a 20 point Arial font with a black background. Words appeared in either green, blue, red, or purple colouring, with 'c', 'v', 'n', and 'm' used as respective response keys. Participants were instructed to "respond by selecting the key on your keyboard that corresponds to the colour the word is printed in". Each trial consisted of a 500ms intertrial interval, a 250ms fixation, and stimulus words presented on screen until the participant responded.

Participants were provided with an opportunity to practice the task up to 3 times before completing the testing, with 10 low arousal neutral words used for the practice trials. During practice trials the response keys were also indicated on screen.

Figure 1. Procedure diagram for the emotional Stroop task.



5.4.3.2.3. Information Processing (Moeller) Task.

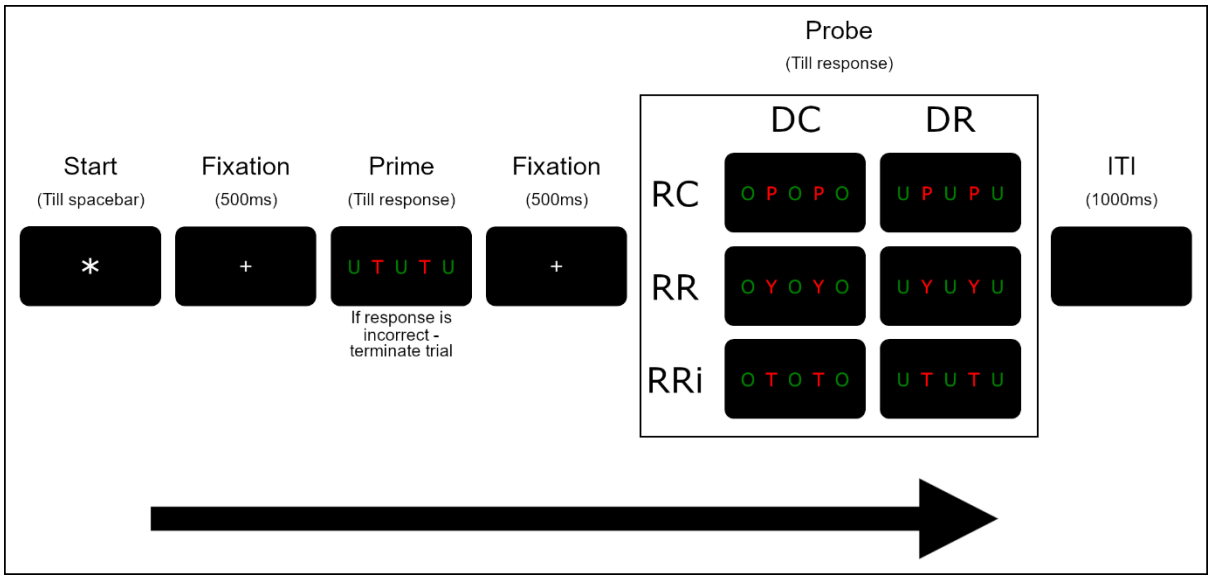
The Moeller task assesses the processing and binding of target (task-relevant) and distractor (task-irrelevant) information. Independent variation of task-relevant information, task-irrelevant information, and associated responses, allows for the examination of information processing efficiency.

Trials consist of 2 stages, with each stage consisting of the presentation of a 5 letter string on screen. All strings have the pattern "distractor, target, distractor, target, distractor" (e.g. "E R E R E"). Participants must respond to the target letter of the string presented on screen, with a total of 8 possible target letters ('E', 'R', 'T', 'Y', 'U', 'I', 'O', and 'P' were used as stimuli in the current iteration of the task) corresponding to 4 potential responses. The keys 'D', 'F', 'J', and 'K' were used as response keys for the current iteration of the task, with 'D' as an accurate response when the target letter was 'E' or 'R'; 'F' as an accurate response when the target letter was 'T' or 'Y'; 'J' as an accurate response when the target letter was 'U' or 'I'; and 'K' as an accurate response when the target letter was 'O' or 'P'. This allows for the manipulation of trials that consist of string pairs with a 2x3 variable structure. The distractor letter may change between stages ('DC' condition), or remain ('DR' condition). The target letter may remain identical between the prime and probe ('RRi' condition), the target letter may change but result in the same accurate response ('RR' condition), or the target letter may change and require a new response to be accurate ('RC' condition). This allows for the examination of the role of changes in distractor information and target information on performance, separately.

Participants began each trial by pressing the 'spacebar' on their keyboard. A 500ms fixation was presented on screen before the prime was displayed until the participant responded. If the participant responded incorrectly to the prime, the trial was terminated. Following a correct response to the prime, a 500ms fixation was displayed prior to the probe, which was displayed until participants responded. A time limit was not placed on responses to the prime and probe to facilitate the online deployment of the task. Following the response to the probe, a 1000ms intertrial interval was used, during which a blank screen was displayed. Participants were instructed they could take a break at anytime, by remaining on the starting screen, and a progress bar on this screen indicated the participants progression through the task.

Participants completed 60 trials each in both pre- and post-consumption testing, split equally across conditions of the 2x3 (response/distractor) structure. This resulted in 10 for each response/distractor variable combination (RC/DC, RC/DR, RR/DC, RR/DR, RRi/DC, & RRi/DR). Trials were also balanced for the handedness of response and whether the hand of the response did or did not change between prime and probe. Due to the complexity of the task for unsupervised participants, they were given up to 3 opportunities to complete 12 practice trials, and response keys were indicated on screen for the duration of the task.

Figure 2. Procedure diagram for the Moeller task.



5.4.3.2.4. Questionnaires.

ERQ: The ERQ (Gross & John, 2003) is a 10-item questionnaire assessing the strategies that participants use to manage their emotions. Participants rate statements on a scale of 1 (strongly disagree) to 7 (strongly agree). The questionnaire results in 2 scores representing the use of cognitive reappraisal (6-items) and expressive suppression (4-items), with each score calculated as the mean of responses on items related to the subscale. Higher scores on each subscale indicate greater use of that emotion regulation strategy. The ERQ exhibits a reliability of $\alpha = 0.70$ for the cognitive reappraisal subscale and $\alpha = 0.73$ for the expressive suppression subscale, with a test-retest reliability of $\alpha = 0.69$ for both scales (Gross & John, 2003).

BSRI: The BSRI (Marchetti et al., 2018) is an 8-item scale measuring participants rumination on stress and/or their mood, as it is 'right now'. Participants rate statements on a visual analogue scale, which was implemented online as a 100-point slider, with anchors from 'completely disagree' to 'completely agree'. Total score is calculated as a sum of responses on all items, with a higher score indicating greater rumination. The BSRI has shown construct validity via positive relationships with measures of negative affect, anxiety, depression, and trait rumination, as well as negative relationships with adaptive emotion regulation strategies and positive affect (Marchetti et al., 2018). Internal consistency has been indicated between $\alpha = 0.89$ and $\alpha = 0.91$.

Hangover symptom ratings: Participants completed ratings of the severity of a variety of hangover symptoms. Symptoms were selected from the 3 most popular hangover severity measures within the literature (in line with e.g. Hogewoning et al., 2016), with the scale including 24 symptoms, as well as an overall 'hangover' rating. Participants were presented the symptoms, one at a time, in a random order. Symptoms were presented in a 20 point white Arial font on a black background, and participants responded to each item on an 11 point scale from 0 (absent) to 10 (extreme). No assessment appears to have been conducted on the reliability or validity of this composite scale, however, the scales the measure combines have been assessed. The acute hangover scale has shown reliability of $\alpha = 0.84$, and discriminant validity (Rohsenow et al., 2007). The hangover symptoms scale has shown validity in identifying hangover occurrence (Robertson et al., 2012; Slutske et al., 2003), and the alcohol hangover severity scale has shown relationships with other hangover severity scales and measures of alcohol consumption (Penning et al., 2013).

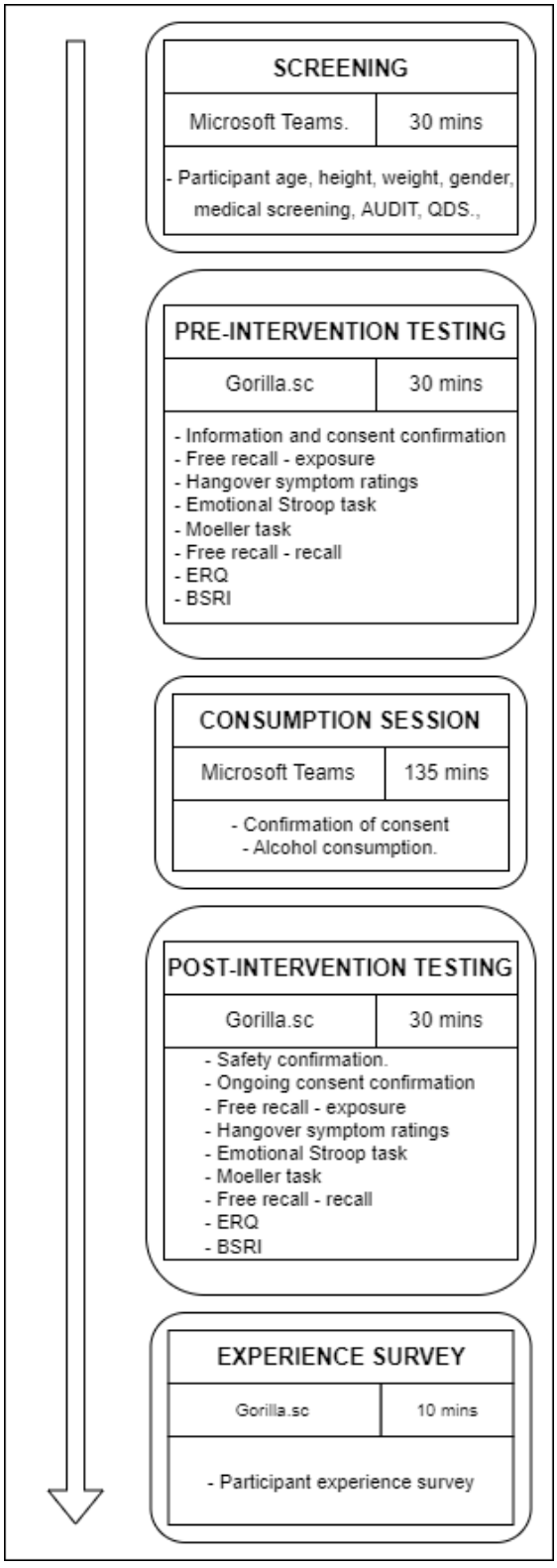
5.4.3.2.5. Participant Experience Survey.

Participants were asked to complete a short survey assessing their experience of taking part in the investigation. This survey assessed whether participants had found information relating to the study to be adequate, their experience of taking part in the online drinking session, whether they would have participated in such a study offline, and provided a space for any other comments the participants wished to make. Results related to the participant experience survey are not of central importance to the current study and have been previously reported (See Chapter 4).

5.4.4. Procedure.

The procedure for the investigation consisted of 5 stages (illustrated in figure 3); screening, pre-intervention testing, a consumption session, post-intervention testing, and the participant experience survey. The pre-intervention testing, consumption session, and post-intervention session were completed over a 2 day-period. The investigation was approved by the University of Salford Health & Society ethics committee (Application ID: 1350).

Figure 3. Diagram illustrating study procedure.



5.4.4.1. Screening.

Participants who responded to advertisements were directed to a website that included participant information as well as a link to book an online screening interview. During the screening, participant identity was verified and an image of identity documents obtained. Demographic information about the participant (age, gender, height, and weight), and participants were asked to self-report on their medical history. The AUDIT and the QDS were administered by the researcher in order to assess eligibility for the investigation. If the participant was eligible and wished to continue, informed consent was collected and emergency contact information was collected. Arrangements were then made for provision of intervention materials.

5.4.4.2. Pre-intervention Testing.

On the morning that the participant would be consuming the provided alcohol, pre-intervention testing was completed. Participants were asked to access online testing via a link, and completed, in order; exposure for the free recall task, hangover symptom ratings, the emotional Stroop task, the Moeller task, recall for the free recall task, the ERQ, and the BSRI. Participants were asked to begin this testing between 07:00 and 09:00 hours to ensure that the participants completed testing during the time window where hangover would be expected (Verster et al., 2018).

5.4.4.3. Consumption Session.

Participants booked their supervised consumption session, during which they would drink the provided alcohol, using an online booking system, with drinking taking place between approximately 20:00 hours and 22:00 hours local time. Participants were instructed to eat a full meal prior to the consumption session. Participants accessed the session via web link, which was hosted using video conferencing software. Up to 5 participants took part in the consumption session at once. After confirmation of the participants identity, emergency information, and consent to continue, participants were given 2 hours to consume the provided drinks. Participants were instructed to space this drinking across the duration of the session, and to cease drinking if they began to feel unwell. A snack (protein bar) was also provided alongside the drinks, to ensure participants had something available to eat during the session if they felt it was necessary. Participants were not limited from leaving their computer during the session, but were asked to inform

the researcher so they could follow up a participant if they did not return. Participants were provided with a movie or games to play for entertainment, or were allowed to entertain themselves if preferred, so long as they remained visible to the researcher. At the end of the consumption session (or if a participant withdrew), the researcher checked whether participants had consumed all of the provided drink or not, reminded participants not to drink anymore, and checked participants were okay, before the session was ended.

5.4.4.4. Post-intervention Testing.

The morning following completion of the consumption session, participants completed online testing by accessing a weblink. The procedure for this testing session was the same as the pre-intervention testing, with the exception that a safety check was carried out at the start, with the opportunity provided for participants to withdraw if they chose. The safety check consisted of a checkbox alongside the text: “I am safe and have had no unexpected side effects of the alcohol consumption completed as part of this investigation.”. Participants were asked to complete this testing session at approximately the same time they had completed the pre-intervention testing session (i.e. starting between 07:00 hours and 09:00 hours).

5.4.4.5. Participant Experience Survey.

The day following completion of the post-intervention testing, participants were provided with a link and asked to complete the experience survey. No time limit or requirements were placed upon completion of this survey. The results of this survey were addressed in chapter 4.

5.4.5. Data Analysis

Data analysis was conducted in JASP 0.19 (JASP team, 2024) using both frequentist and Bayesian approaches. Bayesian analysis provides added insight to non-significant findings by providing a comparative assessment of null and alternative hypotheses (Dienes, 2014). For information on Bayesian analyses, see Nuzzo (2017) for correlations, and van den Bergh et al. (2023) for repeated measures ANOVA’s. Bayes analyses were conducted with default priors. Assessment of evidence strength in Bayesian analyses was based on van Doorn et al., (2021). Prior to analysis, cognitive performance data averages were calculated. For reaction time data in the emotional Stroop and Moeller tasks, data was screened at the trial level and any trials greater than 2 SD’s from the participants mean was excluded from

calculation of averages. Participants with average accuracies and reaction times greater than 2 SD's from the mean were removed from analyses for that task. Simple comparisons for differences in hangover severity scores and individual difference measures were made using repeated measures t-tests, or Wilcoxon signed ranks if assumptions were violated. ANOVA's were used to assess cognitive task performance, with Greenhouse-Geisser corrections used in case of violations of sphericity assumptions. Where hangover effects were observed in ANOVA omnibus tests, individual difference measures were introduced as covariates to examine potential mediation effects. Planned comparisons were utilised to examined whether mood effects were observed in hangover for negative emotional stimuli; specifically, mood congruent recall in hangover was examined using planned contrasts comparing recall for negative words in hangover and sober states for the free recall task; and mood-related interference was examined in the emotional Stroop task utilising planned contrasts for reaction time and accuracy between hangover and sober testing for negative words. Based on the results of Opitz et al. (2020), planned contrasts were also examined for differences between trials in which task-irrelevant information was changed, or task-irrelevant information remained the same between the prime and the probe, for both sober and hangover states. In order to examine relationships between hangover severity and individual difference measures with effects of hangover on cognitive performance, correlations were conducted examining delta scores between sober and hangover testing.

5.5. Results

5.5.1. Participant characteristics and descriptive statistics.

26 participants completed testing as part of this investigation, with a mean age of 24.73 (SD: 7.00). This does not include 2 participants who withdrew from testing, 1 participant who completed the screening interview but did not meet inclusion criteria, and 1 participant who withdrew after the screening interview. Of the 26 participants that completed the investigation, 11 participants were male, 11 female, and 4 were non-binary or transgender. 22 of the participants consumed all of the alcohol provided for the investigation, and 4 did not. Participants who did not consume all the alcohol provided were still included in analyses.

5.5.2. Hangover symptoms.

To verify that the drinking intervention resulted in hangover, comparisons were made on hangover symptom ratings for sober and hungover testing. 4 hangover measurements were assessed; 1-item hangover severity was based on responses to the 'hangover' item; Total hangover severity was calculated as a sum of all symptom ratings; headache and thirst symptom severity was calculated as the mean of responses to the items 'headache', 'tiredness', and 'thirst', and gastric and cardiovascular symptom severity was calculated at the mean of responses to 'dizziness / faintness', 'loss of appetite', 'stomach pain', 'nausea', and 'heart racing', based on the symptom clusters identified in (Royle et al., 2020). Normality assumptions were met for all hangover measurements except gastric and cardiovascular symptoms. Thus, a one-tailed Wilcoxon signed rank test was used to assess the gastric and cardiovascular symptom severity, with other measures assessed using one-tailed repeated measures t-tests. All measures showed significantly higher hangover symptom severity in hungover testing compared to sober testing. Bayesian analyses indicated very strong evidence for greater symptom severity during the hangover session,

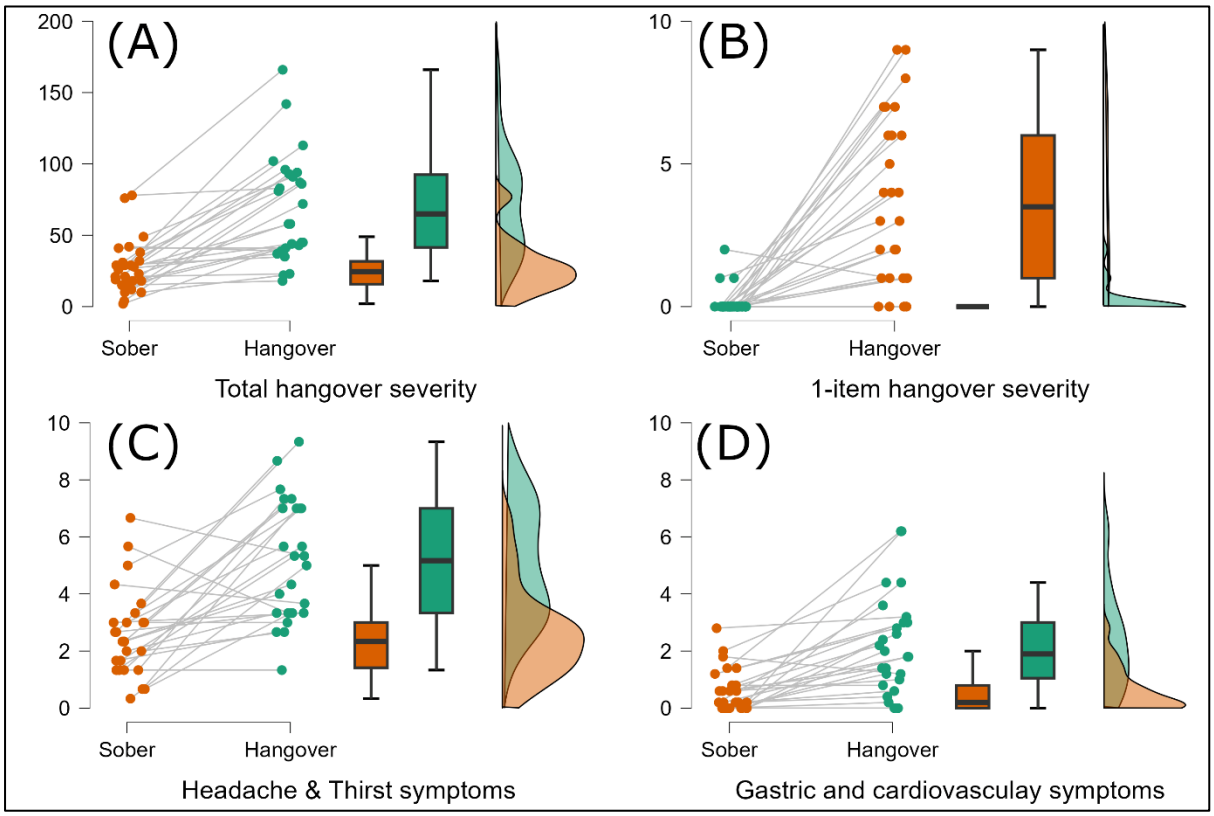
Table 1. Results of parametric comparisons of hangover severity across hangover conditions.

Measure	Condition.	Mean	SD	Min	Max	t	df	Sig.	Cohen's d	BF_{10}
1-item Hangover severity	Sober	0.15	0.46	0	2	6.05	25	<.001	1.78	15072.76
	Hangover	3.77	2.96	0	9					
Total hangover severity	Sober	27.54	18.58	2	78	6.22	25	<.001	1.22	22538.86
	Hangover	69.77	37.21	18	166					
Headache & thirst symptom severity.	Sober	2.59	1.53	0.34	6.67	5.21	25	<.001	1.02	2136.71
	Hangover	5.14	2.12	1.34	9.34					

Table 2. Descriptives for Gastric and cardiovascular symptoms and results of Wilcoxon test for difference between hangover and sober testing.

Measure	Condition.	Mean	SD	Min	Max	W	z	Sig.	rank-biserial correlation	BF_{10}
Gastric & cardiovascular symptom severity.	Sober	0.60	0.75	0	2.80	270	4.02	<.001	0.957	3376.11
	Hangover	2.22	1.71	0	6.20					

Figure 4. Raincloud plots for hangover severity measurements across hangover conditions.



(A) Total hangover severity. (B) 1-item hangover severity. (C) Headache and thirst symptom cluster severity. (D) gastric and cardiovascular symptom cluster severity.

indicating the hangover induction was successful. Results are presented in Table 1 and Table 2. Raincloud plots are presented in Figure 4.

5.5.3. Rumination and emotion regulation.

To investigate changes in rumination and emotion regulation strategies associated with hangover, comparisons were made on rumination and emotion regulation scores between sober and hangover conditions. Results for the BSRI were not normally distributed, and thus were analysed using two-tailed Wilcoxon signed rank tests. ERQ measures were assessed using two-tailed repeated measures t-tests. Results indicated no significant differences in rumination, cognitive reappraisal, or expressive suppression, between sober and hangover conditions. Bayesian analyses indicate weak evidence for no effect of hangover on rumination, and moderate evidence for no effect of hangover on cognitive reappraisal or expressive suppression. Results are presented in Table 3 and Table 4. Raincloud plots are presented in Figure 5.

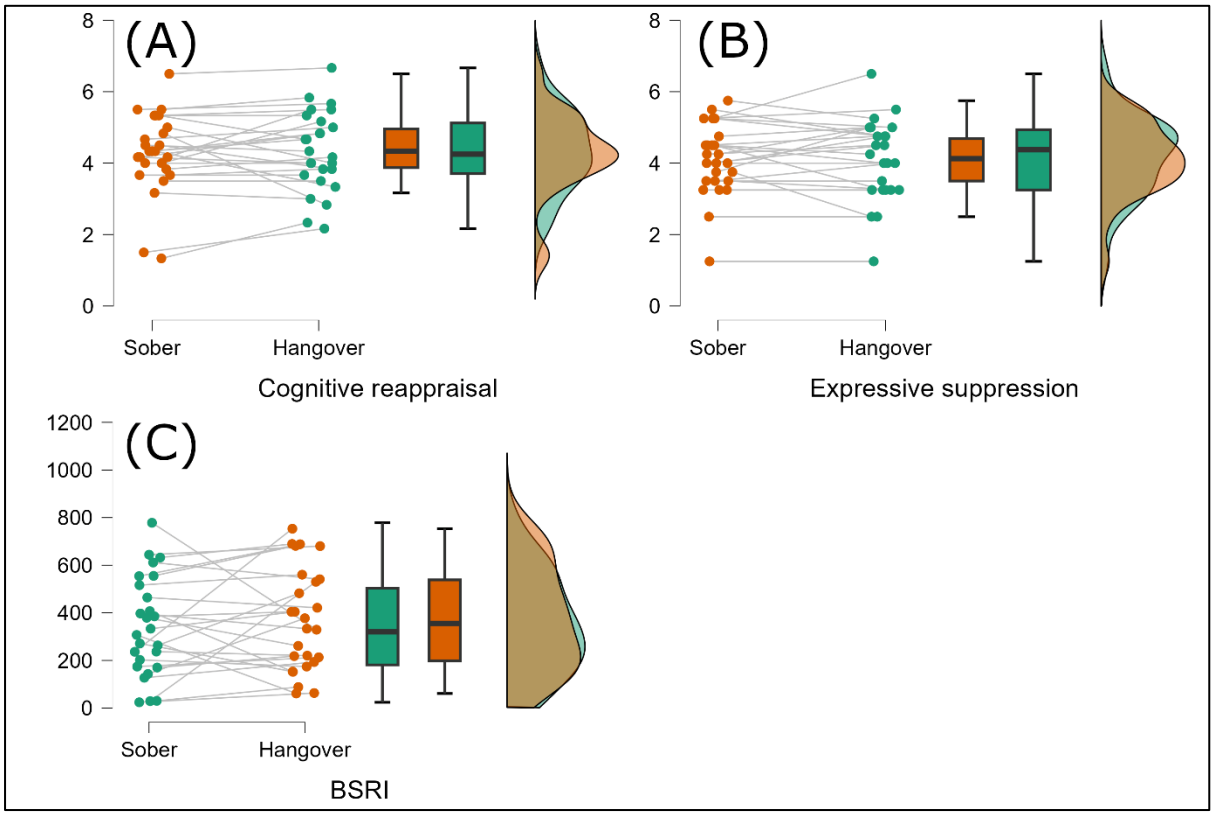
Table 3. Comparison of BSRI between hangover conditions.

Condition	Mean	SD	Min	Max	W	z	Sig.	rank-biserial correlation	BF_{10}
Sober	341.08	207.67	24	778	139	-0.927	.361	-.208	0.334
Hangover	371.85	216.29	61	753					

Table 4. Comparison of cognitive reappraisal and expressive suppression between hangover conditions.

Measure	Condition	Mean	SD	Min	Max	t	Sig.	Cohen's d	BF_{10}
Cognitive reappraisal	Sober	4.28	1.13	1.34	6.50	0.412	.684	0.081	0.224
	Hangover	4.34	1.11	2.17	6.67				
Expressive suppression	Sober	4.12	1.01	1.25	5.75	0.158	.876	0.112	0.210
	Hangover	4.14	1.12	1.25	6.50				

Figure 5. Raincloud plots of individual difference measures across hangover conditions.



(A) ERQ Cognitive Reappraisal. (B) ERQ Expressive suppression. (C) BSRI.

5.5.4. Cognitive performance.

5.5.4.1. Free recall.

Summaries of performance on the free recall task across hangover and emotional valence conditions are presented in Table 5.

Table 5. Summaries of performance on free recall task across hangover and emotional valence condition.

Hangover Condition	Valence	Mean (words recalled)	SD	Min	Max
Sober	Positive	0.65	1.09	0	3
	Neutral	1.12	1.68	0	7
	Negative	0.96	1.25	0	5
Hangover	Positive	0.46	0.76	0	3
	Neutral	0.73	1.15	0	4
	Negative	0.58	0.81	0	2

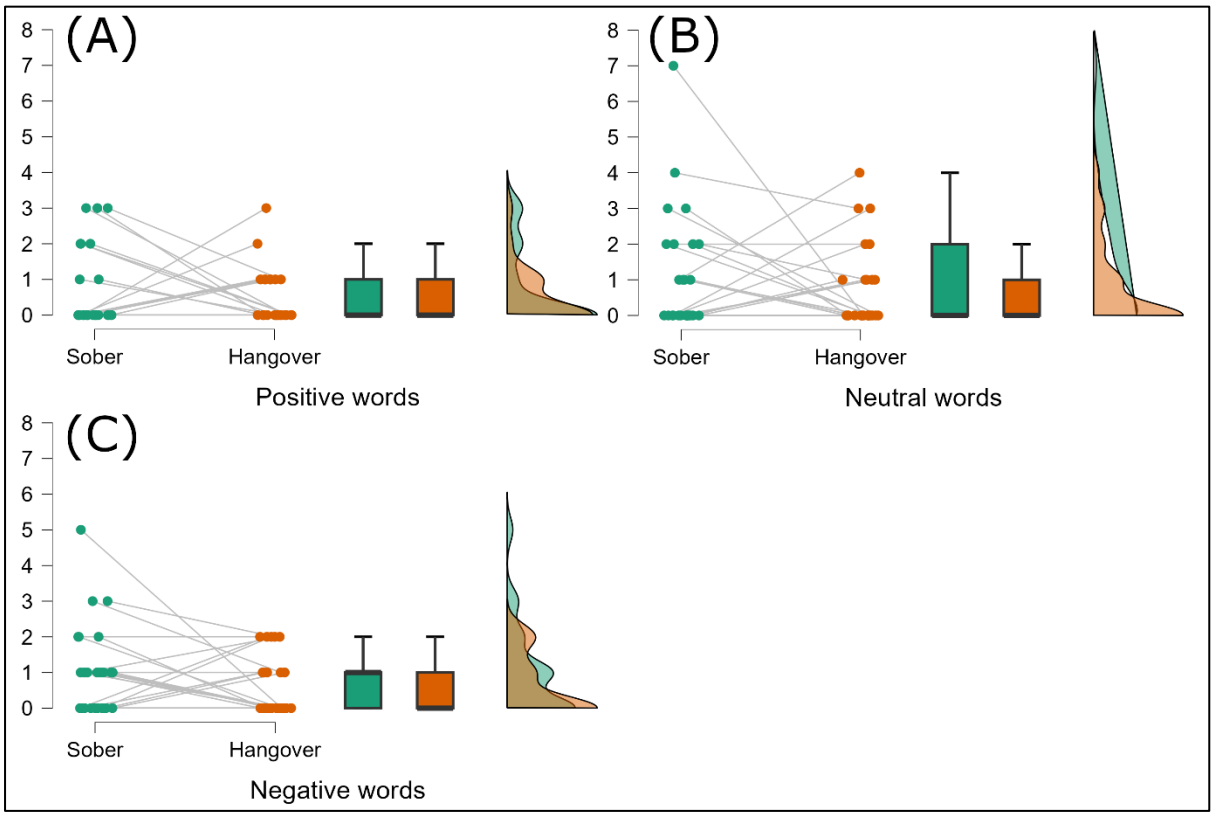
To assess the effect of hangover condition (sober/hangover) and emotional valence condition (positive/neutral/negative) on free recall performance, 2 x 3 ANOVAs were utilised. Results are presented in Table 6, and showed no effects of hangover condition, emotional valence, or interaction effects on the number of words recalled. Bayesian analysis indicated strong evidence of no interaction between hangover condition and emotional valence on free recall performance, and moderate evidence for no effect of emotional valence on free recall performance. Evidence for no effect of hangover on free recall performance was, however, weak. Raincloud plots are presented in Figure 6.

Table 6. ANOVA results for Free recall performance.

Variable	F	significance	η^2	η^2p	BF_{incl}
Hangover condition	2.36	.137	0.029	0.086	0.431
Emotional valence	3.14	.052	0.025	0.112	0.225
Hangover condition * emotional valence[a]	0.13	.804	0.002	0.005	0.048

a = Greenhouse-Geisser corrected.

Figure 6. Raincloud plots of free recall performance between sober and hangover conditions.



Raincloud plots of free recall performance between sober and hangover conditions, for (A) positive, (B) neutral, and (C) negative words.

A priori paired contrasts comparing the number of negative words recalled between hangover and sober states also indicated no significant effects ($t(25) = 1.358$, $p = .187$), with Bayesian analyses indicating weak evidence of no effect ($BF_{10} = 0.470$).

5.5.4.2. Emotional Stroop.

Seven participants were excluded from analyses of the emotional Stroop data due to having overall accuracies approaching chance (<0.34) in both testing sessions, one participant was excluded due to having accuracies approaching chance in hungover testing, and 2 further participants were excluded due to having accuracies greater than 2 standard deviations less than the mean of remaining participants. One participant had an average reaction time greater than 2 SD's larger than the mean, and was subsequently excluded. The final sample was therefore 14 participants. Summaries of performance on the emotional Stroop task are presented in tables 7 (reaction times) and 8 (accuracies).

Table 7. Summary of reaction times for emotional Stroop performance across hangover and emotional valence conditions.

Hangover Condition	Valence	Mean (ms)	SD	Min	Max
Sober	Positive	807.138	106.681	624.01	983.826
	Neutral	804.564	74.739	688.705	909.316
	Negative	846.236	124.785	661.205	1041.08
Hangover	Positive	894.377	277.908	619.55	1592.622
	Neutral	850.351	229.967	623.85	1470.226
	Negative	865.958	192.285	709.34	1446.778

Table 8. Summary of accuracies for emotional Stroop performance across hangover and emotional valence conditions.

Hangover Condition	Valence	Mean	SD	Min	Max
Sober	Positive	0.952	0.043	0.889	1
	Neutral	0.959	0.046	0.895	1
	Negative	0.952	0.051	0.85	1
Hangover	Positive	0.916	0.11	0.65	1
	Neutral	0.956	0.063	0.8	1
	Negative	0.944	0.06	0.842	1

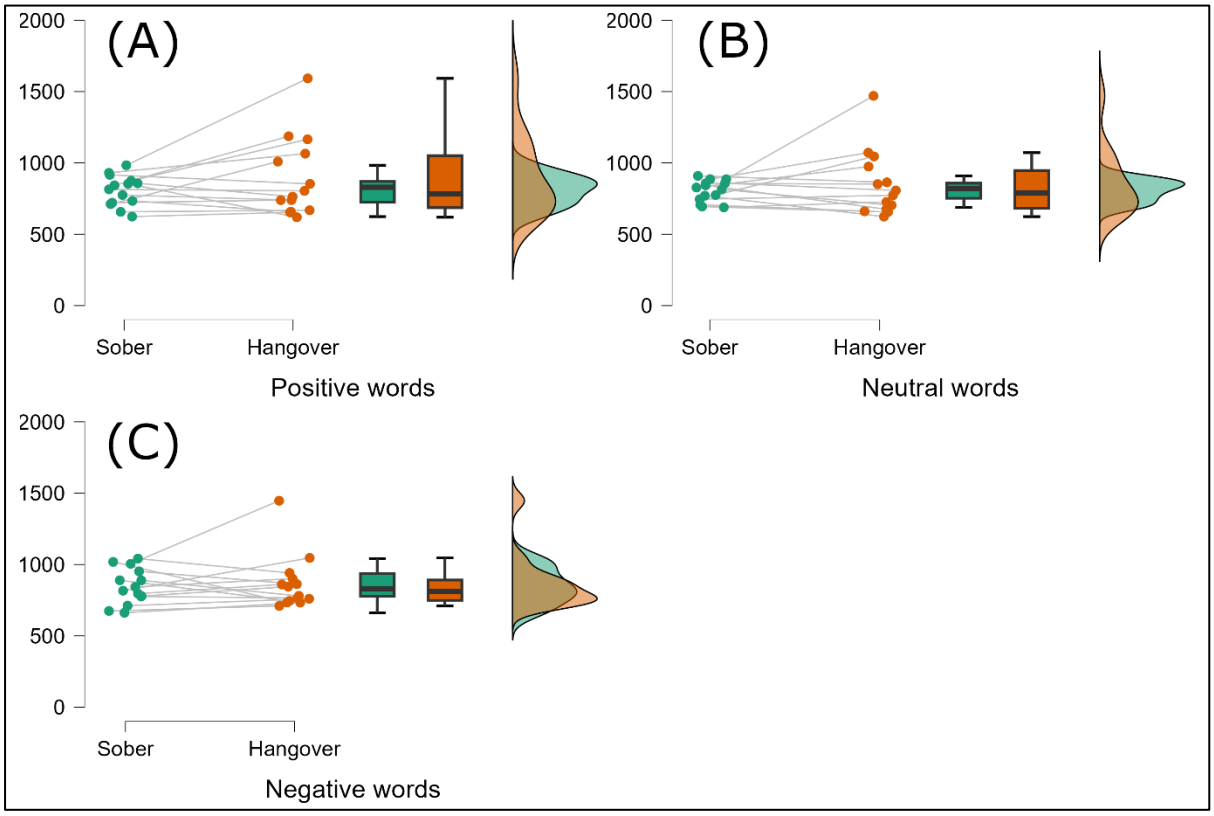
Effects of hangover condition and emotional valence of stimuli was assessed using 2 (sober / hangover) x 3 (positive / neutral / negative) ANOVA. Results are summarised in Table 9 (reactions times) and Table 10 (accuracies). Raincloud plots are presented in Figures 7 (reaction times) and 8 (accuracies). No significant effects of hangover condition, emotional valence, or interactions, were observed on reaction times or accuracy in the emotional Stroop task. Bayesian analyses provided moderate support for the lack of interaction effect or effect of emotional valence, but weak evidence for a lack of effect of hangover on reaction time performance in the emotional Stroop, with the same pattern of results for accuracy.

Table 9. ANOVA results for reaction times in emotional Stroop tasks across hangover and emotional valence conditions.

Variable	F	significance	η^2	η^2p	BF_{incl}
Hangover condition	1.18	.297	0.055	0.083	0.531
Emotional valence	1.25	.303	0.013	0.088	0.203
Hangover condition * emotional valence[a]	1.17	.311	0.016	0.083	0.168

a = Greenhouse-Geisser corrected.

Figure 7. Raincloud plots of emotional Stroop reaction times between sober and hangover conditions.



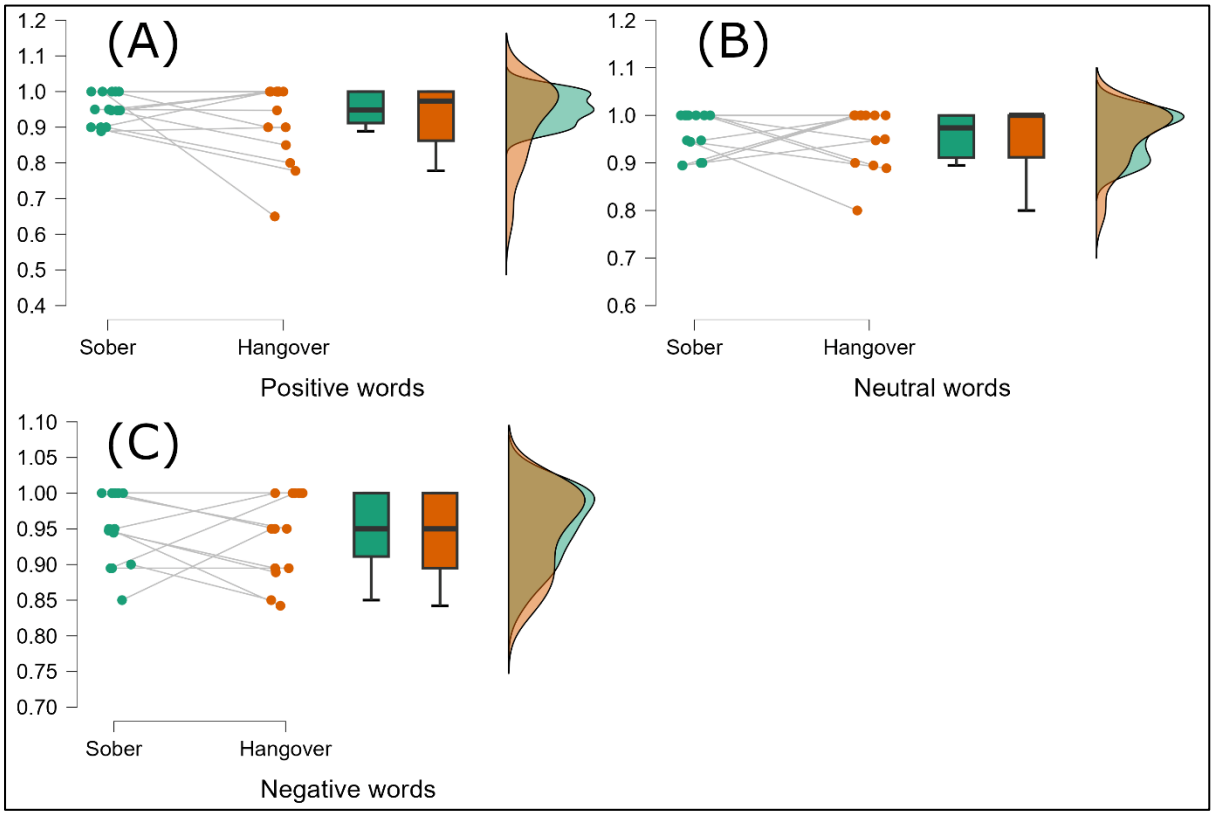
Raincloud plots of emotional Stroop reaction times between sober and hangover conditions, for (A) positive, (B) neutral, and (C) negative words.

Table 10. ANOVA results for accuracies in emotional Stroop tasks across hangover and emotional valence conditions.

Variable	F	significance	η^2	η^2p	BF_{incl}
Hangover condition	0.857	.372	0.024	0.062	0.372
Emotional valence	1.915	.167	0.035	0.128	0.271
Hangover condition * emotional valence	0.815	.454	0.020	0.059	0.132

Planned contrasts comparing performance between sober and hangover states for negative words on reaction times (t(13) = -0.423, *p* = .679) and accuracy (t(13) = -0.489, *p* = .633) showed no significant effects. Bayesian t-tests provided moderate support for a lack of effect of hangover on reaction time (BF_{10} = 0.292) and accuracy (BF_{10} = 0.300) for negative words on the emotional Stroop task.

Figure 8. Raincloud plots of emotional Stroop accuracies between sober and hangover conditions.



Raincloud plots of emotional Stroop accuracies between sober and hangover conditions, for (A) positive, (B) neutral, and (C) negative words.

5.5.4.3. Moeller task.

Data from 2 participants were excluded as outliers due to average accuracies greater than 2 SD's from the mean. The final sample for this analysis therefore consisted of 24 participants. Participant performance is summarised in table 11 (reaction times) and 12 (accuracies).

Data was analysed using a 2 (sober / hangover) x 3 (response change / response remain / identical stimuli) x 2 (distractor change / distractor remain) ANOVA. Results indicated both response condition and distractor condition had a significant effect on reaction times, and response condition had a significant effect on accuracy. No significant main effects were found for hangover condition on accuracy or reaction, and no significant interaction effects were observed. Bayesian analyses supported the results of null-hypothesis significance testing, with the exception of the effect of distractor condition on reaction time, which showed weak evidence of no effect in Bayesian analyses. Very strong

effects of response condition were observed. Bayes factors indicated strong evidence that hangover state had no effect on reaction time, with moderate evidence for no effect of hangover state on accuracy, and moderate to very strong evidence for a lack of interaction effects. ANOVA results are summarised in Table 13 (reaction times) and 14 (accuracies). Raincloud plots are presented in figures 9 (reaction times) and 10 (accuracies). Interaction plots are presented in figure 11.

Table 11. Summary of reaction times for the information processing (Moeller) task.

Hangover condition	Response condition	Distractor condition	Mean (ms)	SD	Min	Max
Sober	Change	Change	1319.376	344.854	731.136	1989.057
		Remain	1321.206	351.282	742.271	2044.535
	Remain	Change	1211.505	312.953	688.229	1733.455
		Remain	1179.538	305.125	638.177	1967.82
	Identical	Change	1035.236	258.947	594.168	1501.741
		Remain	1037.371	301.312	593.277	1865.315
Hangover	Change	Change	1307.315	430.285	702.556	2181.153
		Remain	1253.852	389.168	705.357	1963.769
	Remain	Change	1150.317	353.155	623.91	1996.926
		Remain	1153.169	350.286	688.221	1826.42
	Identical	Change	1034.112	288.263	580.856	1559.869
		Remain	979.538	288.132	579.577	1516.28

Table 12. Summary of accuracies for the information processing (Moeller) task.

Hangover condition	Response condition	Distractor condition	Mean	SD	Min	Max
Sober	Change	Change	0.962	0.05	0.818	1
		Remain	0.95	0.046	0.838	1
	Remain	Change	0.973	0.027	0.921	1
		Remain	0.972	0.029	0.917	1
	Identical	Change	0.981	0.025	0.917	1
		Remain	0.989	0.019	0.944	1
Hangover	Change	Change	0.939	0.075	0.677	1
		Remain	0.95	0.057	0.763	1
	Remain	Change	0.966	0.054	0.781	1
		Remain	0.96	0.063	0.75	1
	Identical	Change	0.982	0.025	0.917	1
		Remain	0.964	0.055	0.813	1

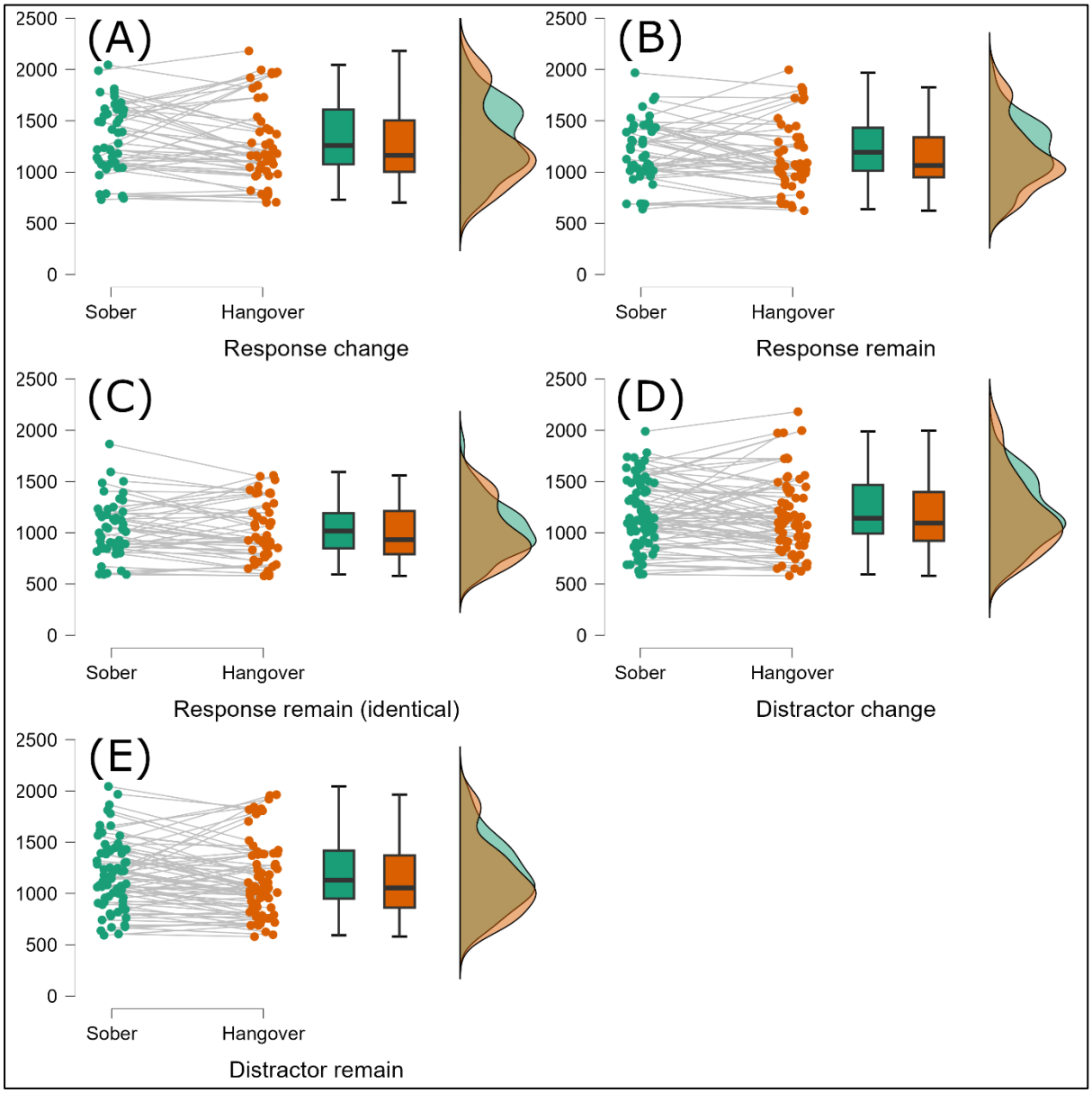
Table 13. ANOVA results for reaction times in information processing (Moeller) task.

Effect	F	significance	η^2	η^2p	BF_{incl}
Hangover condition	0.548	.467	0.010	0.023	0.015
Response condition	101.026	<.001	0.359	0.815	$4.596x10^{14}$
Distractor condition	5.701	.026	0.003	0.199	0.362
Hangover condition * response condition	0.145	.865	$2.502x10^{-4}$	0.006	0.023
Hangover condition * distractor condition	2.220	.150	0.001	0.088	0.019
Response condition * distractor condition	0.131	.877	$2.020x10^{-4}$	0.006	0.194
Hangover condition * response condition * distractor condition	2.517	.092	0.003	0.099	$4.251x10^{-6}$

Table 14. ANOVA results for accuracies in information processing (Moeller) task.

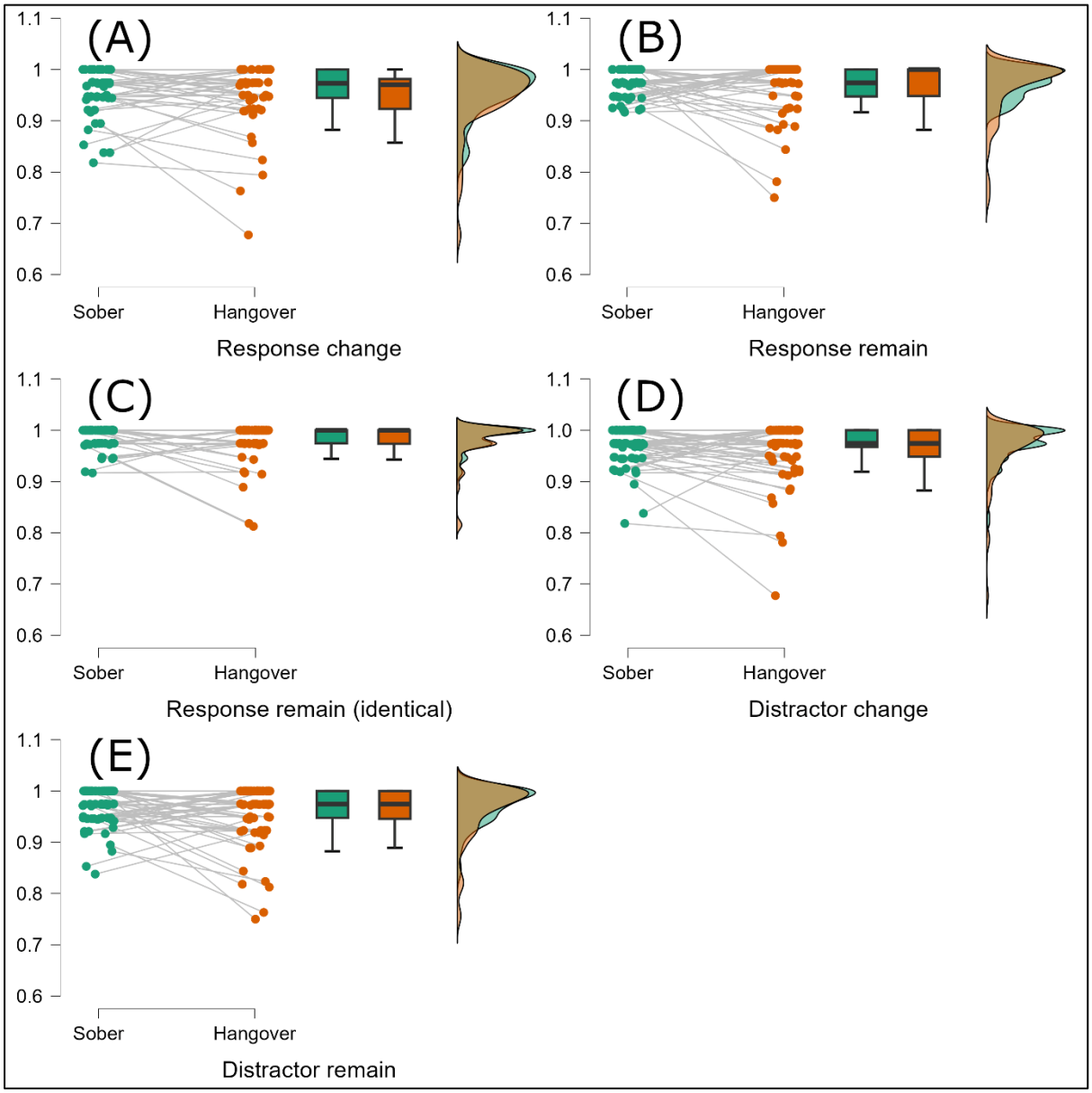
Effect	F	significance	η^2	η^2p	BF_{incl}
Hangover condition	2.536	.125	0.021	0.099	0.321
Response condition	11.806	<.001	0.106	0.339	128.532
Distractor condition	0.723	.404	0.001	0.030	0.093
Hangover condition * response condition	0.005	.995	$4.246x10^{-5}$	$2.353x10^{-4}$	0.130
Hangover condition * distractor condition	0.098	.757	$1.573x10^{-4}$	0.004	0.046
Response condition * distractor condition	0.100	.905	$3.899x10^{-4}$	0.004	0.049
Hangover condition * response condition * distractor condition	3.154	.052	0.016	0.121	0.028

Figure 9. Raincloud plots of reaction times on the information processing (Moeller) task across hangover conditions.



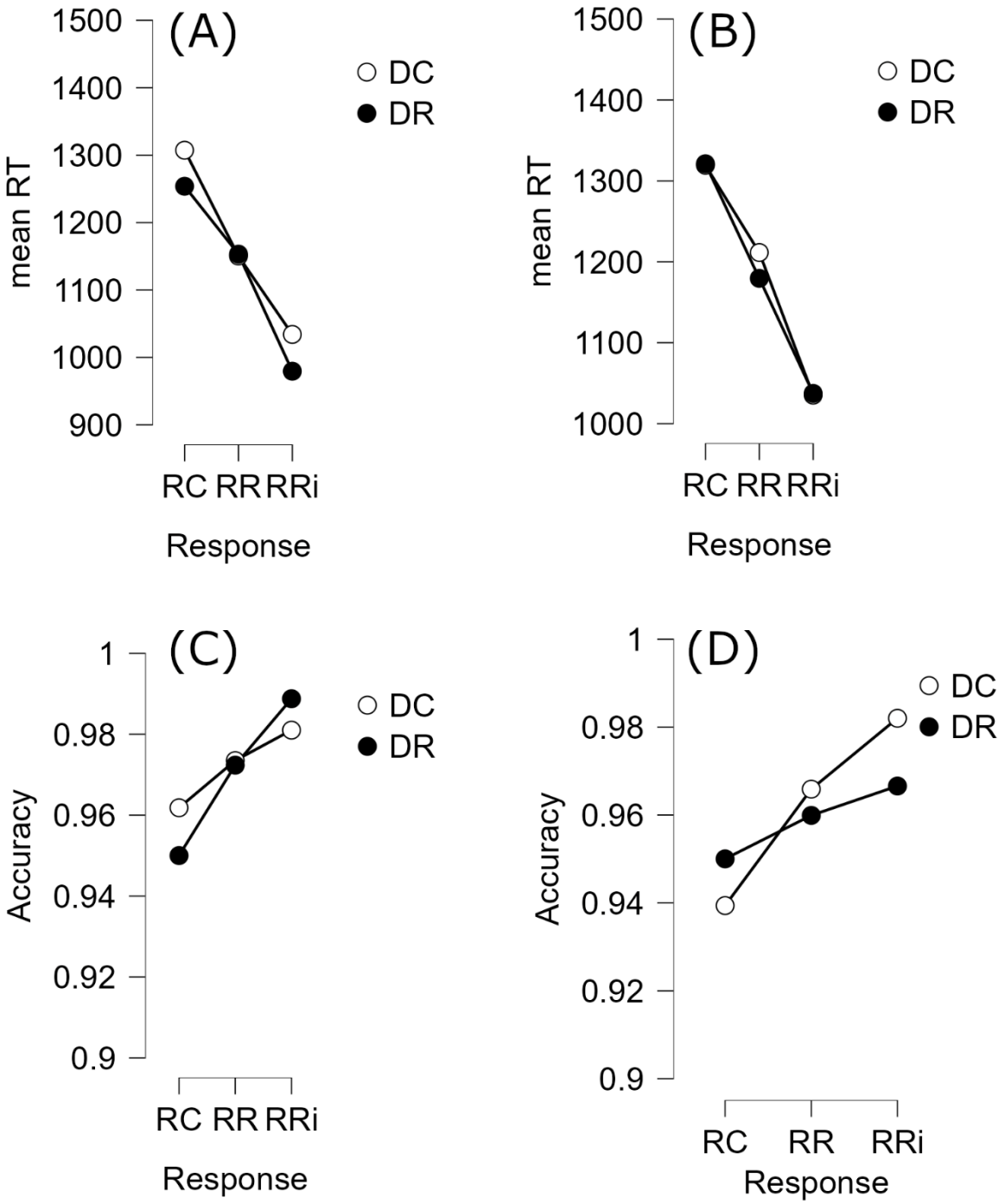
Raincloud plots of reaction times on the information processing (Moeller) task across hangover conditions for trials where (A) the response changed, (B) the response remained when stimuli changed, (C) the response remained when stimuli were identical, (D) when the distractor changed, and (D) when the distractor remained.

Figure 10. Raincloud plots of accuracies on the information processing (Moeller) task across hangover conditions.



Raincloud plots of accuracies on the information processing (Moeller) task across hangover conditions for trials where (A) the response changed, (B) the response remained when stimuli changed, (C) the response remained when stimuli were identical, (D) when the distractor changed, and (D) when the distractor remained.

Figure 11. Interaction plots for reaction times and accuracies across response and distractor conditions in sober and hungover states.



Interaction plots across response and distractor conditions of the Moeller task for; (A) reaction times in the sober state; (B) reaction times in the hungover state; (C) accuracies in the sober state; and (D) accuracies in the hungover state.

Planned contrasts were conducted examining the difference between trials in which distractor information changed or distractor information remained between the prime and the probe. A significant effect was found for the effect of changing distractor information on reaction time in the hangover state ($t(23) = 2.966$, $p = .007$) but not in the sober state ($t(23) = 0.692$, $p = .496$), such that reaction times were slower when distractor information was changed in the hangover state (distractor effect = 35ms) but not the sober state (distractor effect = 9ms). Bayesian analyses provided moderate support for an effect on reaction time in hangover ($BF_{10} = 6.600$), and moderate evidence of no effect on reaction time in the sober state ($BF_{10} = 0.267$). Further examination of the contrast between DC and DR trials at different response condition levels indicated that the distractor effect in hangover was driven by increases in reaction time for RC-DC trials in hangover compared to RC-DR trials ($t(23) = 2.119$, $p = .045$, $BF_{10} = 1.410$), with differences between RRi-DC and RRi-DR trials in hangover approaching significance ($t(23) = 2.043$, $p = .053$, $BF_{10} = 1.249$). Bayesian analyses indicated weak evidence for these effects. No significant difference between RR-DC and RR-DR trials in hangover was observed ($t(23) = -0.169$, $p = .867$, $BF_{10} = 0.217$), with Bayesian analysis indicating moderate evidence of no effect. No significant effects were found on accuracy for either hangover ($t(23) = 0.708$, $p = .486$) or sober states ($t(23) = 0.511$, $p = .614$). Bayesian analyses provided moderate support for no effect on accuracy in both sober ($BF_{10} = 0.242$) and hangover states ($BF_{10} = 0.269$).

5.5.4.4. Correlations with changes in cognitive performance.

In order to investigate potential relationships between hangover symptomology and changes in cognition, exploratory correlation analyses were conducted on delta scores between sober and hungover testing. Delta scores were calculated for each variable as the score from hangover testing minus the score from sober testing and outliers were identified in change score data for questionnaire measures based on cutoffs 1.5 interquartile ranges less than the first quartile or greater than the third quartile. Summaries of delta scores are presented in table 15. Correlations between delta scores on hangover severity measures were carried out using Spearman's rho for frequentist analysis, and Kendall's tau for Bayesian analysis, as some variables were not normally distributed. Results are presented in table 16 (frequentist) and 17 (Bayesian).

Table 15. Summary of delta scores for hangover severity and performance measures.

Measure			N	Δ Mean	SD	Min	Max
Hangover severity	1-item		26	3.615	3.047	-1.000	9.000
	Headache & thirst		26	2.551	2.496	-2.333	6.667
	Gastric & cardio		25	1.448	1.374	-0.600	4.800
	Total		26	42.231	34.597	-3.000	121.000
BSRI			22	22.091	109.336	-246.000	234.000
ERQ - Cognitive reappraisal			22	0.023	0.400	-0.750	0.750
ERQ - Expressive Suppression			21	0.143	0.402	-0.667	1.000
Recall	Positive		26	-0.192	1.470	-3.000	3.000
	Neutral		26	-0.385	2.021	-7.000	3.000
	Negative		26	-0.385	1.444	-5.000	2.000
Stroop	Accuracy	Positive	14	-0.036	0.113	-0.350	0.100
		Neutral	14	-0.003	0.081	-0.147	0.105
		Negative	14	-0.008	0.061	-0.108	0.105
	RT	Positive	14	87.239	223.559	-234.500	608.796
		Neutral	14	45.786	198.856	-167.690	584.458
		Negative	14	19.722	174.408	-284.637	442.272
Moeller	Accuracy	RC-DC	24	-0.022	0.061	-0.217	0.137
		RC-DR	24	<0.001	0.053	-0.132	0.092
		RR-DC	24	-0.008	0.052	-0.142	0.079
		RR-DR	24	-0.012	0.072	-0.250	0.071
		RRi-DC	24	0.001	0.030	-0.057	0.081
		RRi-DR	24	-0.022	0.050	-0.158	0.030
	RT	RC-DC	24	-12.060	324.869	-589.625	834.172
		RC-DR	24	-67.354	307.704	-499.825	743.944
		RR-DC	24	-61.187	280.003	-497.658	507.562
		RR-DR	24	-26.368	274.025	-434.329	622.664
		RRi-DC	24	-1.124	230.904	-403.565	549.102
		RRi-DR	24	-57.833	195.304	-349.035	328.209

RT - reaction time. RC - response change, RR - response remain, RRi - response remain (identical), DC - distractor change, DR - distractor remain.

Table 16. Spearman's rho correlations (and significance) between delta scores.

	Δ Measure	Hangover severity: 1-item	Hangover severity: Headache & thirst	Hangover severity: Gastric & cardio	Hangover severity: Symptom total	BSRI	ERQ - Cognitive Reappraisal	ERQ - Expressive Suppression
Hangover severity	1-item	—						
	Headache & thirst	**.609 (<.001)**	—					
	Gastric & cardio	**.599 (.002)**	.247 (.234)	—				
	Symptom total	**0.789 (<.001)**	**0.785 (<.001)**	**0.603 (.001)**	—			
	BSRI	.156 (.489)	.130 (.564)	.071 (.759)	.383 (.078)	—		
	ERQ - Cognitive Reappraisal	.062 (.788)	-.190 (.408)	.166 (.472)	-.103 (.658)	-.009 (.972)	—	
	ERQ - Expressive Suppression	-.094 (.678)	-.078 (.730)	-.264 (.235)	-.097 (.667)	-.129 (.611)	.019 (.939)	—
Recall	Positive	-.153 (.457)	-.305 (.130)	.008 (.970)	-.254 (.210)	-.147 (.513)	.098 (.671)	-.042 (.854)
	Neutral	-.112 (.587)	.018 (.929)	.083 (.692)	.128 (.535)	.248 (.265)	-.221 (.336)	**.451 (.035)**
	Negative	-.117 (.569)	-.140 (.495)	.113 (.589)	-.086 (.678)	-.105 (.643)	-.111 (.631)	.282 (.203)
Stroop	Accuracy: Positive	.375 (.186)	.163 (.577)	.056 (.857)	.280 (.332)	.446 (.146)	**.814 (.002)**	.077 (.812)
	Accuracy: Neutral	-.118 (.688)	-.232 (.424)	.045 (.884)	.062 (.832)	.418 (.176)	.385 (.243)	-.192 (.551)
	Accuracy: Negative	**.545 (.044)**	**.637 (.014)**	.363 (.222)	.520 (.057)	-.282 (.374)	.298 (.374)	-.273 (.391)
	RT: Positive	.404 (.152)	.309 (.283)	.461 (.113)	.359 (.208)	-.039 (.905)	-.032 (.924)	-.248 (.437)
	RT: Neutral	.420 (.135)	.322 (.262)	.343 (.252)	.275 (.341)	.004 (.991)	.214 (.528)	-.507 (.092)
	RT: Negative	.071 (.809)	-.020 (.946)	-.199 (.515)	.277 (.337)	.329 (.296)	-.395 (.230)	.014 (.965)

Table 16 contd. Spearman's rho correlations (and significance) between delta scores.

	Δ Measure		Hangover severity						
			1-item	Headache & thirst	Gastric & cardio	Symptom total	BSRI	ERQ - Cognitive Reappraisal	ERQ - Expressive Suppression
Moeller	Accuracy	RC-DC	-.029 (.894)	.273 (.196)	**-.420 (.046)**	-.021 (.923)	-.291 (.200)	-.181 (.459)	-.055 (.817)
		RC-DR	-.093 (.667)	-.003 (.990)	-.201 (.358)	-.276 (.192)	-.303 (.181)	-.278 (.249)	.210 (.373)
		RR-DC	.248 (.242)	.195 (.362)	.088 (.690)	.034 (.874)	.008 (.973)	.218 (.369)	.134 (.572)
		RR-DR	-.035 (.872)	.118 (.584)	-.176 (.421)	.225 (.290)	.402 (.071)	-.062 (.802)	-.010 (.966)
		RRi-DC	.085 (.693)	-.060 (.780)	.095 (.666)	-.110 (.608)	-.421 (.057)	.133 (.586)	-.148 (.535)
		RRi-DR	.161 (.452)	.176 (.412)	.031 (.888)	.046 (.832)	-.320 (.157)	.393 (.096)	.336 (.148)
	RT	RC-DC	.294 (.163)	.229 (.282)	.249 (.253)	.344 (.100)	.123 (.594)	.091 (.712)	**-.723 (<.001)**
		RC-DR	.113 (.601)	.192 (.369)	.200 (.361)	.335 (.110)	.277 (.223)	.134 (.584)	**-.486 (.030)**
		RR-DC	.172 (.423)	.155 (.469)	.262 (.227)	.337 (.107)	.319 (.159)	.164 (.502)	**-.592 (.006)**
		RR-DR	.184 (.390)	.289 (.171)	.227 (.298)	.377 (.069)	.194 (.399)	.225 (.353)	**-.617 (.004)**
		RRi-DC	.257 (.225)	.281 (.184)	.334 (.119)	**.440 (.031)**	.386 (.084)	.247 (.308)	**-.568 (.009)**
		RRi-DR	.285 (.178)	.378 (.068)	.185 (.398)	**.551 (.005)**	**.432 (.050)**	-.223 (.359)	-.305 (.191)

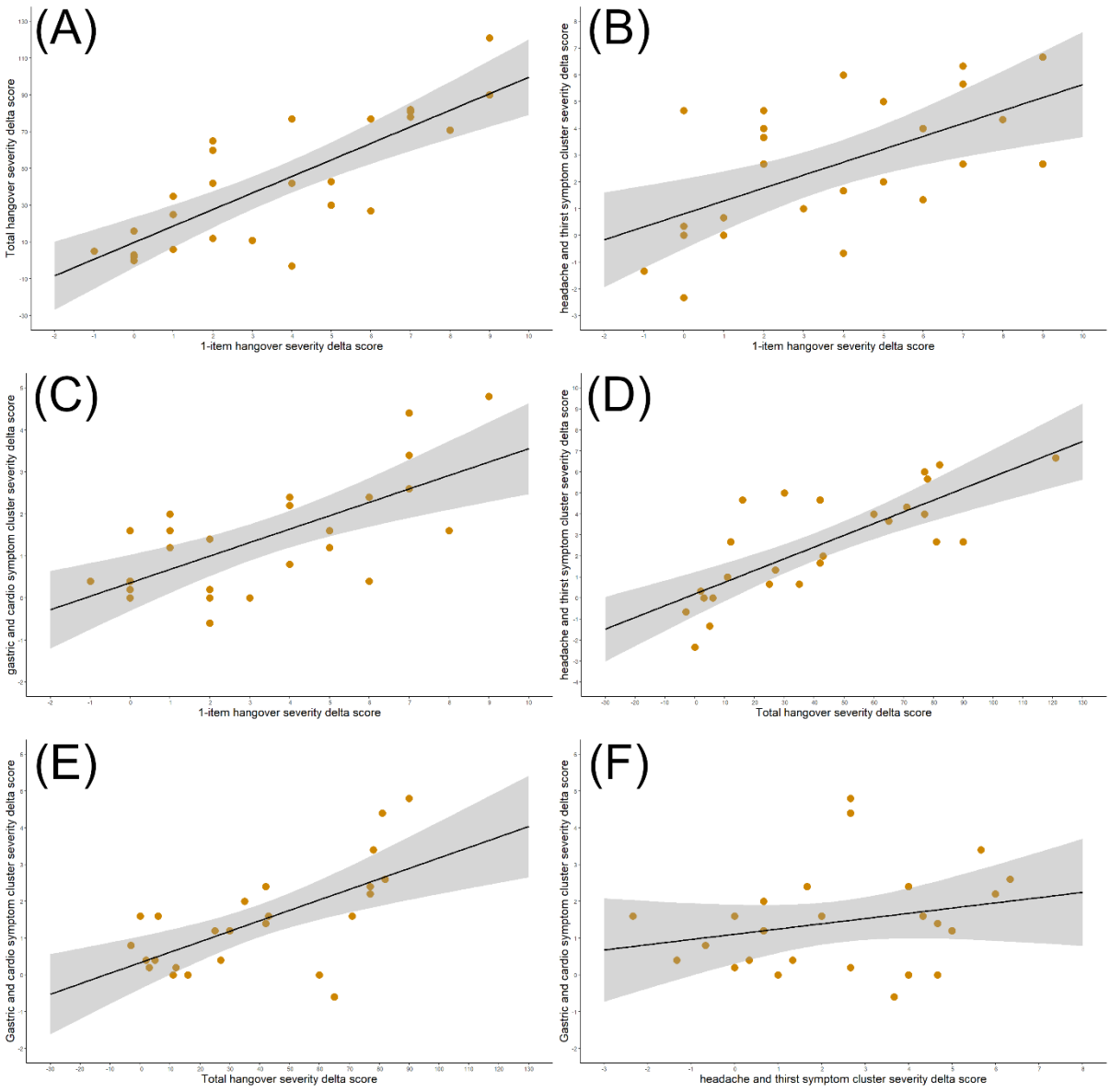
Significant relationships are indicated in bold, with p-values presented in brackets. RT - reaction time. RC - response change, RR - response remain, RRi - response remain (identical), DC - distractor change, DR - distractor remain.

Table 17. Kendall's tau posterior odds of correlations between delta scores.

Δ Measure			Hangover severity						
			1-item	Headache & thirst	Gastric & cardio	Total	BSRI	ERQ - Cognitive Reappraisal	ERQ - Expressive Suppression
Hangover severity		1-item	—						
		Headache & thirst	**73.522**	—					
		Gastric & cardio	**32.859**	0.465	—				
		Total	**4230.515**	**3344.777**	**38.719**	—			
BSRI			***0.326***	0.396	***0.285***	1.306	—		
ERQ - Cognitive Reappraisal			***0.294***	0.452	0.349	***0.307***	***0.308***	—	
ERQ - Expressive Suppression			***0.314***	***0.292***	0.522	***0.306***	0.428	***0.303***	—
Recall		Positive	0.453	1.098	***0.257***	0.597	***0.320***	***0.304***	***0.281***
		Neutral	***0.288***	***0.253***	***0.285***	***0.285***	0.488	0.553	**4.002**
		Negative	***0.307***	***0.330***	0.343	***0.284***	***0.289***	***0.314***	0.621
Stroop	Accuracy	Positive	0.838	0.381	0.366	0.575	1.390	**9.311**	0.370
		Neutral	0.342	0.478	0.360	0.372	0.952	0.827	0.473
		Negative	2.510	**5.433**	0.551	1.972	0.582	0.630	0.539
	RT	Positive	1.291	0.486	1.170	0.753	0.382	0.396	0.483
		Neutral	1.086	0.535	0.715	0.530	0.382	0.421	2.043
		Negative	0.339	0.337	0.418	0.530	0.790	0.836	0.363
Moeller	Accuracy	RC-DC	***0.263***	0.720	1.360	***0.262***	0.642	0.476	***0.297***
		RC-DR	***0.288***	***0.264***	0.425	0.610	0.819	0.619	0.485
		RR-DC	0.561	0.368	***0.287***	***0.262***	***0.284***	0.556	0.365
		RR-DR	***0.263***	***0.325***	0.358	0.555	1.447	***0.300***	***0.290***
		RRi-DC	***0.302***	***0.271***	***0.295***	***0.303***	1.638	0.338	0.369
		RRi-DR	0.388	0.355	***0.268***	***0.276***	0.746	2.179	0.901
	RT	RC-DC	0.663	0.457	0.560	1.371	***0.312***	***0.316***	**51.575**
		RC-DR	***0.290***	0.337	0.526	1.063	0.560	0.352	**3.285**
		RR-DC	0.363	0.337	0.598	1.256	1.338	0.389	**18.420**
		RR-DR	0.396	0.651	0.468	1.499	0.413	0.468	**22.432**
		RRi-DC	0.546	0.539	0.800	2.193	1.094	0.438	**10.475**
		RRi-DR	0.765	1.301	0.352	**12.727**	1.338	0.543	0.581

BF > 3 presented in bold. BF < 0.33 presented in bold italics. RT - reaction time. RC - response change, RR - response remain, RRi - response remain (identical), DC - distractor change, DR - distractor remain.

Figure 12. Scatter plots for relationships between delta scores for hangover severity measures.



Scatter plots for relationships between delta scores for hangover severity measures. (A) 1-item hangover severity and total hangover severity. (B) 1-item hangover severity and headache and thirst severity. (C) 1-item hangover severity and gastric and cardiovascular severity. (D) total hangover severity and headache and thirst severity. (E) total hangover severity and gastric and cardiovascular severity. (F) headache and thirst severity and gastric and cardiovascular severity.

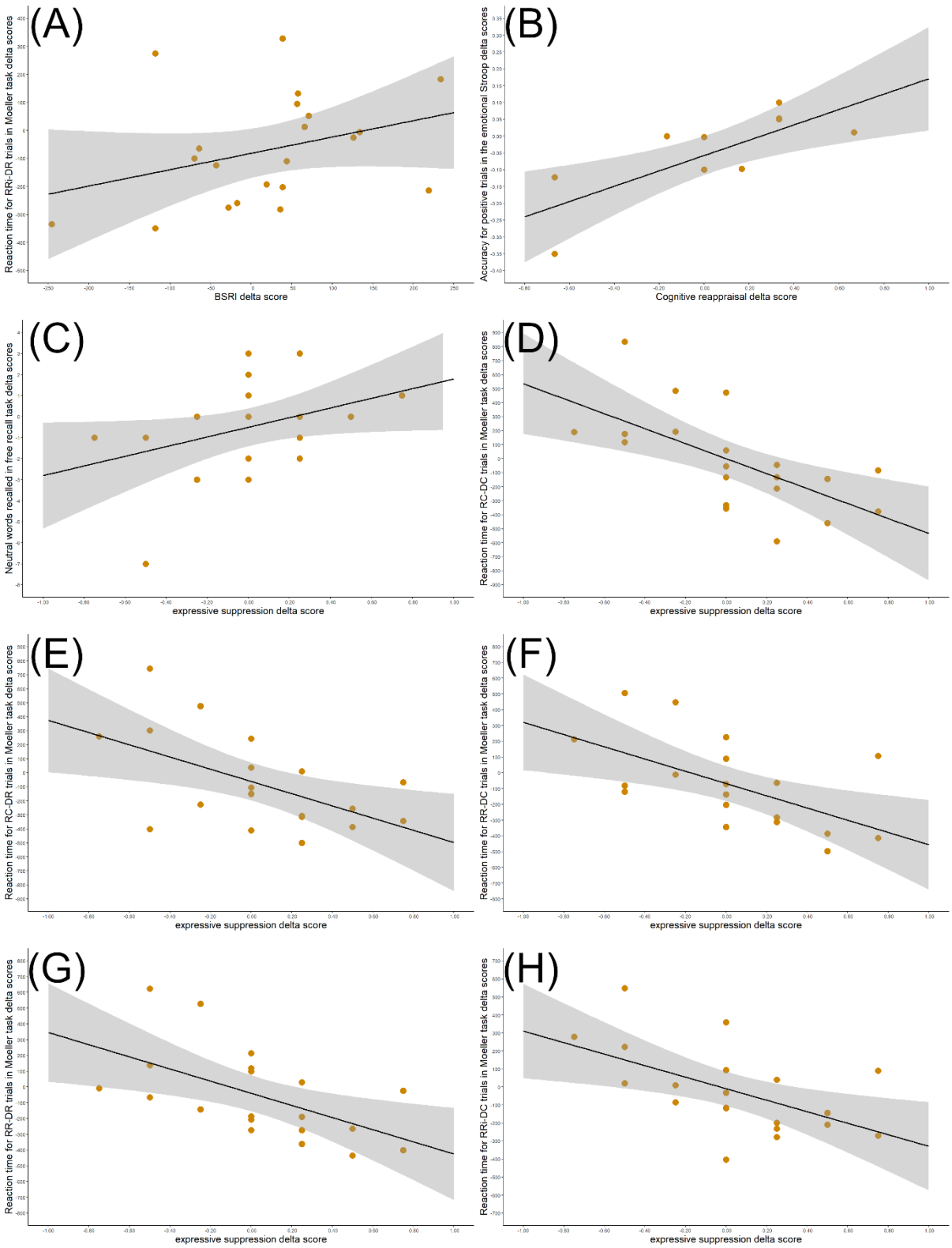
Significant positive correlations were observed between 1-item hangover severity difference scores, total hangover severity difference scores, and headache and thirst symptom cluster severity difference scores, with Bayes factors for these relationships indicating strong evidence in support of the relationships. No significant relationship was

found between headache and thirst symptom cluster severity difference scores and gastric and cardiovascular symptom cluster severity scores, with Bayesian results indicating weak evidence of no relationship. Scatter plots of relationships between hangover severity delta scores are presented in figure 11.

No significant relationships were observed between hangover severity measurement delta scores and delta scores for rumination, cognitive reappraisal, or expressive suppression. Bayesian analyses indicated weak to moderate evidence for a lack of relationships between these variables, with the exception of the relationship between the delta scores for total hangover severity and rumination, where weak evidence of a relationship was observed.

For relationships between individual difference measure (rumination, cognitive reappraisal, and expressive suppression) delta scores and changes in task performance between hangover and sober testing, results showed a significant positive relationship between rumination delta scores and changes in reaction time for trials of the Moeller task in which both task-relevant and task-irrelevant information remained identical. Bayesian results indicated strong evidence for this relationship. A significant positive relationship was also observed for delta scores on the cognitive reappraisal measure with accuracy for positive trials in the emotional Stroop, with moderate evidence of this relationship indicated by Bayesian analysis. For expressive suppression delta scores, a significant positive relationship was found with memory for neutral words in the free recall task, with moderate evidence of a relationship in Bayesian analysis. Significant negative relationships were observed between delta scores for expressive suppression and reaction times on the Moeller task, in all conditions that involved a change of either the task-relevant, and/or task-irrelevant information, but not for the trials in which both task-relevant and task-irrelevant information remained identical between the prime and the probe. Bayesian analyses indicated moderate to strong evidence of the relationships between expressive suppression and reaction times on the Moeller task (range 3.285 – 51.575). Scatter plots of significant relationships between individual difference measures and task performance are presented in figure 12.

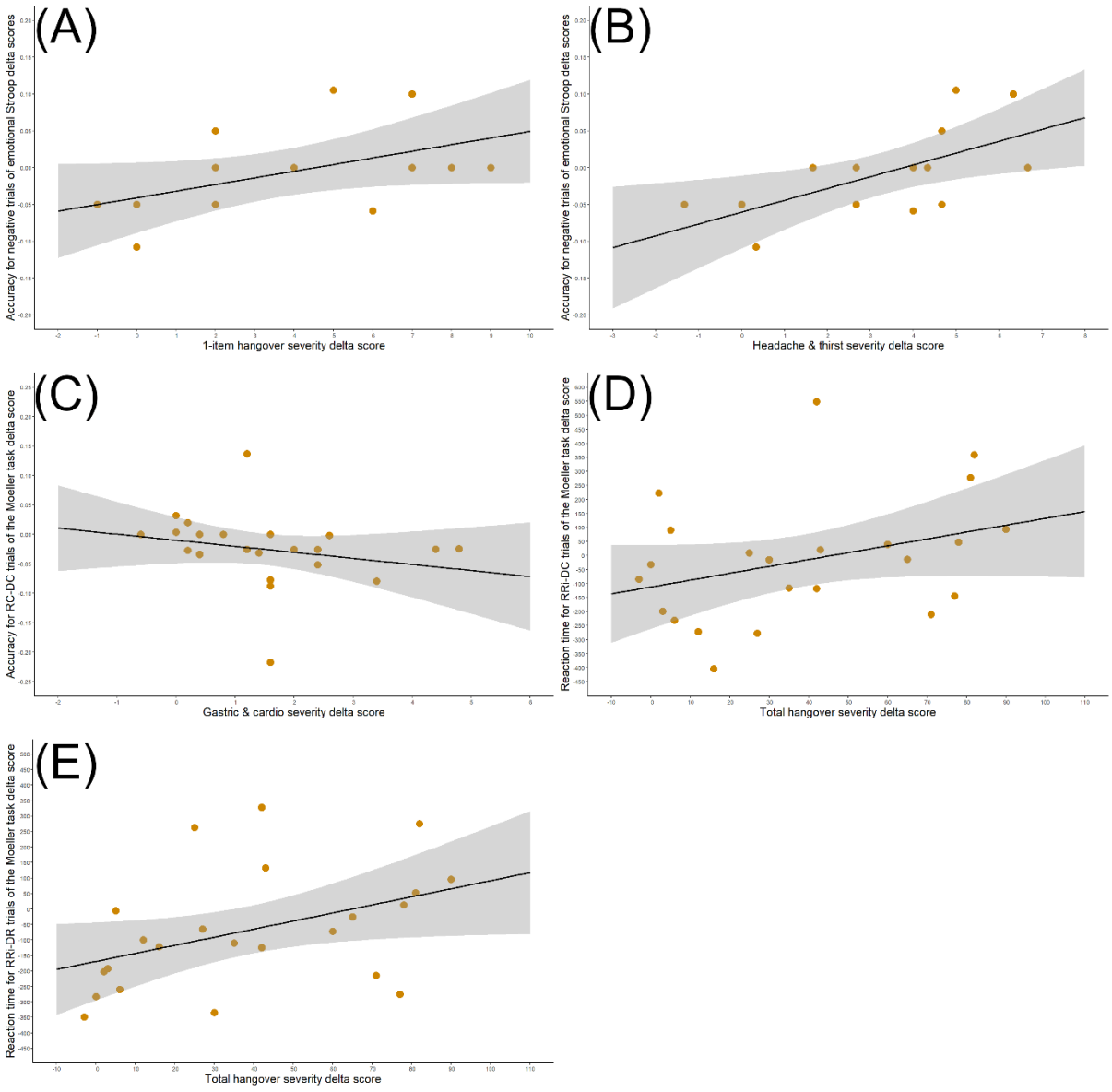
Figure 13. Scatter plots for significant relationships between delta scores for individual differences and cognitive performance measures.



Scatter plots for significant relationships between delta scores for individual differences and cognitive performance measures. (A) BSRI and Reaction time on RRi-DR trials of the Moeller task. (B) Cognitive reappraisal and accuracy for positive trials of the emotional Stroop. (C) Expressive suppression and

negative words recalled in free recall task. (D) Expressive suppression and reaction time for RC-DC trials in the Moeller task. (E) Expressive suppression and reaction time for RC-DR trials in the Moeller task. (F) Expressive suppression and reaction time for RR-DC trials in the Moeller task. (G) Expressive suppression and reaction time for RR-DR trials in the Moeller task. (H) Expressive suppression and reaction time for RRi-DC trials in the Moeller task.

Figure 14. Scatter plots of significant relationships between hangover severity and cognitive performance delta scores.



Scatter plots of significant relationships between hangover severity and cognitive performance delta scores. (A) 1-item hangover severity and accuracy for negative trials of the emotional Stroop delta scores. (B) Headache and thirst severity and accuracy for negative trials of the emotional Stroop task delta scores. (C) Gastric and cardiovascular severity and accuracy for RC-DC trials on the Moeller task delta scores. (D) Total hangover severity and reaction time for RRi-DC trials on the Moeller task delta scores. (E) Total hangover severity and reaction time for RRi-DR trials on the Moeller task delta scores.

For relationships between hangover severity delta scores and changes in cognitive performance, a significant positive relationship was observed between delta scores for 1-item hangover severity and accuracy on negative trials on the emotional Stroop, however, Bayesian analysis indicated evidence of this relationship was weak. Delta scores for accuracy on the negative trials of the emotional Stroop was also significantly positively related to headache and thirst symptom cluster severity delta scores, with Bayesian analysis indicated moderate evidence of this relationship. A significant negative relationship was observed between delta scores for severity of the gastric and cardiovascular symptom cluster with accuracy for trials in the Moeller task where both task-relevant and task-irrelevant information was changed between the prime and the probe, though Bayesian analysis indicated evidence for this relationship was weak. A significant positive relationship was observed between the delta score for total hangover severity with reaction time changes for trials of the Moeller task in which task-relevant information remained identical and task-irrelevant distractor information was changed, however Bayesian analysis indicated evidence of this relationship was week. Finally, a significant positive relationship was observed between the delta score for total hangover severity with reaction time changes for trials of the Moeller task in which both task-relevant and task-irrelevant information remained identical between the prime and the probe, with Bayesian analysis indicating strong evidence for this relationship. Scatter plots of significant relationships between delta scores for hangover and performance measures are presented in figure 13.

5.6. Discussion.

The aims of this exploratory investigation were; to assess the effects of hangover on affective cognition and information processing; to assess the relationship between hangover induced cognitive performance changes (delta scores for affective cognition and information processing) with rumination; to assess the relationship between hangover induced cognitive performance changes and alterations to emotion regulation (cognitive reappraisal and expressive suppression); and to assess the relationship between affective cognition and information processing changes in hangover with the severity of symptom clusters in hangover. Assessment of emotional long-term memory (free recall) performance, and emotional Stroop performance showed no significant effects of hangover or interactions between hangover and emotional valence. Strong evidence of increases in all hangover

symptom severity ratings during hangover in comparison to sober testing indicate that hangover was induced by the alcohol intervention, and therefore the lack of significant findings on cognitive tasks was not due to the intervention failing to induce hangover in participants. An effect of hangover was found on reaction times in the Moeller task, with increased effects of changing distractor information observed in hangover compared to sober testing.

No effects of hangover state were found on measures of cognitive reappraisal, or expressive suppression emotion regulation strategies. This contrasts with past research assessing self-reported emotion regulation changes in hangover (Gunn et al., 2021a), though Gunn et al's. (2021a) research found no effects of hangover on emotion regulation as assessed on an image rating task in which participants were instructed to upregulate their emotional response, downregulate their emotional response, or not to deliberately regulate their emotions. Evidence from Bayesian analysis of the current investigation indicated moderate evidence of no effect of hangover on emotion regulation measures. Likewise, no correlations were observed between changes in cognitive reappraisal or expressive suppression scores between sober and hangover states, and changes in reported symptom severity between sober and hangover states, with moderate evidence of no relationship between emotion regulation measures and hangover severity measures in Bayesian analyses.

State rumination also showed no difference between sober and hangover states, however, changes in rumination scores between hangover and sober states did correlate weakly with total hangover severity, in line with previous results indicating a relationship between rumination and hangover severity (Saeed et al., 2021). Bayesian analyses indicated evidence of this relationship was very weak, however, this may indicate that rumination is a covariant of other predictors of hangover severity.

5.6.1. Free recall performance.

No effect of hangover status on long-term memory for emotional stimuli was observed in the current investigation for either omnibus tests, or the planned contrast of negative words recalled between hangover and sober states. A meta-analysis, however, has indicated effects of hangover on long term memory do exist (Gunn et al., 2018). In the current investigation, recall was notably low in the current sample, with anecdotal feedback

from participants that this task was considered difficult. On average, participants recalled less than 1 word per emotional valence category in both sober (0.91 words) and hangover (0.59 words) testing. Floor effects may therefore have contributed to the lack of significant findings. In comparison to previous research that has indicated reduced free recall for words following a delay (Verster et al., 2003), the current investigation did not include any immediate recall following presentation of the words that would allow for rehearsal and consolidation of presented words. Despite the longer delay between recall and presentation in the investigation by Verster et al. (2003), who had a 60 minute delay, versus approximately 20-25 minutes in the current investigation, the immediate recall task may have allowed participants to more successfully commit stimuli to memory. Verster et al's. (2003) study also did not include any other word-based tasks during the delay between presentation and recall that may have produced retroactive interference (Dewar et al., 2007). In the current investigation, the emotional Stroop task, completed following the presentation of the free recall stimuli, also included emotional words as stimuli. Though the word lists used in each task were distinguished in their nature, with adjectives used in the free recall task, and nouns used in the emotional Stroop task, it is possible that the processing of emotional Stroop stimuli interfered with memory for the free recall word lists (Dewar et al., 2007), especially given the lack of any time or tasks that would promote consolidation of free recall stimuli, such as completing an immediate recall phase (Wixted, 2004).

Bayesian analysis provides some support for the idea that floor effects are responsible for a lack of findings in this task, as they did not indicate evidence of no effect of hangover on free recall in general, though there was strong evidence for a lack of interaction between hangover state and emotional valence. This lack of interaction suggests that mood changes observed in hangover (Alford, Martinkova, et al., 2020b; Benson et al., 2020; Devenney et al., 2019a; Terpstra et al., 2022) are not associated with mood congruence effects in affective cognition, at least with regards to memory. Analysis of planned contrasts assessing differences in recall for negative words between hangover and sober states also indicated no differences in memory performance, though Bayesian analyses indicated evidence was weak, and this therefore may also have been a product of floor effects

produced as a result of memory interference from the emotional Stroop task (Dewar et al., 2007; Wixted, 2004).

5.6.2. Emotional Stroop performance.

The current investigation did not find any significant effects of hangover on emotional Stroop performance, nor was any effect of the emotional valence of words on performance observed, and no interaction was present between hangover state and valence of words presented in the task. Likewise, planned contrasts did not indicate any biasing of emotional information processing between sober and hangover conditions, as assessed by examining performance for negative trials across hangover and sober states. Mood congruent attentional biases in the emotional Stroop have been demonstrated following mood inductions (Gilboa-Schechtman et al., 2000), and in patients experiencing depression (Epp et al., 2012). Given hangover is associated with increases in negative mood (Alford, Martinkova, et al., 2020a; Devenney et al., 2019a; van Schrojenstein Lantman et al., 2017), it is perhaps therefore surprising that no emotional bias in information processing was observed. Previous results have indicated hangover effects on the Stroop task (Devenney et al., 2019b; McKinney et al., 2012), however, these investigations did not use the emotional variant of the task, and therefore measured different aspects of cognition. Traditional Stroop tasks measure cognitive interference as a product of the congruence (e.g. the word red, presented in the colour red) or incongruence of task-relevant stimuli (e.g. the word red, in the colour green; Scarpina & Tagini, 2017). Comparatively, the emotional Stroop task examines the automaticity of emotional information processing for task irrelevant features of stimuli (Phaf & Kan, 2007). The task relevance of emotional stimuli does appear to modulate its distracting effects (Lichtenstein-Vidne et al., 2012), therefore future research examining interference in emotional processing would benefit from deploying a version of the affective Stroop task (i.e. the emotional face-word Stroop task) such as that employed by Egner et al. (2008), in which word-face pairings are presented with congruence (or incongruence) between an emotion described by the word, and presentation of emotion in a face image.

Results of the current investigation indicate that whilst interference effects from semantic congruence are elevated in hangover, the automaticity of emotional information processing is not. Data quality was however an issue for this task, with 12 of the 26

participants excluded from analyses, which almost certainly left analyses underpowered and may explain the lack of main effects for the valence of stimuli in both sober and hangover testing. It would be expected that emotionally valenced words (positive and negative) would produce slower reaction times than neutral words (Kahan & Hely, 2008). Bayesian results did provide only weak evidence of no effect of hangover on performance measures for the emotional Stroop. Future research will be needed to elucidate the presence of any emotional biasing of information processing in hangover, and any onward associations with behaviour that may contribute to longer term health outcomes. As well as adoption of emotional information processing tasks that include task-relevant emotional stimuli, future research should also consider the fast and slow components of responses to emotional stimuli presentations (McKenna & Sharma, 2004).

5.6.3. Moeller task performance.

The Moeller task allows for the separation of effects from changes of distractor information, changes in response information, and the initiation of psychomotor responses. Trials consist of a prime and a probe, with changes between the prime and probe allowing for the separation of effects using a 2x3 structure in which; either the task-irrelevant distractor information changes (DC trials), or the task-irrelevant distractor information remains the same (DR trials); and either the task-relevant stimuli changes and requires a different response (RC trials), the task-relevant stimuli changes and requires the same response (RR trials), or the task relevant-stimuli is identical and thus requires the same response (RRi trials). Significant differences were observed in the current investigation of changing task-relevant information on both accuracy and reaction time, with significant differences observed for the effects of changes to task-irrelevant distractor information on reaction times. This indicates that performance was affected by the parameters of the task, however, no main or interaction effects were found in omnibus tests examining the presence of the hangover state. Bayesian analyses supported these findings, with moderate to strong evidence of no main or interaction effects of hangover state.

Planned contrasts, in comparison, did indicate a difference between hangover and sober testing for the effects of changing task-irrelevant distractor information, with changes in distractor information significantly increasing reaction time in the hangover condition, but not the sober condition (i.e. the distractor effect was increased during hangover). This

finding opposes previous results which indicated that the effect of changing distractor information on accuracy is reduced during hangover (Opitz et al., 2020). Notably, the results from Opitz et al., (2020) are not in line with hypotheses derived from the theory of event coding which the Moeller task is based on, though it is proposed that enhanced target processing or reduced distractor processing could explain the results observed by Opitz et al. (2020). In comparison, the results of the current investigation are in line with predictions that distractor-response bindings would be strengthened during hangover, given that sensory information processing is faster in hangover (Stock et al., 2017). Stronger distractor-response bindings require a longer period of time to correct based on the new information presented, and the instigation of a corrected event-file. Indeed, further analysis of the distractor effects between hangover and sober conditions indicated that distractor effects in hangover were particularly driven by trials in which the task-relevant target information changed alongside the task-irrelevant information, which would require the instantiation of new event-files with both target-response and distractor-response bindings. The theory of event coding may therefore provide an explanation and mechanisms for increased distractibility during hangover, which has been considered a major contributor to hangover induced behavioural deficits in everyday activities (Høiseth et al., 2015; Rohsenow et al., 2010; Verster, Bervoets, et al., 2014; Verster, Van Der Maarel, et al., 2014).

5.6.4. Relationships between change scores for individual difference measures and cognitive performance.

Cognitive reappraisal, expressive suppression, and rumination are implicated in psychopathologies (Aldao et al., 2010), including addiction (Devynck et al., 2019; Stellern et al., 2023). This may be due to relationships between emotion regulation, rumination, and cognitive control (Pruessner et al., 2020), which are neurologically related by overlapping localisations in the dlPFC (Chen et al., 2023). The dlPFC is vulnerable to damage from oxidative stress (Joyce et al., 2024), which is thought to underly hangover experience (Turner et al., 2024). In the current investigation, correlations between emotion regulation changes in hangover and cognitive performance changes in hangover were examined, that may have implications in the aetiology of addiction. Results indicated that BSRI rumination change scores correlated positively with change scores for reaction time on RRi-DR trials of the Moeller task, that is, trials where neither the task-relevant or task-irrelevant information

changed between the prime and the probe. This indicates that as rumination increased, reaction times increased (i.e. performance speed was decreased). In the theory of the response-distractor binding paradigm, these trials require minimal processing as it does not require the instantiation of a new event file (Moeller et al., 2014). Relationships with performance in Moeller task trials in which neither task-relevant or task-irrelevant information changes between prime and probe stimuli displays may then be a product of psychomotor impairments in hangover (Gunn et al., 2018). Bayesian analyses, however, indicated that evidence for the relationship between BSRI changes scores and changes in performance for RRi-DR trials on the Moeller task was weak.

For cognitive reappraisal, change scores correlated positively with accuracy for positive trials of the emotional Stroop task, indicating that increases in cognitive reappraisal during hangover were associated with increases in accuracy for positive emotional Stroop trials. Bayesian analysis indicated moderate evidence of a relationship between cognitive reappraisal and performance for positive trials of the emotional Stroop task. Cognitive reappraisal is associated with improved affect, so positive relationships with performance for positive trials may represent a mood congruence effect in information processing (Gilboa-Schechtman et al., 2000). Comparatively, change scores for expressive suppression were positively correlated with recall for neutral words, such that increases in expressive suppression during hangover were associated with increased recall of neutral words during hangover, with moderate support for this relationship in Bayesian analysis. Expressive suppression is generally associated with decrements in memory (Gross & John, 2003), however neutral stimuli may not compete for cognitive resources as emotional (positive or negative) stimuli does (Richards & Gross, 2006). Memory formation and consolidation for emotional content is processed differently at a neurological level from non-emotional content (Phelps, 2004), so expressive suppression may not inhibit memory for neutral words, and may provide an explanation for the positive relationship seen here.

Change scores for expressive suppression also negatively correlated with changes in reaction times on the Moeller task during hangover, in all conditions except where the task-relevant stimuli remained identical between prime and probe, and the distractor information remained (RRi-DR trials). This indicates that as expressive suppression increased, performance on the Moeller task increased (reduced reaction time). Bayes factors indicated

between weak and moderate evidence for these relationships, with the strongest relationships observed for trials where distractor information changed (DC trials), or where the distractor remained but the task-relevant stimuli changed whilst requiring the same response (RR-DR trials). Though use of expressive suppression is generally associated with decrements in cognitive performance (John & Gross, 2004), expressive suppression has been associated with improved performance in a visual search task (Bendall et al., 2022). Expressive suppression may benefit performance on cognitive tasks that require the inhibition of task-irrelevant information, such as the Moeller task, by allowing focus to be maintained on information relevant to task performance. Whilst the use of expressive suppression as an emotion regulation strategy may be beneficial for cognitive performance in the short term, habitual use of maladaptive emotion regulation strategies are associated with substance use-disorders (Stellern et al., 2023), as well as affective disorders (Dryman & Heimberg, 2018). This may suggest that those who demonstrate reduced impact of hangover on cognitive performance requiring the inhibition of task-irrelevant information have a greater tendency to engage with expressive suppression as an emotion regulation strategy, and are at greater risk of negative health outcomes including addiction.

5.6.5. Relationships between change scores for hangover severity measures and cognitive performance.

Relationships between delta scores for hangover severity measures, cognitive performance measures, and individual difference measures, were assessed across a series of exploratory pairwise correlation analyses. Correlations of delta scores for hangover symptom severity measures indicated significant positive relationships between the 1-item hangover severity delta scores and total hangover symptom severity delta scores, with both the 1-item hangover score and total hangover severity score showing significant positive relationships with scores on the hangover symptom clusters identified in chapter 2 and confirmed in chapter 3 (Royle et al., 2020): headache and thirst symptoms, and gastric and cardiovascular symptoms. Bayes factors indicated strong evidence for these relationships. In contrast, however, no relationship was found between the delta scores for the 2 hangover symptom clusters, with Bayes factors indicating weak evidence of no relationship between delta scores for headache and thirst symptom cluster severity and delta scores for gastric and cardiovascular symptom cluster severity. The lack of correlation between headache and

thirst, and gastric and cardiovascular symptoms of hangover indicates some level of independence between these symptom clusters. This observation further substantiates the findings previously reported in Royle et al. (2020) and the need to consider these independent symptomologies in future hangover research.

For relationships between hangover severity measure change scores and cognitive performance, both the 1-item severity delta score and headache and thirst symptom cluster severity delta score correlated positively with delta scores for accuracy in the negative trials of the Stroop, indicating that increases in hangover symptom severity during the hangover state compared to the sober state was associated with increases in accuracy for negative trials during the hangover state in comparison to the sober state. The 1-item hangover severity score is thought to capture the broad experience of hangover (Verster et al., 2020), including negative mood effects (Alford, Martinkova, et al., 2020a; Devenney et al., 2019a; van Schrojenstein Lantman et al., 2017), so relationships between the 1-item measure of hangover severity and accuracy for negative trials of the emotional Stroop may be indicative of mood congruency effects that have been observed for emotional Stroop tasks (Gilboa-Schechtman et al., 2000). In contrast, the headache and thirst symptom cluster is focused on somatic symptoms of hangover, and does not include consideration of mood effects. It is possible that headache and thirst symptoms are more closely associated with mood effects of hangover than other symptoms, such as those included in the gastric and cardiovascular symptom cluster. Headache and thirst symptom severity was correlated with 1-item hangover severity, however, headache and thirst symptom cluster and 1-item hangover severity were both also correlated with total symptom severity across all measured symptoms in the current study. Though this total measure of hangover severity did not correlate with performance for accuracy in negative trials in the emotional Stroop task, this relationship did approach significance (p = .057), and Bayesian analyses did indicate evidence of a relationship. In contrast, gastric and cardiovascular symptom severity, which did not correlate with headache and thirst severity in the current investigation, was not correlated with performance for negative trials of the emotional Stroop task, with Bayesian analysis providing weak evidence of no relationship. Collectively this may suggest that gastric and cardiovascular symptoms of hangover severity are less associated with mood

effects of hangover and consequent effects on emotional processing, than other common symptoms.

Increases in gastric and cardiovascular symptom severity during hangover in comparison to the sober state was negatively correlated with changes in accuracy for RC-DC trials of the Moeller task during hangover compared to sober states, indicating that as gastric and cardiovascular symptom cluster severity increased, accuracy for RC-DC trials in the Moeller task decreased (i.e. performance was reduced). RC-DC trials of the Moeller task require, within the theory of event coding, instantiation of a new event file (Moeller et al., 2014), as both task-relevant and task-irrelevant information changes between the prime and the probe presentation. Associations between reductions in accuracy on RC-DC trials of the Moeller task and gastric and cardiovascular symptom severity may therefore indicate that either the ability to release an old event file, or instantiate a new event file, are impaired by the experience of these symptoms of hangover, however, evidence of this relationship in Bayesian analyses was weak. In contrast, total hangover symptom severity, delta scores between sober and hangover states correlated positively with delta scores for reaction times in RRi-DC and RRi-DR trials of the Moeller task. This indicates that increases in total hangover symptom severity were associated with increased reaction times (i.e. poorer performance) during hangover on trials of the Moeller task that had identical target stimuli for the prime and probe during the hangover state in comparison to the sober state. One explanation for this outcome, given both of these trial types utilise identical task-relevant stimuli between the prime and probe that theoretically require less cognitive processing in the alteration (or lack thereof) of event files (Moeller et al., 2014), is that the total hangover symptom severity score is associated with decrements in psychomotor performance that have been observed in hangover (Gunn et al., 2018). This idea is supported by the strong relationship observed between changes in total symptom severity and reaction times for RRi-DR trials (i.e. trials in which the prime and probe stimuli were completely identical, and thus can utilise the previous event file) in Bayesian analyses. Comparatively, evidence for the relationship between total hangover symptoms and RRi-DC trial performance in Bayesian analyses was weaker, which would be explained by requirements to alter aspects of the event file.

Collectively, a variety of different relationships were observed for different hangover severity measurements with aspects of performance. Though evidence of these effects was generally weak, particularly given a lack of significant effects of hangover versus sober states on performance in the free recall and emotional Stroop tasks, this may still indicate that different symptom sets in hangover are associated with different effects on performance. Future research will be needed to elucidate the relationships between the severity of symptom clusters and specific effects on performance, as well as investigating any potential downstream effects on health outcomes, such as addiction and immune-related diseases (Išerić et al., 2024; Piasecki et al., 2010; Vatsalya et al., 2019).

5.6.6. Limitations and future directions.

Whilst varying correlations have been observed in the current investigation between hangover severity, individual difference measures, and cognitive performance, demonstrating the complex nature of interactions between hangover and performance, the current investigation failed to find any significant effects of hangover on affective cognition. Results for both the emotional free recall and emotional Stroop tasks did not indicate effects of hangover on performance, however, due to a combination of time constraints and data quality issues, these tasks were underpowered in comparison to a priori calculations of required samples. Future research may therefore wish to examine performance in wider samples or using more sensitive measures such as the affective Stroop (emotional word-face Stroop). The lack of significant differences between hangover and sober states on these tasks, as well as the exploratory nature of correlational analyses, having no corrections applied, also places limitations on the interpretation of relationships between hangover severity and cognitive performance, as well as relationships between individual difference measures and cognitive performance. These results should therefore be considered as preliminary and require further examination in research designed to elucidate relationships between emotion regulation (including rumination), hangover symptom severity, and cognitive performance. Results indicating potential relationships between emotion regulation and cognitive performance changes that occur in hangover may also have implications for addiction and immune-function-related diseases (Išerić et al., 2024; Piasecki et al., 2010; Vatsalya et al., 2019), that require exploration, and would benefit from prospectively framed research approaches.

5.6.7. Conclusion.

The current investigation examined the cognitive effects of alcohol hangover, and provided exploration of the relationships between emotion regulation measures and cognitive performance, as well as hangover symptom cluster severity and cognitive performance. Preliminary results indicated decrements in performance caused by task-irrelevant information was increased in hangover, which may explain indicators of increased distractibility in hangover (Opitz et al., 2020). Likewise, exploratory analysis indicated that changes in emotion regulation during hangover were associated with aspects of cognition that may have implications for health outcomes including addiction and immune-related disease (Išerić et al., 2024; Piasecki et al., 2010; Vatsalya et al., 2019). Finally, novel exploratory investigation of the associations between cognitive performance changes observed in hangover with different measures of overall hangover severity, including the severity of specific symptom clusters (Royle et al., 2020), indicated relationships may exist between different hangover measures and varying indicators of cognitive performance. These relationships could have implications for understanding both the physiological mechanisms underlying hangover symptomology, and the behavioural outcomes associated with hangover.

5.7. Chapter summary.

The objectives of this chapter were; to examine cognitive outcomes associated with the hangover state; to examine relationships between individual difference factors and the cognitive outcomes of hangover; and to explore relationships between hangover symptomology and the cognitive outcomes of hangover. This has been achieved based on a remote experimental investigation of the cognitive effects of hangover following a 1.5g/Kg body water alcohol administration. This approach was successful in inducing hangover, with significant increases in hangover observed across all hangover severity measures (total hangover severity, 1-item hangover severity, headache and thirst symptom cluster severity, and gastric and cardiovascular symptom cluster severity). All bar 1 participant in this investigation reported increases in hangover symptomology following the alcohol consumption. A key finding indicated in the current chapter was that delta scores for headache and thirst symptoms were not correlated with delta scores for gastric and cardiovascular symptoms, calculated as a difference between measures from sober and

hangover states. This lack of correlation between the symptom clusters reinforces the idea that these symptom clusters are, at least partially, independent, and may be associated with different physiological mechanisms.

With regards to the cognitive effects of hangover, no effects were observed of hangover on emotional free recall or emotional Stroop performance. An effect was observed on reaction times for the Moeller task, such that the effect of changes in task-irrelevant distractor information significantly slowed reaction times in hangover testing, but not sober testing. This result is in line with hypotheses regarding increased distractibility in hangover (Opitz et al., 2020). Increased distractibility in hangover may contribute to everyday performance decrements, including decrements in driving performance (Verster, Bervoets, et al., 2014; Verster, Van Der Maarel, et al., 2014). It may also contribute to reduced productivity and the economic impacts of hangover (Bhattacharya, 2019).

The investigation also assessed potential roles of emotion regulation strategies and rumination on cognitive performance during hangover. Though no differences were observed in measures of cognitive reappraisal, expressive suppression, or rumination, between hangover and sober states, relationships were observed in exploratory analyses between these individual difference variables and changes in cognitive performance between hangover and sober states. In particular, expressive suppression showed strong relationships with reaction time in the Moeller task, such that increased expressive suppression was associated with improved performance. This may be because greater expressive suppression enhances the ability to inhibit task-irrelevant information, in line with results indicating relationships between increased expressive suppression and improved performance in a visual search task (Bendall et al., 2022). Expressive suppression may provide short term benefits in cognitive performance, but is associated with longer term negative health outcomes (Aldao et al., 2010). This may indicate that those who are less cognitively affected by hangover are at increased risk for negative alcohol related health outcomes. Patients with substance use disorders do report poorer emotion regulation (Stellern et al., 2023), and emotion regulation measures show associations with the symptoms of AUD (Dvorak, Sargent, et al., 2014; Jakubczyk et al., 2018). Expressive suppression may therefore provide a link between hangover experience, cognitive performance during hangover, and alcohol-related health outcomes (Išerić et al., 2024;

Piasecki et al., 2010). Future research should therefore seek to examine whether expressive suppression and enhanced ability to suppress irrelevant information are associated with risk for AUD.

Chapter 6: Discussion.

6.1. Review of research aims and objectives.

The work presented in this thesis aimed to develop understanding of alcohol hangover symptomology, the predictors of hangover severity, and the consequences of hangover, based on 5 objectives; First, to characterise the symptomology of alcohol hangover; second, to examine individual difference factors that may be associated with hangover; third, to examine cognitive outcomes caused by hangover; fourth, to examine relationships between individual difference factors and the cognitive outcomes of hangover; and finally, to assess relationships between hangover symptomology and the cognitive outcomes of hangover. These aims were achieved via exploration of literature regarding relationships between individual difference factors and hangover, collection of cross-sectional survey data on hangover symptomology and individual difference factors, and a remote experimental investigation based on a within-subjects alcohol challenge design examining the cognitive effects of hangover in a more ecologically valid environment.

First, a systematic review examining existing research on the relationships between hangover severity and individual difference factors was presented (chapter 1). Consideration of existing literature on hangover severity and individual differences was expanded upon in cross-sectional retrospective surveys which sought to characterise hangover symptomology, as well as explore the association between hangover symptomology and tendency to engage with a maladaptive pain-related coping strategy (chapter 2). Data from a cross-sectional survey was also used to model alcohol hangover symptomology in relation to both maladaptive coping tendencies and psychological distress brought about by an external stressor (chapter 3). Finally, a remote alcohol challenge investigation methodology was assessed (chapter 4) and utilised to examine the effects of hangover on affective cognition and information processing, and to examine the relationships between the cognitive effects of hangover and both hangover symptomology and individual difference factors (chapter 5). Key contributions of the thesis are as follows:

- Individual difference factors are differentially associated with measures of hangover severity.

- The severity of certain hangover symptoms covary, and different sets of covarying symptoms are associated with different cognitive outcomes.
- Remote experimental alcohol challenge designs are feasible for use in hangover research.

6.2. Individual difference factors are differentially associated with measures of hangover severity.

Though various psychosocial factors have been investigated in past research assessing hangover severity, including mood (Benson et al., 2020; Ceballos et al., 2022; Devenney et al., 2019a; Gunn et al., 2021a; Harburg et al., 1993b; Hogewoning et al., 2016; Hudson & Gunn, 2023; Tellez-Monnery et al., 2023; Terpstra et al., 2022; van de Loo, Kerssemakers, et al., 2020; van Schrojenstein Lantman et al., 2017; Verster, Arnoldy, et al., 2020; Verster et al., 2023), personality factors (Harburg et al., 1993b; Hudson & Gunn, 2023; Span & Earleywine, 1999; Terpstra et al., 2022; Verster, Arnoldy, et al., 2020; Verster et al., 2023), resilience, emotion regulation and coping (Ceballos et al., 2022; Gunn et al., 2021a; Hudson & Gunn, 2023; Tellez-Monnery et al., 2023; Terpstra et al., 2022; Van De Loo et al., 2018; Verster et al., 2023), only subjective intoxication during alcohol consumption has been consistently related with hangover severity (Hesse & Tutenges, 2009; Rohsenow et al., 2012; Stangl et al., 2022; van de Loo, Kerssemakers, et al., 2020; Verster, Arnoldy, et al., 2020). In the current work, pain catastrophising was shown to be positively related to somatic symptom severity in hangover, as assessed using the AHS (Chapter 2; Royle et al., 2020). Catastrophising has been associated with inhibitive processes (Quartana et al., 2009) and may act as a mediator in relationships between hangover severity, cognition, and drinking behaviour. Catastrophising is also associated with altered physiological responses to pain, with elevated pain catastrophising associated with greater levels of pro-inflammatory markers (Edwards et al., 2008) and indicators of oxidative stress in participants undergoing knee arthroplasty (Bruehl et al., 2022, 2024). Oxidative stress and inflammation also appear to be key mechanisms underlying hangover experience (Turner et al., 2024), suggesting that catastrophising may affect hangover severity by increasing levels of oxidative stress and inflammation.

The results from chapter 2 indicated a positive relationship between catastrophising and hangover severity, which have been replicated, with results found specifically relating

hangover severity to rumination (Saeed et al., 2021). Rumination has been associated with drinking behaviour in patients with AUD (Caselli et al., 2008, 2010), and may therefore have implications for understanding relationships between hangover and addiction (Piasecki et al., 2010; Vatsalya et al., 2019). Changes in state rumination between sober and hangover state was not, however, related to hangover severity in the investigation of hangover and cognition presented in chapter 5. Two possible explanations for this discrepancy are apparent. First, measures of trait catastrophising and rumination may be associated with hangover severity, whilst state changes between hangover and sober states are not. Indeed, no difference in state rumination was indicated in hangover in chapter 5 analyses. An alternative explanation is that the BSRI (which was used to measure rumination in chapter 5) is based on a broader representation of rumination as a response to stress, whereas catastrophising in chapter 2 was measured specifically in relation to pain responses.

Broader measures of coping were associated with hangover severity in chapter 3, however, this was only true for the 1-item measure of hangover severity, and not for measures based on clusters of somatic symptoms. The relationship between hangover severity and maladaptive coping was, however, negative, indicating that greater levels of maladaptive coping was associated with less severe hangover. One potential explanation for this seemingly protective effect of maladaptive coping on hangover severity is that maladaptive coping is associated with negative alcohol expectancies that lead to lower alcohol consumption, and thus less severe hangover, though this will need to be investigated. Still, a relationship between hangover severity and broader measures of coping may indicate that broader measures of coping are associated with non-somatic symptoms of hangover, such as depression and anxiety. Further, this shows that different measures of hangover severity are predicted by different factors, and may be associated with different physiological mechanisms and cognitive outcomes of hangover.

6.3. The severity of certain hangover symptoms covary, and different sets of covarying symptoms are associated with different cognitive outcomes.

The presence of symptom clusters in hangover has been investigated previously (Penning et al., 2012), however this was based on a wide range of symptoms rather than those included in specific hangover severity measures. The current work has established 2 symptom clusters within the AHS, a popular measure of hangover severity (Rohsenow et al.,

2007). The first symptom cluster, 'headache and thirst symptoms', consists of tiredness, headache, and thirst symptoms, and the second cluster, 'gastric and cardiovascular symptoms, consists of dizziness/faintness, loss of appetite, stomach ache, nausea, and increased heart rate.

Several non-exclusive explanations may be posited for the existence of the hangover symptom clusters observed: (i) The symptom clusters may represent the rarity of hangover symptoms. The symptoms included in the 'headache and thirst' cluster are the 3 most commonly reported symptoms of hangover (Slutske et al., 2003), with those included in the gastric and cardiovascular symptom cluster reported with lower incidence (Penning et al., 2012). (ii) The symptom clusters may be associated with different mechanisms, such as different metabolic processes involved in the processing of alcohol. (iii) Finally, the presence of symptoms from different clusters may be indicative of the severity of hangover experienced. This approach to the classification of hangover severity was used in early hangover research (Harburg et al., 1993), but no research has sought to validate an approach to acute hangover severity classification based on the presence of particular symptoms. Such an approach to hangover severity classification may have utility, particularly given recent discussion regarding the nature of hangover mechanisms. Mackus et al. (2024), based on a review of literature, argue that whilst dehydration is co-occuring with hangover, it is an independent consequence of alcohol consumption. Typical symptoms of dehydration are however included in measures of hangover severity, including thirst (Thornton, 2010), tiredness (Hodges, 2012), and headache (Arca & Singh, 2021). Tiredness, headache, and thirst were the symptoms that loaded on to the 'headache and thirst' symptom cluster in the current work. The independence of the identified symptom clusters was reinforced by a lack of correlation between delta scores for 'headache and thirst' symptoms and 'gastric and cardiovascular' symptoms in the investigation presented in Chapter 5. A re-analysis of relationships between average 'headache and thirst' and 'gastric and cardiovascular' symptom ratings for the investigations presented in Chapter 2 and Chapter 3 did indicate significant positive one-tailed relationships between symptom cluster severity ($r_s(84) = 0.369$, $p < .001$, $BF_{10} = 226$, and $r_s(134) = 0.543$, $p < .001$, $BF_{10} = 5.921x10^{10}$, for Chapters 2 and 3, respectively). This difference in results appears to be due to the use of delta scores in Chapter 5 analyses. A re-analysis of separate correlations of mean scores for 'headache and

thirst' and 'gastric and cardiovascular' symptom severity in sober (r_s = 0.459, p = .018, BF_{10} = 6.986) and hangover (r_s = 0.471, p = .015, BF_{10} = 5.680) conditions did indicate significant positive relationships. These results suggest that changes in the severity of each symptom cluster as a result of experiencing the hangover state are, to some extent, independent, whilst correlations between symptom clusters within sober or hangover states may represent tendencies in symptom severity reporting for individuals. Collectively this may support ideas that symptom clusters are indicative of hangover classes, that specific symptom clusters are more indicative of hangover experience, or that the experience of symptom clusters during hangover are associated with different physiological mechanisms. The investigation of hangover mechanisms and outcomes would benefit from the ability to disentangle symptomology that is associated with hangover or other concurrent processes such as dehydration or effects on sleep quality, and this appears not to be achieved using current symptomatic hangover severity ratings (Penning et al., 2013; Rohsenow et al., 2007; Slutske et al., 2003), nor 1-item hangover severity ratings (Verster et al., 2020), as drinkers are likely to include these symptoms in consideration of hangover severity (Mackus et al., 2024). These approaches to hangover severity measurement may therefore be appropriate for research considering perception of hangover severity, but may not capture physiological and cognitive associations with hangover.

The results of the reported investigation into the cognitive effects of hangover in relation to hangover symptom cluster severity (chapter 5) has also provided a tentative indication that the identified symptom clusters may be associated with different effects on cognitive performance. This has implications for both economic and health-related outcomes of hangover. Hangover has been estimated to cost the UK economy between 1.2 and 1.4 billion pounds per year (Bhattacharya, 2019) through workplace absenteeism and reduced productivity. Understanding how hangover symptomology is associated with decrements in aspects of cognition may allow for action to reduce the impact of hangover on workplace productivity. Information may be integrated into workplace policies regarding 'hangover days' (BBC, 2019). Likewise, hangover has been associated with the development of alcohol problems and heavy chronic drinking (Courtney et al., 2018; Vatsalya et al., 2019). The relationships between alcohol hangover and health outcomes have been proposed to be a product of the cognitive changes observed in hangover (Piasecki et al., 2010). Elucidating if

particular symptomologies of hangover are associated with cognitive decrements underlying the development of unhealthy drinking practices will provide a route for the identification of those at risk for negative outcomes. Identification of risk for negative alcohol-related health outcomes based on hangover experience would allow for education and intervention to reduce the demands on health services, and society more generally, caused by alcohol related disease.

6.4. Remote experimental alcohol challenge designs are feasible for use in hangover research.

Both the establishment of reliable hangover-based identifiers for risk of negative health outcomes, and interventions to reduce the economic impact of hangover requires an understanding of hangover that applies across diverse populations. Experimental hangover research is currently reliant on student samples (Devenney et al., 2019a), which are used primarily due to their accessibility. Approaches to research that enable the recruitment of more diverse samples are therefore important in developing the field. Within this work an approach that allows for remote collection of experimental data from alcohol challenge studies has been presented. An assessment of feasibility based on participant experience indicated that 50% of those who took part in the remote investigation would have been less likely to participate in a lab-based investigation. Remote investigations of alcohol hangover therefore, can provide an option for researchers to recruit from populations that are less likely to participate in lab-based research, and may provide more geographically dispersed and demographically diverse samples (Buhrmester et al., 2011; Casler et al., 2013; Palan & Schitter, 2018), and allow for participation in a more ecologically valid setting.

6.5. Conclusion.

Alcohol hangover is a prevalent but poorly understood phenomenon that follows single episodes of alcohol consumption, and has implications for economic productivity, public safety, and health. Developments in understanding of alcohol hangover will therefore have benefits for both economic productivity and health. The work presented in this thesis aimed to develop understanding of alcohol hangover symptomology, the predictors of hangover severity, and the cognitive consequences of hangover. This was accomplished using both cross-sectional survey data, and a within-subjects alcohol challenge experiment. Two symptom clusters have been identified and confirmed in the AHS: headache and thirst,

and gastric and cardiovascular symptoms, which may be associated with distinct physiological mechanisms. These symptom clusters were shown to be independently predicted by individual difference factors when compared to a 1-item hangover severity measurement. Coping responses to pain, specifically catastrophising, was associated with the severity of somatic hangover symptoms, whereas measures of distress and a broader indicator of coping were only associated with 1-item hangover severity, which is thought to capture a broader conceptualisation of hangover including non-somatic symptoms. Likewise, Cognitive testing, conducted utilising a novel methodology for remote online hangover experiments, indicated that the symptom clusters identified may be associated with different cognitive outcomes during hangover. Relationships between certain symptom clusters and specific domains of cognition, such as those involved in regulation of emotional response or inhibition, may have implications for health outcomes such as addiction.

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Appendices.

Appendix 1. Ethics approvals.

A1.1. Ethical approval for chapter 2- 'Pain catastrophising predicts alcohol hangover severity and symptoms.

University of Salford MANCHESTER

Research, Innovation and Academic Engagement Ethical Approval Panel

Research Centres Support Team
G0.3 Joule House
University of Salford
M5 4WT

T +44(0)161 295 2280

www.salford.ac.uk/

7 June 2017

Dear Sam,

RE: AMENDED ETHICS APPLICATION–HSR1617-15–'An investigation into factors affecting Alcohol Hangover Severity.'

Based on the information you provided I am pleased to inform you that amended application HSR1617-15 has been approved.

If there are any changes to the project and/or its methodology, then please inform the Panel as soon as possible by contacting Health-ResearchEthics@salford.ac.uk

Yours sincerely,

Sue McAndrew
Chair of the Research Ethics Panel

A1.2. Ethical approval for chapter 3 – 'Psychological distress and hangover symptomology'.

University of Salford MANCHESTER

Research, Enterprise and Engagement
Ethical Approval Panel

Doctoral & Research Support
Research and Knowledge Exchange,
Room 827, Maxwell Building,
University of Salford,
Manchester
M5 4WT

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www.salford.ac.uk

26 May 2020

Dear Lauren,

RE: ETHICS APPLICATION–HSR1920-089 - Psychological Health and Wellbeing During the COVID 19 Outbreak.

Based on the information you provided, I am pleased to inform you that application HSR1920-089 has been approved.

If there are any changes to the project and/or its methodology, then please inform the Panel as soon as possible by contacting Health-ResearchEthics@salford.ac.uk

Yours sincerely,

S. Pearson

Dr. Stephen Pearson
Deputy Chair of the Research Ethics Panel

A1.3. Ethical approval for chapters 4 & 5 – 'A remote experimental investigation of the effects of alcohol hangover on cognition'

The Ethics Panel has reviewed your application: Associations between cognition and hangover symptomology.
Application ID: 1350

The decision is: Application Approved.

If the Chair has provided comments, these are as follows:

Thank you for your careful attention to the feedback.

There is a small error for you to correct: you have been inconsistent in the BMI threshold between the application (40), the Case Report Form-appendix 10 (34) and the PIS (30) and response letter to the panel (30). Please can you update the case report form so that it is consistent with the PIS (BMI threshold 30). Please also update the version number and email the final version to ethics@salford.ac.uk so that we can update your record.

We note that you have sought legal advice from UoS colleagues and have put checks in place to ensure participants have experience of alcohol consumption but do not identify as having problems with alcohol consumption. This advice and the safeguarding and support processes described in the application must be carefully adhered to.

You will no longer be able to edit your application in the system.

Link to the Ethics Application Tool: https://apps.powerapps.com/play/de0240e7-3d59-4974-849e-ba87d2541856?tenantId=65b52940-f4b6-41bd-833d-3033ecbcf6e1

Appendix 2. Participant information sheets.

A2.1. Participant information sheet for chapter 2- 'Pain catastrophising predicts alcohol hangover severity and symptoms.

Participant information sheet - An investigation into factors affecting alcohol hangover severity.

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or would like more information. Please take at least 24 hours to decide whether or not to take part.

What is the purpose of this study?

Researchers in the directorate of psychology and public health are investigating the factors that impact on alcohol hangover severity, and how these may relate to the propensity for those diagnosed with alcohol use disorders to experience more severe hangovers.

Why have I been invited?

Anyone who is of legal drinking age for their country of residence and at least 18 years of age, and has experienced alcohol hangover during the last 6 months has been invited to take part in this study.

Do I have to take part?

Your participation in this study is entirely voluntary. If you decide to take part, you will then have the opportunity to ask the researcher any questions you might have about the study. You will then be asked to sign a consent form confirming your agreement to take part in the study. You are free to withdraw from this study at any time, without having to provide a reason. Your decision to take part or not take part in this study will in no way affect your academic studies.

What will happen to me if I take part?

In this investigation we will be asking you about your most recent alcohol hangover experience.

The investigation will consist of an online survey incorporating questions about your drinking behaviour, your most recent hangover experience, and aspects of your personality. There will also be questions regarding your height, weight, age and gender.

Should you choose to participate, you will be asked to sign up to this study through the Salford Psychology departments SONA system. You can create a SONA account at the following URL using the 'request an account button': https://salford-psychology.sona-systems.com/

Upon creation of a SONA account, you will be given a unique participant number, which you should use in any communications with the researchers, and you will be asked to provide during the survey to verify your participation. This participant number can also be used to withdraw your data.

To access the survey, select 'view available studies' on the SONA homepage, and search for the study title 'An investigation into factors affecting alcohol hangover severity'. From here you will

be able to sign up to the study, which will provide you with a link to the online survey. Instructions on how to complete the survey will be presented within the survey.

The entire survey should take approximately 15 minutes to complete.

Expenses and repayments?

No expenses are associated with this study. If you are a student at level 4 or 5 (first and second year), you will receive 1 participation credit toward your course or module requirements in return for your participation. No other payments will be available.

What are the possible disadvantages and risks of taking part?

There are no anticipated risks associated directly with this study, however, the topic of alcohol use and abuse can be distressing to some. Information on support services for alcohol use and abuse will be provided to all participants. Anyone who, at any time, feels uncomfortable or distressed answering questions about alcohol use is free to withdraw from the study with no penalty.

What are the possible benefits of taking part?

It cannot be promised that participation in this investigation will lead to benefits for you, however taking part may help to give you a greater understanding of the research process. Findings from this research will improve our understanding of the alcohol hangover phenomenon and direct future research examining the links between alcohol hangover and alcohol use disorders.

What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak to the researcher who will do their best to answer any questions you may have (please see *'Further information and contact details'* below). If you remain unhappy and wish to complain formally, you can do this by contacting the Research Centre Manager:

Anish Kurien (Research Centre Manager), University of Salford, G.08, Joule House, Acton Square, Salford, M5 4WT
0161 295 5276
a.kurien@salford.ac.uk

Will my taking part in the study be kept confidential?

All the data collected from you will remain confidential. Your data will only be referred to by a participant number, and any documents with your name on will **not** be associated with your participant number. All collected data will be stored on encrypted drives on a password-protected computers (in the case of electronic data), or within a locked cupboard in a locked office (in the case of 'pen and paper' data). Data will only be accessible to the research team.

Data will be stored for a minimum of three years.

What will happen if I don't carry on with the study?

If you choose to withdraw from the study, or if you wish to remove your data from the study at any point, you can contact the researcher with your participant number, and all data collected from you, as well as any other details, will be removed from all study files and destroyed.

What will happen to the results of the research study?

Further information and contact details.

If you would like further information about the study or would like to volunteer to participate, please contact:

Sam Royle,
L820 Allerton Building,
University of Salford
w.s.s.royle@salford.ac.uk

A2.2. Participant information sheet for chapter 3 – 'Psychological distress and hangover symptomology'.

Participant Information Sheet

Title of study: Psychological Health and Wellbeing During the COVID 19 Outbreak.

Principal Investigators/ Researchers; Dr Lauren Owen, William Royle, Dr Lynne Marrow

Nutrition and Psychopharmacology Brain Development Unit, University of Salford

Invitation paragraph: You are invited to participate in a research project assessing the effects of the COVID-19 situation on the psychological health and wellbeing of people residing in the UK. This project will help us to understand the impact of the COVID-19 situation on mental health, diet and alcohol consumption and identify effective and ineffective coping strategies. Please read the information below and take some decide whether or not to take part.

What is the purpose of the study: The aim of this research project is to explore the impact that the COVID-19 outbreak has on people's alcohol use and mood in the UK. As drinking behavior and mood may change during this time, we will invite you to take part in an initial survey and then subsequent surveys.

Why have I been chosen?; To participate in this 15-20 minute survey, you must be currently living in the United Kingdom and be aged 18 years or older.

Do I have to take part: It is up to you to decide whether or not to take part. If you do decide to take part, you will be emailed this information sheet. In addition, you will be asked consent to participation prior to actively completing the survey. However, you can still withdraw at any time without giving a reason and without it affecting any benefits that you are entitled to. If you do withdraw you should, however, note that the University will continue to process the information you have already provided. It will only do this for research purposes and in an anonymized way, so that you cannot not be identified.

What does participation involve?: You will be asked to answer questions about your demographics (e.g. age, gender, etc.), employment, alcohol use, diet, psychological health and well-being. The survey will take approximately 15 minutes to complete. Please not if you are not comfortable answering any question in the survey you may choose not to give an answer. You will be asked to complete the survey four times; the first three surveys will be four weeks apart and the final survey will be six months later. We are asking you to respond multiple times so we can track your psychological health and well-being over the course of the COVID-19 situation. This will help us to understand the impact of COVID-19 and determine any time points that may be particularly stressful. You will be asked to provide your email address and we will send you an email inviting you to complete each of the remaining surveys. None of your contact details

(including email address) will be shared with any 3rd party and your email address will be stored un-linked to the other information that you provide in the survey.

Expenses and payments?: There is no remuneration for taking part. However participant will be entered into a prize draw to win Amazon Vouchers. In the first questionnaire you will be entered to win £10, if you complete the second questionnaire you will be entered to win £20, third questionnaire £30 and at the fourth £50.

Possible benefits and risks to taking part: We cannot promise the study will help you but the information we get from the study will help aid the understanding of the impact of COVID-19 and social isolation on mental health and drinking behaviour. Additionally the questions asked in this survey may improve your awareness of your drinking behaviours or psychological health. There are minimal risks, although some questions, such as those about your alcohol use and coping, may cause some discomfort. In the event that you do become upset, a list of resources and sources of support are provided at the end of this Information sheet and at the end of the survey.

What if there is a problem?: If you have a complaint about the research study, your experience, and/or the researcher, please contact the researcher in the first instance, who can try to resolve the problem.

If you have a concern about any aspect of this study, you should contact a member of the research team by email; Dr Lauren Owen (l.owen2@salford.ac.uk), Dr Lynne Marrow (l.marrow@salford.ac.uk) and Sam Royle (w.s.s.royle@salford.ac.uk) who will do their best to answer your questions.

Following this, if you have any issues or complaints, you may contact Prof Andrew Clark, Chair of the University of Salford School of Health & Society Research & Enterprise Ethical Approval Panel. Tel. 0161 2954109; email a.clark@salford.ac.uk.

Will my taking part in the study be kept confidential? / What will happen to the results of the research project? The information you give us will be unlinked to your contact details and given a unique identifying code so that your participation is completely anonymous. Only the research team at Salford University will have the ability to re-identify you if you choose to withdraw from the study. Upon completion of the study your anonymous data (that cannot be linked to your identity or contact information in any way) will be uploaded to an online data repository. This data may then be analyzed by researchers at other national or international institutions. For example it is envisaged that anonymous data from this study will be compared to anonymous data from a similar study being run at Swinburne University, Australia. Your contact information will be used by the researchers for the sole purpose of contacting you in relation to this research. You will be asked if you consent to being contacted in the future for other research studies, in which case your email address will be securely archived. Your data will be stored on password protected

drives at Salford University and will be deleted after a period of 3 years. The data processing and protection agreement for the survey carrier Gorilla can be found here https://gorilla.sc/data-processing-agreement. Procedures for handling, processing, storage and destruction of your data match the Coadicott principles and/or General Data Protection Regulation (GDPR).

Procedures for handling, processing, storage and destruction of your data match the Cadicott principles and/or General Data Protection Regulation (GDPR).

What will happen if I want to stop being part of the study?; You are free to withdraw from the study at any point without prejudice and without giving any reason. If you withdraw from the study, all the information and data collected from you, to date, will continue to be used as part of the study, however your data will be anonymous and un-linked to any identifying information about you.

What will happen to the results of the research study? ; The results of this study may be presented, in the aggregate, for academic purposes at conferences, lectures, etc., and may be published in academic journals. Your responses will not be identifiable in any of these research outputs. Some of the data may be used within a student postgraduate research thesis.

Who is organising or sponsoring the research?; The University of Salford

Further information and contact details:

If you have found any of the questions in this survey have touched on subjects which cause you distress, or if you are experiencing distress related to the COVID 19 situation or any other personal matter and you would like to talk to someone you may wish to contact;

- The Samaritans (Phone number; 116 123)
- Confidential emotional support line (Phone number; 01708 765200)

You may also wish to visit the NHS mental health website and tips for you may wish to visit one of the following;

- The NHS Mental Health and Wellbeing page; https://www.nhs.uk/conditions/stress-anxiety-depression/
- The NHS Every Mind Matters webpage; https://www.nhs.uk/oneyou/every-mind-matters/coronavirus-covid-19-staying-at-home-tips/

If you are struggling with alcohol/ or drug related issues during the COVID-19 situation you may will to contact one of the support lines below

- Alcoholics Anonymous, whose helpline is open 24/7 on 0800 9177 650. If you would prefer, you can also email them at help@aamail.org or live chat via their website at www.alcoholics-anonymous.org.uk.

- Al-Anon which offers support and understanding to the families and friends of dependent drinkers. You can call their confidential helpline on 020 7403 0888 (open 10am-10pm). There are lots more resources for families and friends here.
- NHS drug addiction and getting help (https://www.nhs.uk/live-well/healthy-body/drug-addiction-getting-help/)

Thank you

A2.3. Participant information sheet for chapters 4 & 5 – 'A remote experimental investigation of the effects of alcohol hangover on cognition'

Participant information sheet - Associations between cognition and hangover symptomology.

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or would like more information. Please take at least 24 hours to decide whether or not to take part.

What is the purpose of this study?

Researchers in the directorate of Psychology and Sport are investigating how alcohol hangover is related to emotional responsiveness and performance. This investigation has been designed in order to examine how people respond to different symptoms of hangover and their effect on performance in information processing tasks.

Why have I been invited?

You are a healthy adult aged 18 – 40 years old, resident in the UK, and would consider yourself to be a regular drinker. You have access to a computer, webcam, and microphone.

You are not eligible to take part in this investigation if:

- You are aged less than 18, or over 40 years.
- You have a body mass index of less than 18.5, or more than 30.
- You have a history of; heart disease, high blood pressure, diabetes, anxiety, depression, substance abuse issues, or other conditions affecting the liver.
- You have a history of chronic, somatic, neurological or psychological conditions.
- You take medication affecting the central nervous system, kidney, or liver.
- You are a pregnant or lactating female, or there is any chance that you may be pregnant.
- You do not drink alcohol at least once a month on average.

Do I have to take part?

Your participation in this study is entirely voluntary. If you decide to take part, you will have the opportunity to clarify any questions you may have about the investigation with the researcher. You will then be asked to sign a consent form confirming your agreement to take part in the study. You are free to withdraw from this study at any time, without having to provide a reason.

If you are a student at the University of Salford, Your decision to take part or not take part in this study will in no way affect your academic studies.

This investigation will involve the consumption of alcohol, with the expectation that participants will experience a hangover following the alcohol consumption. Participants should ensure that participation in the investigation will not compromise their ability to complete necessary tasks. Students should ensure that the investigation will not interfere with their studies or course requirements (e.g. exams).

What will happen to me if I take part?

In this investigation, we will be asking you to complete a number of cognitive tasks online, both whilst sober (not-hungover), and hungover. In order to induce the hangover state, we will be

asking you to consume a specified amount of alcohol (to be provided) over the course of a 2 hour digital meeting, which may be completed alongside other participants. In total we would expect this investigation to require approximately 4 hours of participant time to complete.

The investigation will consist of 4 stages:

1. ***Screening:***

   The screening session will consist of a 30 minute digital one-to-one meeting, hosted in Microsoft teams. This screening session will be used to ensure that your engagement with this investigation does not present any unnecessary risk, and will require you to answer a number of questions about yourself (such as your weight and height) as well as questions about your alcohol consumption. You will need access to a computer with a webcam and microphone for this session.

   You will also need to provide proof of identity during this session, so will require a form of photographic ID to be available during the screening interview.

   At the end of the screening session you will be informed if you are eligible for the study. If you are eligible, then you will be informed of how much alcohol you will be expected to drink as part of the investigation and information on continuing the investigation will be provided. You will be asked to book a date to complete the 'consumption session', when you will be asked to consume the alcohol for the investigation. You should ensure that participation in the consumption session will not interfere with any essential activities, either on the evening of consumption or the following day, when you are highly likely to be hungover. If you are not eligible for the study then you will be informed of this. Following the screening session, eligible participants will be sent an information pack containing the study materials as well as instructions.

   Screening sessions will be recorded and stored securely for a period of 3 years. Recordings will only be used for the purposes of; recording participant consent, verifying participant identity, and verifying procedure, if necessary.

2. ***Testing session 1.***

   Following the screening you will be provided with a link to the first set of online performance tasks, hosted on the Gorilla.sc platform. You will be asked to complete these tests between 7am and 9am on the day that you will be completing the consumption session, and the tasks should take no longer than 40 minutes to complete. Instructions for the performance tasks will be provided once you access the link to the session, and you will be given an opportunity to practice each task to ensure you understand it.

3. ***Consumption session***

   Participants will be mailed the drinks required for this session via a recorded postal service with age verification. Drinks will consist of a mixture of Smirnoff vodka and Sainsbury's diet lemonade.

   Participants will be asked to consume 1.5g of alcohol per litre of their total body water, calculated according to their gender, height, and weight.

   For example:

Male, 178cm, 84Kg – would be asked to consume a total of 117mL of alcohol (equivalent to 293mL of Vodka). This is roughly equivalent to 12 'shots' (or 12 standard units).

Male, 170cm, 65Kg – would be asked to consume a total of 98mL of alcohol (equivalent to 244mL of Vodka). This is roughly equivalent to 10 'shots' (or 10 standard units).

Female, 164cm, 69Kg – would be asked to consume a total of 78mL of alcohol (equivalent to 196mL of Vodka). This is roughly equivalent to 8 'shots' (or 8 standard units).

Female, 155cm, 55Kg – would be asked to consume a total of 68mL of alcohol (equivalent to 170mL of Vodka). This is roughly the equivalent of 7 'shots' (or 7 standard units).

You should be aware that it is likely you will be asked to drink an amount that would meet the definition of 'binge' drinking, and UK government guidelines recommend you drink no more than 14 units of alcohol per week, spread across 3 occasions.

Participants consuming this quantity of alcohol will have minimal chance of exceeding a blood alcohol concentration of 0.15g%. Blood alcohol concentrations, assuming guidance is followed, are expected to reach between 0.12g% and 0.13g%. In comparison, the legal limit for drunk driving in the UK is 0.08g%, so the quantities of alcohol involved in this investigation would be expected to make you feel drunk.

Participants will be asked to confirm their understanding that the University of Salford cannot be held responsible for any adverse effects due to participant's or third parties behaviour undertaken during their engagement with the investigation.

The consumption session will consist of a 2 and a quarter hour online meeting (8 – 10.15pm), hosted in Microsoft Teams. Initially a researcher will confirm the requirements of the session as well as your consent to continue. A researcher and trained first aider will also be present during this session to answer questions and address any adverse events that may occur as a result of the alcohol consumption. Participants will be asked to keep their webcams on during this session for safety reasons, should attend having eaten a full meal, and should cease drinking once the session is complete.

A movie will be provided during the session for entertainment (streamed by the researcher).

At the end of the consumption session the researcher will confirm with all participants that they are not in distress. Participants will be expected to cease drinking and go to bed following the consumption session, both to ensure safety and prevent issues with testing.

4. Testing session 2

The second testing session will be completed on the morning following the consumption session, between 7am and 9am, and will consist of the same performance tasks as the first testing session, hosted on the Gorilla.sc platform. A link to this session will be provided to participants via email, with instructions on when to complete the tasks. Instructions will also be clarified at the beginning of the consumption session. These tasks should take no more than 40 minutes to complete.

Participants that choose to withdraw after completing the consumption session but before completing the second testing session will still be asked to complete a virtual 'check-in' before 9am on the day following the consumption session to confirm their safety.

5. ***Participant experience survey***

The day following the second testing session you will be asked to complete a short (10 minute) online survey addressing your experience of participating in the investigation.

Expenses and repayments?

No payments or incentives are being offered for participation in this investigation.

What are the possible disadvantages and risks of taking part?

Since this investigation will require you to drink an amount of alcohol likely to induce the hangover state, there is a risk of adverse events occurring during the consumption of this alcohol. Though the eligibility criteria for this study have been designed in order to minimise the risk of adverse events, participants may still experience discomfort during alcohol consumption, and would be expected to inform the researcher if at any point they felt unable to continue. Participants that don't complete the drinking session will be asked to remain online until the researcher is satisfied they are safe. The researcher may also ask you to stop drinking during the consumption session if they have concerns for your safety.

This investigation will also require participants to engage with the experience of hangover itself, a collection of negative physical and mental symptoms that occur following a single alcohol consumption session. This will therefore require participants to endure some discomfort associated with the experience, and may influence the participants ability to engage in tasks on the day following the alcohol consumption. Participants would therefore be expected to avoid any activities on the day following the consumption session, since hangover effects may impact on their ability to perform tasks (e.g. driving) safely.

What are the possible benefits of taking part?

It cannot be promised that participation in this investigation will lead to benefits for you, however taking part may help to give you a greater understanding of the research process. Findings from this research will improve our understanding of the alcohol hangover phenomenon and direct future research examining the links between alcohol hangover and drinking behaviour.

What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak to the researcher who will do their best to answer any questions you may have (please see *'Further information and contact details'* below). If you remain unhappy and wish to complain formally, you can do this by contacting the Research Centre Manager:

Andrew Clark (Chair of the Health Research Ethics Panel),
Room L517a, Allerton Building, University of Salford, M6 6PU
(Phone: 0161-2954209; Email: a.clark@salford.ac.uk).

Will my taking part in the study be kept confidential?

All the data collected from you will remain confidential. Your data will only be referred to by a participant number. Data will be anonymised post-collection for public sharing. Only the research team will have access to your name and email address. Recordings of screening sessions will only be accessible to the research team, and will only be used for the purposes of identity and age verification during participation, as well as providing a record of participant consent.

All collected data will be stored on encrypted drives on password-protected computers (in the case of electronic data), or within a locked cupboard in a locked office (in the case of 'pen and paper' data).

Data will be stored for a minimum of three years.

What will happen if I don't carry on with the study?

If you choose to withdraw from the study, or if you wish to remove your data from the study at any point, you can contact the researcher with your email address, and all data collected from you, as well as any other details, will be removed from all study files and destroyed, where it is possible to do so (for example, data may not be removed from already anonymised datasets).

Participants that choose to withdraw between the consumption session (where alcohol will be consumed) and the second testing session the morning after the consumption session, will still be asked to access the testing website to 'check-in' and confirm their safety. Participants will at this point have a chance to withdraw before completing the second testing session.

What will happen to the results of the research study?

Results from this investigation will be collated in an article for publication in a research journal, included within the Doctoral thesis of the lead researcher, and may be submitted for presentation at relevant conferences. Participants that choose to take part in the investigation will be able to opt-in to a research newsletter, to be disseminated once data from the investigation has been analysed.

Further information and contact details.

If you would like further information about the study or would like to volunteer to participate, please contact:

Sam Royle,
L826 Allerton Building,
University of Salford
w.s.s.royle@salford.ac.uk

A2.4. Participant information pack for chapters 4 & 5- 'A remote experimental investigation of the effects of alcohol hangover on cognition' (provided with intervention materials).

Participant information pack.

Thank you for agreeing to participate in our research into the effects of alcohol hangover. This pack contains everything you need to complete the testing and consumption sessions. Inside you will find:

- A copy of the participant information sheet.
- Instructions for the testing and consumption sessions.
- Booking instructions for your consumption session.
- Sealed drinks consisting of Smirnoff Vodka and Sainsbury's diet lemonade, as well as information on the quantity of alcohol you have been provided for the investigation.
- A protein-bar snack for the consumption session, in case it is desired.

If you have any questions, please contact the research team (Sam Royle, w.s.s.royle@salford.ac.uk).

Participant information sheet - Associations between cognition and hangover symptomology.

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or would like more information. Please take at least 24 hours to decide whether or not to take part.

What is the purpose of this study?

Researchers in the directorate of Psychology and Sport are investigating how alcohol hangover is related to emotional responsiveness and performance. This investigation has been designed in order to examine how people respond to different symptoms of hangover and their effect on performance in information processing tasks.

Why have I been invited?

You are a healthy adult aged 18 – 40 years old, resident in the UK, and would consider yourself to be a regular drinker. You have access to a computer, webcam, and microphone.

You are not eligible to take part in this investigation if:

- You are aged less than 18, or over 40 years.
- You have a body mass index of less than 18.5, or more than 30.
- You have a history of; heart disease, high blood pressure, diabetes, anxiety, depression, substance abuse issues, or other conditions affecting the liver.
- You have a history of chronic, somatic, neurological or psychological conditions.
- You take medication affecting the central nervous system, kidney, or liver.
- You are a pregnant or lactating female, or there is any chance that you may be pregnant.
- You do not drink alcohol at least once a month on average.

Do I have to take part?

Your participation in this study is entirely voluntary. If you decide to take part, you will have the opportunity to clarify any questions you may have about the investigation with the researcher. You will then be asked to sign a consent form confirming your agreement to take part in the study. You are free to withdraw from this study at any time, without having to provide a reason.

If you are a student at the University of Salford, Your decision to take part or not take part in this study will in no way affect your academic studies.

This investigation will involve the consumption of alcohol, with the expectation that participants will experience a hangover following the alcohol consumption. Participants should ensure that participation in the investigation will not compromise their ability to complete necessary tasks. Students should ensure that the investigation will not interfere with their studies or course requirements (e.g. exams).

What will happen to me if I take part?

In this investigation, we will be asking you to complete a number of cognitive tasks online, both whilst sober (not-hungover), and hungover. In order to induce the hangover state, we will be asking you to consume a specified amount of alcohol (to be provided) over the course of a 2 hour digital meeting, which may be completed alongside other participants. In total we would expect this investigation to require approximately 4 hours of participant time to complete.

The investigation will consist of 4 stages:

6. ***Screening:***

The screening session will consist of a 30 minute digital one-to-one meeting, hosted in Microsoft teams. This screening session will be used to ensure that your engagement with this investigation does not present any unnecessary risk, and will require you to answer a number of questions about yourself (such as your weight and height) as well as questions about your alcohol consumption. You will need access to a computer with a webcam and microphone for this session.

You will also need to provide proof of identity during this session, so will require a form of photographic ID to be available during the screening interview.

At the end of the screening session you will be informed if you are eligible for the study. If you are eligible, then you will be informed of how much alcohol you will be expected to drink as part of the investigation and information on continuing the investigation will be provided. You will be asked to book a date to complete the 'consumption session', when you will be asked to consume the alcohol for the investigation. You should ensure that participation in the consumption session will not interfere with any essential activities, either on the evening of consumption or the following day, when you are highly likely to be hungover. If you are not eligible for the study then you will be informed of this. Following the screening session, eligible participants will be sent an information pack containing the study materials as well as instructions.

Screening sessions will be recorded and stored securely for a period of 3 years. Recordings will only be used for the purposes of; recording participant consent, verifying participant identity, and verifying procedure, if necessary.

7. ***Testing session 1.***

Following the screening you will be provided with a link to the first set of online performance tasks, hosted on the Gorilla.sc platform. You will be asked to complete these tests between 7am and 9am on the day that you will be completing the consumption session, and the tasks should take no longer than 40 minutes to complete. Instructions for the performance tasks will be provided once you access the link to the session, and you will be given an opportunity to practice each task to ensure you understand it.

8. ***Consumption session***

Participants will be mailed the drinks required for this session via a recorded postal service with age verification. Drinks will consist of a mixture of Smirnoff vodka and Sainsbury's diet lemonade.

Participants will be asked to consume 1.5g of alcohol per litre of their total body water, calculated according to their gender, height, and weight.

For example:

Male, 178cm, 84Kg – would be asked to consume a total of 117mL of alcohol (equivalent to 293mL of Vodka). This is roughly equivalent to 12 'shots' (or 12 standard units).

Male, 170cm, 65Kg – would be asked to consume a total of 98mL of alcohol (equivalent to 244mL of Vodka). This is roughly equivalent to 10 'shots' (or 10 standard units).

Female, 164cm, 69Kg – would be asked to consume a total of 78mL of alcohol (equivalent to 196mL of Vodka). This is roughly equivalent to 8 'shots' (or 8 standard units).

Female, 155cm, 55Kg – would be asked to consume a total of 68mL of alcohol (equivalent to 170mL of Vodka). This is roughly the equivalent of 7 'shots' (or 7 standard units).

You should be aware that it is likely you will be asked to drink an amount that would meet the definition of 'binge' drinking, and UK government guidelines recommend you drink no more than 14 units of alcohol per week, spread across 3 occasions.

Participants consuming this quantity of alcohol will have minimal chance of exceeding a blood alcohol concentration of 0.15g%. Blood alcohol concentrations, assuming guidance is followed, are expected to reach between 0.12g% and 0.13g%. In comparison, the legal limit for drunk driving in the UK is 0.08g%, so the quantities of alcohol involved in this investigation would be expected to make you feel drunk.

Participants will be asked to confirm their understanding that the University of Salford cannot be held responsible for any adverse effects due to participant's or third parties behaviour undertaken during their engagement with the investigation.

The consumption session will consist of a 2 and a quarter hour online meeting (8 – 10.15pm), hosted in Microsoft Teams. Initially a researcher will confirm the requirements of the session as well as your consent to continue. A researcher and trained first aider will also be present during this session to answer questions and address any adverse events that may occur as a result of the alcohol consumption. Participants will be asked to keep their webcams on during this session for safety reasons, should attend having eaten a full meal, and should cease drinking once the session is complete.

A movie will be provided during the session for entertainment (streamed by the researcher).

At the end of the consumption session the researcher will confirm with all participants that they are not in distress. Participants will be expected to cease drinking and go to bed following the consumption session, both to ensure safety and prevent issues with testing.

9. Testing session 2

The second testing session will be completed on the morning following the consumption session, between 7am and 9am, and will consist of the same performance tasks as the first testing session, hosted on the Gorilla.sc platform. A link to this session will be provided to participants via email, with instructions on when to complete the tasks. Instructions will also be clarified at the beginning of the consumption session. These tasks should take no more than 40 minutes to complete.

Participants that choose to withdraw after completing the consumption session but before completing the second testing session will still be asked to complete a virtual 'check-in' before 9am on the day following the consumption session to confirm their safety.

10. Participant experience survey

The day following the second testing session you will be asked to complete a short (10 minute) online survey addressing your experience of participating in the investigation.

Expenses and repayments?

First year psychology students at the University of Salford may receive up to 10 SONA credits for participation in the investigation. No other payments or incentives are being offered for participation in this investigation.

What are the possible disadvantages and risks of taking part?

Since this investigation will require you to drink an amount of alcohol likely to induce the hangover state, there is a risk of adverse events occurring during the consumption of this alcohol. Though the eligibility criteria for this study have been designed in order to minimise the risk of adverse events, participants may still experience discomfort during alcohol consumption, and would be expected to inform the researcher if at any point they felt unable to continue. Participants that don't complete the drinking session will be asked to remain online until the researcher is satisfied they are safe. The researcher may also ask you to stop drinking during the consumption session if they have concerns for your safety.

This investigation will also require participants to engage with the experience of hangover itself, a collection of negative physical and mental symptoms that occur following a single alcohol consumption session. This will therefore require participants to endure some discomfort associated with the experience, and may influence the participants ability to engage in tasks on the day following the alcohol consumption. Participants would therefore be expected to avoid any activities on the day following the consumption session, since hangover effects may impact on their ability to perform tasks (e.g. driving) safely.

What are the possible benefits of taking part?

It cannot be promised that participation in this investigation will lead to benefits for you, however taking part may help to give you a greater understanding of the research process. Findings from this research will improve our understanding of the alcohol hangover phenomenon and direct future research examining the links between alcohol hangover and drinking behaviour.

What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak to the researcher who will do their best to answer any questions you may have (please see *'Further information and contact details'* below). If you remain unhappy and wish to complain formally, you can do this by contacting the Research Centre Manager:

Andrew Clark (Chair of the Health Research Ethics Panel),
Room L517a, Allerton Building, University of Salford, M6 6PU
(Phone: 0161-2954209; Email: a.clark@salford.ac.uk).

Will my taking part in the study be kept confidential?

All the data collected from you will remain confidential. Your data will only be referred to by a participant number. Data will be anonymised post-collection for public sharing. Only the research team will have access to your name and email address. Recordings of screening sessions will only be accessible to the research team, and will only be used for the purposes of identity and age verification during participation, as well as providing a record of participant consent.

All collected data will be stored on encrypted drives on password-protected computers (in the case of electronic data), or within a locked cupboard in a locked office (in the case of 'pen and paper' data).

Data will be stored for a minimum of three years.

What will happen if I don't carry on with the study?

If you choose to withdraw from the study, or if you wish to remove your data from the study at any point, you can contact the researcher with your email address, and all data collected from you, as well as any other details, will be removed from all study files and destroyed, where it is possible to do so (for example, data may not be removed from already anonymised datasets).

Participants that choose to withdraw between the consumption session (where alcohol will be consumed) and the second testing session the morning after the consumption session, will still be asked to access the testing website to 'check-in' and confirm their safety. Participants will at this point have a chance to withdraw before completing the second testing session.

What will happen to the results of the research study?

Results from this investigation will be collated in an article for publication in a research journal, included within the Doctoral thesis of the lead researcher, and may be submitted for presentation at relevant conferences. Participants that choose to take part in the investigation will be able to opt-in to a research newsletter, to be disseminated once data from the investigation has been analysed.

Further information and contact details.

If you would like further information about the study or would like to volunteer to participate, please contact:

Sam Royle,
L826 Allerton Building,
University of Salford
w.s.s.royle@salford.ac.uk

Instructions for the testing and consumptions sessions.

For this investigation, we are asking you to complete a series of three sessions, as well as a short online survey. You can choose when you wish to complete this series of sessions, but the sessions will need to be completed over a 2 day period.

- Testing session 1 – Day 1; 7am – 9am.
- Consumption session – Day 1; 8pm – 10.15pm.
- Testing session 2 – Day 2; 7am – 9am.
- Participant experience survey – Day 3; any time.

You will be able to book the consumption session online for a Thursday, Friday, or Saturday evening (information on how to do this is below).

Links to the testing sessions are provided below, and will also be sent to you via email.

Testing sessions will be hosted online in the Gorilla.sc platform; you can find more information on the platform here: https://support.gorilla.sc/support/info/faq

The testing sessions will consist of a number of behavioural tasks and questionnaires. Instructions for the tasks and questionnaires will be provided as part of the sessions, and you will have opportunities to practice the tasks before completing them.

Links for testing sessions:

Testing Session 1 (to be completed on the morning of your consumption session).

<<INSERT LINK TO TESTING SESSION 1>>

Testing Session 2 (to be completed the morning after your consumption session).

<<INSERT LINK TO TESTING SESSION 2>>

Participant experience survey (to be completed the day after testing session 2).

<<INSERT LINK TO PARTICIPANT EXPERIENCE SURVEY>>

Consumption session.

The Consumption session will be completed using Microsoft Teams. A link for this will be emailed to you once you have booked the session. When joining these sessions you will be able to select a screen name of your choosing.

Other participants may be attending the same consumption session, and you will be able to interact with other participants if you choose to do so.

Before the consumption session, you should ensure;

- You have eaten a full meal – this helps to prevent rapid rises in blood alcohol concentrations that can increase the risk of adverse events such as vomiting.
- You have water available to drink, in case it is desired.
- You have the provided snack available, in case it is desired.

During the consumption session, you will be asked to;

- Remain visible on your webcam for the duration of the session (except for short breaks, with notification of the researcher).
- If you begin to feel unwell, cease drinking and inform the researcher. You will be asked to stay online until the researcher is happy you are not in danger.
- Consume the provided drink over the course of the 2 hour consumption session. Drinking should be spaced out over the duration of the session.

After the consumption session is completed, you should not continue drinking, and should head to bed before 11pm, in order to ensure that you have a full night's sleep before completing the second testing session between 7am and 9am the following morning. This is to ensure that you complete the testing session during the hangover phase, rather than whilst still under the acute influences of the alcohol consumption.

Booking your consumption session.

Consumption sessions can be booked online for Thursday, Friday, or Saturday evenings, and will run from approximately 8 – 10.15pm.

You can book your consumption session online using the following link: <<INSERT BOOKING LINK>>

On the evening of your consumption session, please try to arrive promptly to avoid delays to the end of the session, as the provided drink must be consumed over a 2 hour period.

Drink information.

The drinks included in this pack have been tailored to your body composition. This is because the result of consuming a particular quantity of alcohol in terms of a person's blood alcohol concentration is based on the amount of water in their body.

We can estimate a person's total body water using a calculation based on their gender, weight, and height.

For this investigation we are asking participants to consume 1.5g of alcohol for each litre of total body water – there is therefore only a minimal chance that your blood alcohol concentration could exceed 0.15g%. If you ensure that you eat a full meal before the consumption session and space you're drinking out over the 2 hours as we are asking, it is expected that the blood alcohol concentrations achieved will be between 0.12 and 0.13g%. For comparison, the UK drink driving limit is 0.08g%.

Your personal drinks contain:

Grams of alcohol	
Millilitres of vodka	
Millilitres of sugar-free lemonade	

We're aware that alcohol use can be a potentially sensitive topic, and if you have any concerns about your own, or others alcohol use, the services detailed below provide sources of information and support that you may wish to contact.

- See your GP. Information on where to find your local GP services can be obtained from the NHS website - http://www.nhs.uk/Service-Search/GP/LocationSearch/4

- Drinkaware – Drinkaware is an independent charity which aims to reduce alcohol harm by helping people make better choices about their drinking through providing impartial, evidence based information, advice and practical resources.

  Website: https://www.drinkaware.co.uk/

  Telephone: 020 7766 9900

  Email: contact@drinkaware.co.uk

- Drinkline – Drinkline is a free, confidential helpline for people concerned about their own, or another person's, drinking.

  Telephone: 0300 123 1110

- Alcohol Concern – Alcohol concern is the national agency on alcohol misuse for England and Wales, and can provide general information about alcohol, and can help put you in touch with your nearest alcohol advice centre.

Telephone: 020 7928 7377

If you have any questions about the investigation you can contact the lead researcher, <<RESEARCHER NAME>>, <<RESEARCHER EMAIL>>.

Thank you for considering taking part in this investigation.

Appendix 3. Stimuli parameter data and analyses.

A3.1. Stimuli information for emotional free recall task in chapters 4 & 5 – 'A remote experimental investigation of the effects of alcohol hangover on cognition'

word (stimuli)	letters	syllables	freq_BNC	Valence	Arousal	Imagery	Concreteness	Meaning	Familiarity	Emotionality	Likeableness	Desirability	Control	Grouping	Set
bland	5	1	6.213786	1.96	2.83	5.47	5.49	6.61	4.22	3	2.08	1.2	2.65	Neg	1
unstudious	10	3		2	3.56	5.14	3.86	4.39	3.21	2.03	1.55	1.34	2.72	Neg	2
flabby	6	2	0.999001	1.91	3.62	5.31	4.01	5.26	2.97	3.28	2.2	1.17	3.65	Neg	2
discourteous	12	4	0.31968	1.42	3.85	5.51	4.44	5.25	3.01	3.29	1.42	1.4	3.33	Neg	1
dreary	6	2	2.717283	1.9	3.89	4.69	3.79	6.76	2.86	3.62	1.69	1.8	2.23	Neg	1
sluggish	8	2	2.497502	1.81	3.93	5.36	4.33	5.54	3.01	3.13	1.91	1.35	4.01	Neg	2
detached	8	2	10.15984	1.68	3.99	4.96	4.49	6.51	3.66	4.23	2.42	2	2.47	Neg	2
unattentive	11	4		1.55	4.18	6.08	4.38	6.68	2.85	3.74	1.38	1.46	1.73	Neg	1
shut	4	1	50.999001	2.04	4.2	5.69	4.9	6.12	4.48	3.14	2.37	1.8	4.34	Neg	1
purposeless	11	3	0.30969	1.82	4.26	3.87	4.47	6.27	2.92	3.69	1.86	1.39	2.24	Neg	2
careless	8	2	5.774226	1.97	3.55	5.07	3.86	6.17	5.19	3.55	2.37	2.79	3.56	Neg	2
hopeless	8	2	7.552448	1.41	3.6	6.29	4.69	6.71	4.65	5.22	1.51	1.08	2.81	Neg	1
unhappy	7	3	19.100899	1.89	3.85	5.28	3.74	6.87	6.05	5.07	1.63	1.56	4.25	Neg	1
rude	4	1	9.84016	1.78	3.86	4.85	5.38	6.76	4.54	3.91	1.46	1.27	4.18	Neg	2
thoughtless	11	2	1.018981	1.72	3.9	4.71	4.03	6.87	3.46	3.04	2.04	1.44	3.97	Neg	2
sinful	6	2	1.848152	1.86	3.97	5.58	3.25	7	3.89	2.63	2.25	1.65	3.35	Neg	1
sloppy	6	2	2.127872	1.78	4.1	6.34	3.42	6.63	4.39	3.78	2.15	1.77	4.45	Neg	1
despairing	10	3	2.297702	1.89	4.19	4.49	4.85	5.44	3.7	3.56	1.27	1.28	2.59	Neg	2
self-centered	13	3		1.81	4.25	5.02	4.29	6.33	3.5	4.99	1.41	1.38	4.54	Neg	2
withdrawn	9	2	16.813187	1.92	4.29	6.14	3.48	6.87	3.26	4.35	1.72	1.6	4.09	Neg	1

word (stimuli)	letters	syllables	freq_BNC	Valence	Arousal	Imagery	Concreteness	Meaning	Familiarity	Emotionality	Likeableness	Desirability	Control	Grouping	Set
strong	6	1	161.078921	6.44	4.62	5.9	4.13	6.92	6.73	3.84	5.77	6.43	5.12	Pos	1
attentive	9	3	2.547453	5.9	4.2	4.12	4.04	6.93	4.15	2.76	5.84	5.9	5.26	Pos	2
quick-witted	12	3	0.31968	5.41	4.17	4.73	4.5	6.48	3.45	4.53	5.89	6.29	5.21	Pos	2
fearless	8	2	1.578422	5.36	4.03	5.59	2.92	6.85	5.07	4.85	5.43	5.84	4.83	Pos	1
thorough	8	2	11.158841	5.96	3.82	4.79	4.67	5.2	4.79	2.51	6.16	6.22	4.52	Pos	1
ambitious	9	3	15.394605	6.09	3.7	5.91	4.54	6.21	4.72	3.94	5.77	6.22	5.05	Pos	2
crafty	6	2	1.648352	5.33	3.65	4.41	3.57	5.31	3.9	3	5.95	5.46	4.94	Pos	2
masterful	9	3	0.929071	5.7	3.61	4.79	4.18	5.46	3.69	3.52	4.72	5.81	5.46	Pos	1
decisive	8	3	12.267732	5.41	3.57	4.57	4.4	5.79	4.13	3.54	5.61	5.97	6	Pos	1
excited	7	3	19.070929	6	3.53	5.78	3.5	6.04	5.44	4.95	5.83	6.28	4.56	Pos	2
diligent	8	3	1.438561	5.32	4.24	4.99	4.48	5.71	3.78	2.01	5.9	6.4	5	Pos	2
disciplined	11	3	4.755245	5.71	4.2	4.69	5.89	6.81	5.46	1.95	5.84	6.31	6.05	Pos	1
punctual	8	3	0.679321	5.63	4.05	5.32	4.93	6.15	4.17	3.73	5.89	5.71	4.74	Pos	1
studious	8	3	0.599401	6	3.89	6.69	4.39	6.54	4.13	4.09	6.16	6.12	4.81	Pos	2
high-spirited	13	4	0.539461	6.02	3.74	6.47	3.9	6.47	3.75	3.86	5.93	6.37	4.74	Pos	2
purposeful	10	3	2.697303	5.94	3.65	4.33	4.43	6.4	3.71	4.73	6.42	6.54	5.36	Pos	1
active	6	2	72.827173	6.21	3.64	6.49	5.08	6.79	4.66	3.15	6.24	6.6	4.99	Pos	1
experienced	11	4	55.804196	5.5	3.58	5.26	5.21	6.49	5.86	3.73	5.38	6.17	5.75	Pos	2
pretty	6	2	79.55045	5.57	3.54	5.77	4.51	6.2	5.05	1.81	5.88	5.88	3.85	Pos	2
self-discipline	15	4	1.208791	5.48	3.53	5.97	5.8	7	3.75	3.46	5.89	5.83	6.14	Pos	1
suave	5	1	0.719281	4.42	3.18	5.35	2.95	6.19	2.73	3.57	4.5	4.88	5.88	Neu	1
objective	9	3	46.303696	4.08	3.67	3.65	4.24	6.76	4.82	3.21	3.78	3.99	4.18	Neu	2
valour	6	2	0.979021	4.06	3.36	3.5	3.95	5.08	3.75	3.57	4.63	4.97	3.97	Neu	2
erotic	6	3	4.355644	3.86	3.8	5.7	4.15	6.18	2.57	3.84	4.01	3.79	4.23	Neu	1
solar	5	2	13.166833	3.78	3.31	4.33	4.71	5.05	2.61	2.24	2.55	2.73	2.85	Neu	1

word (stimuli)	letters	syllables	freq_BNC	Valence	Arousal	Imagery	Concreteness	Meaning	Familiarity	Emotionality	Likeableness	Desirability	Control	Grouping	Set
homespun	8	2	0.519481	3.76	3.5	2.76	2.77	2.57	1.31	1.27	4.02	2.64	3.3	Neu	2
tempestuous	11	4	0.46953	3.36	4.13	2.77	4.05	3.95	2.06	3.58	3.16	3.01	3.77	Neu	2
indifferent	11	4	6.183816	3.24	4.16	4.51	3.92	4.97	3.99	2.86	3.06	2.07	4	Neu	1
subdued	7	2	5.034965	3.12	3.53	5.41	5.01	5.55	3.69	3.05	3.39	2.77	2.53	Neu	1
conforming	10	3	1.228771	3	3.83	5.79	4.38	6.69	4.19	3.06	2.57	2.07	3.48	Neu	2
decent	6	2	18.531469	4.28	2.73	4.36	3.43	6.21	4.54	4.16	5.05	5.38	3.45	Neu	2
wealthy	7	2	13.586414	4.23	3.63	6.27	5.62	7	3.83	2.11	4.54	5.13	4.37	Neu	1
conventional	12	4	39.230769	4.04	3.09	4.17	3.66	5.88	5.27	2.26	4.89	4.26	4.72	Neu	1
cautious	8	2	11.428571	3.98	4.96	5.63	5.1	6.42	4.19	3.3	3.97	3.57	4.98	Neu	2
skeptical	9	3	0.11988	3.78	4.95	4.49	3.72	5.87	4.03	3.01	2.99	3.17	4.17	Neu	2
dominant	8	3	30.569431	3.72	4.51	5.44	4.94	6.6	4.97	3.55	3.49	4.01	5.37	Neu	1
hungry	6	2	18.611389	3.34	4.94	5.27	3.85	6.73	5.18	4.3	3.67	2.34	4.3	Neu	1
small	5	1	444.065934	3.03	3.44	5.89	4.94	6.5	4.68	1.77	3.2	2.58	3.71	Neu	2
tired	5	1	41.168831	2.97	2.93	5.4	5.18	5.67	4.9	3.7	2.35	1.89	3.13	Neu	2
forceful	8	2	3.756244	2.89	5.29	6.6	3.58	6.58	3.31	3.37	2.43	1.72	5.92	Neu	2

A3.2. Stimuli analyses for emotional free recall task in chapters 4 & 5 – 'A remote experimental investigation of the effects of alcohol hangover on cognition'

A3.2.1. Descriptive statistics split by valence group.

Parameter	Valence group	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
letters	Neg	20	0	8.15	2.661	4	13
letters	Neu	20	0	7.6	2.186	5	12
letters	Pos	20	0	8.9	2.469	6	15
syllables	Neg	20	0	2.3	0.865	1	4
syllables	Neu	20	0	2.4	0.94	1	4
syllables	Pos	20	0	2.8	0.768	1	4
freq_BNC	Neg	17	3	8.27	12.359	0.31	50.999
freq_BNC	Neu	20	0	35.001	97.409	0.12	444.066
freq_BNC	Pos	20	0	22.305	40.824	0.32	161.079
Valence	Neg	20	0	1.806	0.176	1.41	2.04
Valence	Neu	20	0	3.647	0.487	2.89	4.42
Valence	Pos	20	0	5.749	0.327	5.32	6.44
Arousal	Neg	20	0	3.893	0.345	2.83	4.29
Arousal	Neu	20	0	3.847	0.742	2.73	5.29
Arousal	Pos	20	0	3.848	0.311	3.53	4.62
Imagery	Neg	20	0	5.293	0.632	3.87	6.34
Imagery	Neu	20	0	4.864	1.099	2.76	6.6
Imagery	Pos	20	0	5.329	0.774	4.12	6.69
Concreteness	Neg	20	0	4.258	0.612	3.25	5.49
Concreteness	Neu	20	0	4.208	0.769	2.77	5.62
Concreteness	Pos	20	0	4.454	0.719	2.92	5.89
Meaning	Neg	20	0	6.252	0.711	4.39	7
Meaning	Neu	20	0	5.822	1.084	2.57	7
Meaning	Pos	20	0	6.287	0.555	5.2	7
Familiarity	Neg	20	0	3.791	0.878	2.85	6.05
Familiarity	Neu	20	0	3.831	1.099	1.31	5.27
Familiarity	Pos	20	0	4.519	0.867	3.45	6.73
Emotionality	Neg	20	0	3.663	0.81	2.03	5.22
Emotionality	Neu	20	0	3.089	0.797	1.27	4.3
Emotionality	Pos	20	0	3.498	0.94	1.81	4.95
Likeableness	Neg	20	0	1.835	0.378	1.27	2.42
Likeableness	Neu	20	0	3.612	0.834	2.35	5.05
Likeableness	Pos	20	0	5.825	0.357	4.72	6.42
Desirability	Neg	20	0	1.536	0.38	1.08	2.79
Desirability	Neu	20	0	3.349	1.152	1.72	5.38
Desirability	Pos	20	0	6.117	0.303	5.46	6.6
Control	Neg	20	0	3.358	0.866	1.73	4.54
Control	Neu	20	0	4.115	0.92	2.53	5.92
Control	Pos	20	0	5.119	0.567	3.85	6.14

A3.2.2. Descriptive statistics split by word set.

parameter	Set	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
letters	1	30	0	7.933	2.545	4	15
letters	2	30	0	8.5	2.389	4	13
syllables	1	30	0	2.467	0.937	1	4
syllables	2	30	0	2.533	0.819	1	4
freq_BNC	1	29	1	17.658	32.267	0.32	161.079
freq_BNC	2	28	2	27.665	83.971	0.12	444.066
Valence	1	30	0	3.74	1.706	1.41	6.44
Valence	2	30	0	3.728	1.645	1.68	6.09
Arousal	1	30	0	3.897	0.522	2.83	5.29
Arousal	2	30	0	3.828	0.477	2.73	4.96
Imagery	1	30	0	5.419	0.694	4.17	6.6
Imagery	2	30	0	4.905	0.958	2.76	6.69
Concreteness	1	30	0	4.347	0.806	2.92	5.89
Concreteness	2	30	0	4.266	0.585	2.77	5.38
Meaning	1	30	0	6.32	0.638	4.97	7
Meaning	2	30	0	5.921	0.951	2.57	6.93
Familiarity	1	30	0	4.132	1.032	2.57	6.73
Familiarity	2	30	0	3.962	0.969	1.31	5.86
Emotionality	1	30	0	3.476	0.849	1.95	5.22
Emotionality	2	30	0	3.357	0.904	1.27	4.99
Likeableness	1	30	0	3.757	1.75	1.38	6.42
Likeableness	2	30	0	3.758	1.756	1.27	6.16
Desirability	1	30	0	3.676	2.047	1.08	6.6
Desirability	2	30	0	3.659	2.044	1.17	6.4
Control	1	30	0	4.354	1.216	1.73	6.14
Control	2	30	0	4.041	0.896	2.24	5.75

A3.2.3. Valence ANOVA.

ANOVA - Valence

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Grouping	155.700	2	77.850	593.550	< .001	0.956
Set	0.002	1	0.002	0.018	0.893	1.478×10^{-5}
Grouping ✻ Set	0.050	2	0.025	0.189	0.828	3.049×10^{-4}
Residuals	7.083	54	0.131			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
6.538	5.000	54.000	< .001

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	1.841	0.115	54	16.075	< .001
Pos - Neg	3.943	0.115	54	34.429	< .001

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	−0.013	0.094	54	−0.135	0.893

A3.2.4. Arousal ANOVA.

ANOVA - Arousal

Cases	Sum of Squares	df	Mean Square	F	p	η²
Grouping	0.028	2	0.014	0.053	0.948	0.002
Set	0.071	1	0.071	0.269	0.606	0.005
Grouping ✻ Set	0.134	2	0.067	0.253	0.777	0.009
Residuals	14.347	54	0.266			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
3.896	5.000	54.000	0.004

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	−0.046	0.163	54	−0.285	0.777
Pos - Neg	−0.045	0.163	54	−0.279	0.781

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	−0.069	0.133	54	−0.518	0.606

A3.2.5. Letters ANOVA.

ANOVA - let

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Grouping	17.033	2	8.517	1.395	0.257	0.048
Set	4.817	1	4.817	0.789	0.378	0.013
Grouping ✻ Set	6.633	2	3.317	0.543	0.584	0.019
Residuals	329.700	54	6.106			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.100	5.000	54.000	0.992

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	−0.550	0.781	54	−0.704	0.485
Pos - Neg	0.750	0.781	54	0.960	0.341

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	0.567	0.638	54	0.888	0.378

A3.2.6. Syllables ANOVA.

ANOVA - syl

Cases	Sum of Squares	df	Mean Square	F	p	η²
Grouping	2.800	2	1.400	1.835	0.169	0.062
Set	0.067	1	0.067	0.087	0.769	0.001
Grouping ✻ Set	0.933	2	0.467	0.612	0.546	0.021
Residuals	41.200	54	0.763			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
1.107	5.000	54.000	0.368

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	0.100	0.276	54	0.362	0.719
Pos - Neg	0.500	0.276	54	1.810	0.076

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	0.067	0.226	54	0.296	0.769

A3.2.7. Frequency (BNC) ANOVA.

ANOVA - freq_BNC

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Grouping	6669.249	2	3334.625	0.832	0.441	0.030
Set	1052.887	1	1052.887	0.263	0.611	0.005
Grouping ✻ Set	8626.788	2	4313.394	1.076	0.349	0.039
Residuals	204478.100	51	4009.375			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
2.974	5.000	51.000	0.020

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	26.963	20.908	51	1.290	0.203
Pos - Neg	14.266	20.908	51	0.682	0.498

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	8.627	16.834	51	0.512	0.611

A3.2.8. Concreteness ANOVA.

ANOVA - Concreteness

Cases	Sum of Squares	df	Mean Square	F	p	η²
Grouping	0.676	2	0.338	0.670	0.516	0.023
Set	0.098	1	0.098	0.195	0.661	0.003
Grouping ✻ Set	0.838	2	0.419	0.830	0.441	0.029
Residuals	27.245	54	0.505			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
1.079	5.000	54.000	0.383

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	−0.050	0.225	54	−0.223	0.825
Pos - Neg	0.196	0.225	54	0.873	0.387

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	−0.081	0.183	54	−0.442	0.661

A3.2.9. Meaning ANOVA.

ANOVA - Meaning

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Grouping	2.680	2	1.340	2.086	0.134	0.066
Set	2.384	1	2.384	3.712	0.059	0.059
Grouping ✻ Set	0.696	2	0.348	0.542	0.585	0.017
Residuals	34.684	54	0.642			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
2.917	5.000	54.000	0.021

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	−0.430	0.253	54	−1.695	0.096
Pos - Neg	0.035	0.253	54	0.140	0.889

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	−0.399	0.207	54	−1.927	0.059

A3.2.10. Familiarity ANOVA.

ANOVA - Familiarity

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Grouping	6.709	2	3.354	3.548	0.036	0.115
Set	0.435	1	0.435	0.460	0.500	0.007
Grouping ✻ Set	0.369	2	0.184	0.195	0.823	0.006
Residuals	51.061	54	0.946			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.512	5.000	54.000	0.766

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	0.040	0.308	54	0.130	0.897
Pos - Neg	0.729	0.308	54	2.369	0.021

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	−0.170	0.251	54	−0.678	0.500

A3.2.11. Emotionality ANOVA.

ANOVA - Emotionality

Cases	Sum of Squares	df	Mean Square	F	p	η²
Grouping	3.488	2	1.744	2.297	0.110	0.078
Set	0.210	1	0.210	0.277	0.601	0.005
Grouping ✻ Set	0.117	2	0.058	0.077	0.926	0.003
Residuals	40.998	54	0.759			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.431	5.000	54.000	0.825

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	−0.574	0.276	54	−2.081	0.042
Pos - Neg	−0.164	0.276	54	−0.597	0.553

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	−0.118	0.225	54	−0.526	0.601

A3.2.12. Desirability ANOVA.

ANOVA - Desirability

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Grouping	212.908	2	106.454	193.551	< .001	0.878
Set	0.004	1	0.004	0.008	0.930	1.787×10^{-5}
Grouping ✻ Set	0.007	2	0.003	0.006	0.994	2.786×10^{-5}
Residuals	29.700	54	0.550			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
10.334	5.000	54.000	< .001

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	1.812	0.235	54	7.726	< .001
Pos - Neg	4.581	0.235	54	19.533	< .001

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	−0.017	0.191	54	−0.089	0.930

A3.2.13. Control ANOVA.

ANOVA - Control

Cases	Sum of Squares	df	Mean Square	F	p	η²
Grouping	31.213	2	15.606	24.947	< .001	0.461
Set	1.463	1	1.463	2.339	0.132	0.022
Grouping ✻ Set	1.195	2	0.598	0.955	0.391	0.018
Residuals	33.782	54	0.626			

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
2.268	5.000	54.000	0.061

Contrast Tables

Simple Contrast - Grouping

Comparison	Estimate	SE	df	t	p
Neu - Neg	0.757	0.250	54	3.029	0.004
Pos - Neg	1.761	0.250	54	7.041	< .001

Simple Contrast - Set

Comparison	Estimate	SE	df	t	p
2 - 1	−0.312	0.204	54	−1.529	0.132

A3.3. Descriptive statistics for the emotional Stroop task in chapters 4 & 5 – 'A remote experimental investigation of the effects of alcohol hangover on cognition'

word	letters	syllables	freq_KF	freq_BNC	freq_TV	freq_PG	freq_BN	noun	Valence	Arousal	Imagery	Concreteness	Meaningfulness	Familiarity	Emotionality	Group
goals	5	1	40	47.142857	5.648016		5.137255	1	5.41	4.4	4.03	3.37	6.06	5.8	4.79	POS
rescue	6	2	15	23.166833	21.907455	18.1771	25.411765	1	5.77	4.06	5.06	4.48	6.64	4.9	4.54	POS
merit	5	2	29	11.758242	3.149197	29.8629	3.392157	1	5.34	3.37	3	3.06	5	3.62	2.93	POS
bible	5	2	61	19.74026	10.440271		18.333333	1	5.52	3.79	6.76	6.08	6.5	5.02	4.79	POS
diploma	7	3		7.492507	2.841123		2.529412	1	6.16	3.58	6.45	5.87	6.91	4.12	3.37	POS
knowledge	9	2	145	145.714286	21.702072	153.829	25.529412	1	5.71	3.38	4.28	2.95	6	5.38	2.8	POS
truth	5	1	128	82.387612	324.161869	212.548	192.176471	1	5.7	3.59	3.24	3.16	6	4.97	5.32	POS
prestige	8	2	29	9.93007	1.266525	4.17086	1.372549	1	5.25	3.55	3.88	3.55	5.55	4.11	4.29	POS
journey	7	2	28	48.491508	13.418316		19.941176	1	5.23	3.57	4.52	4.09	6.38	5.09	4.28	POS
fireworks	9	2	5	3.596404	7.017232	2.39951	5.627451	1	5.46	3.53	6.34	5.46	6.03	3.19	4.15	POS
despair	7	2	21	14.905095	4.004957	45.4633	5.862745	1	1.92	4.44	3.46	2.46	5.19	4.16	5.26	NEG
ignorance	9	3	16	11.408591	2.156515	35.1524	3.607843	1	2.17	3.68	3.67	3.32	5.79	4.37	3.32	NEG
waste	5	1	35	67.532468	54.631715	38.1643	53.254902	1	1.9	4	5.73	4.43	6.13	4.83	3.43	NEG
dummy	5	2	3	4.505495	5.682246		9.803922	1	1.92	3.8	4.92	3.16	5.64	3.16	3.16	NEG
grime	5	1		1.288711			0.411765	1	2.29	3.91	5.12	4.95	6.08	3.7	3	NEG
scar	4	1	10	4.305694	8.317987	4.00472	8.470588	1	2.47	3.95	6.56	5.39	6.17	3.56	3.6	NEG
trash	5	1	3	2.127872	28.308539	2.60125	22.470588	1	2.45	3.68	6.18	5.36	6.5	4.81	2.18	NEG
fungus	6	2	2	2.927073	1.985363		2.196078	1	2.12	3.96	6.12	5.58	6	2.38	2.35	NEG
pity	4	2	17	20.1998	20.914773	60.858	23.509804	1	2.48	3.96	4.16	3.08	5.96	4.56	4.36	NEG
fire	4	1	205	140.889111	186.62413	240.652	215.490196	1	2.53	4.13	6.16	5	6.06	4.48	3.29	NEG
teacher	7	2	82	87.412587	32.861182	26.1288	55.72549	1	4.11	3.5	6.46	5.5	6.42	4.57	2.69	NEU

word	letters	syllables	freq_KF	freq_BNC	freq_TV	freq_PG	freq_BN	noun	Valence	Arousal	Imagery	Concreteness	Meaningfulness	Familiarity	Emotionality	Group
vanity	6	3	7	3.966034	3.217657	24.3242	4.117647	1	3.39	4.06	4.39	3.7	5.84	3.03	3.57	NEU
bust	4	1	7	7.122877	22.523602	5.60993	27.568627	1	3.66	3.55	4.55	4.48	5.59	3.96	2.37	NEU
secret	6	2	79	57.592408	130.417816	111.678	109.509804	1	3.55	4.9	3.95	3.9	6.25	5.1	5.1	NEU
contempt	8	2	15	12.587413	5.511094	31.802	5.019608	1	3.6	3.83	3.6	3.1	5.6	3.66	4.7	NEU
tiger	5	2	7	9.020979	10.542963	9.16529	18.529412	1	4.31	3.78	6.71	6.37	6.56	3.59	2.46	NEU
witness	7	2	28	25.064935	49.87369	40.5456	51.392157	1	3.68	3.9	4.63	4.4	6.36	5.09	2.86	NEU
crush	5	1	4	5.024975	19.956322	9.94772	16.803922	1	3.87	3.93	5.09	3.64	6.41	3.45	3.96	NEU
lust	4	1	6	4.855145	4.929177	8.48412	5.568627	1	3.42	3.97	4.17	3.14	5.8	4.42	5.25	NEU
cause	5	1	132	130.46953	317.555402	204.686	310.039216	1	3.82	3.41	2.44	3.16	5.7	4.62	2.7	NEU

A3.4. Stimuli analyses for the emotional Strrop task in chapters 4 & 5 – 'A remote experimental investigation of the effects of alcohol hangover on cognition'

A3.4.1. Descriptive statistics split by valence group.

Parameter	Group	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
letters	NEG	10	0	5.4	1.578	4	9
letters	NEU	10	0	5.7	1.337	4	8
letters	POS	10	0	6.6	1.647	5	9
syllables	NEG	10	0	1.6	0.699	1	3
syllables	NEU	10	0	1.7	0.675	1	3
syllables	POS	10	0	1.9	0.568	1	3
freq_BNC	NEG	10	0	27.009	44.634	1.289	140.889
freq_BNC	NEU	10	0	34.312	43.704	3.966	130.47
freq_BNC	POS	10	0	39.942	44.563	3.596	145.714
Valence	NEG	10	0	2.225	0.254	1.9	2.53
Valence	NEU	10	0	3.741	0.294	3.39	4.31
Valence	POS	10	0	5.555	0.285	5.23	6.16
Arousal	NEG	10	0	3.951	0.222	3.68	4.44
Arousal	NEU	10	0	3.883	0.418	3.41	4.9
Arousal	POS	10	0	3.682	0.322	3.37	4.4
Imagery	NEG	10	0	5.208	1.125	3.46	6.56
Imagery	NEU	10	0	4.599	1.268	2.44	6.71
Imagery	POS	10	0	4.756	1.352	3	6.76
Concreteness	NEG	10	0	4.273	1.155	2.46	5.58
Concreteness	NEU	10	0	4.139	1.083	3.1	6.37
Concreteness	POS	10	0	4.207	1.204	2.95	6.08
Meaningfulness	NEG	10	0	5.952	0.352	5.19	6.5
Meaningfulness	NEU	10	0	6.053	0.381	5.59	6.56
Meaningfulness	POS	10	0	6.107	0.55	5	6.91
Familiarity	NEG	10	0	4.001	0.793	2.38	4.83
Familiarity	NEU	10	0	4.149	0.714	3.03	5.1
Familiarity	POS	10	0	4.62	0.824	3.19	5.8
Emotionality	NEG	10	0	3.395	0.897	2.18	5.26
Emotionality	NEU	10	0	3.566	1.12	2.37	5.25
Emotionality	POS	10	0	4.126	0.836	2.8	5.32

A3.4.2. Valence ANOVA.

ANOVA - Valence

Cases	Sum of Squares	df	Mean Square	F	p
Classification	55.593	2	27.796	359.470	< .001
Residuals	2.088	27	0.077		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	1.516	0.124	27	12.191	< .001
2	1.814	0.124	27	14.587	< .001
3	3.330	0.124	27	26.777	< .001

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.3. Arousal ANOVA.

ANOVA - Arousal

Cases	Sum of Squares	df	Mean Square	F	p
Classification	0.391	2	0.196	1.793	0.186
Residuals	2.946	27	0.109		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	−0.068	0.148	27	−0.460	0.649
2	−0.201	0.148	27	−1.361	0.185
3	−0.269	0.148	27	−1.821	0.080

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.4. Letters ANOVA.

ANOVA - let

Cases	Sum of Squares	df	Mean Square	F	p
Classification	7.800	2	3.900	1.674	0.206
Residuals	62.900	27	2.330		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	0.300	0.683	27	0.440	0.664
2	0.900	0.683	27	1.319	0.198
3	1.200	0.683	27	1.758	0.090

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.5. Syllables ANOVA.

ANOVA - syl

Cases	Sum of Squares	df	Mean Square	F	p
Classification	0.467	2	0.233	0.553	0.582
Residuals	11.400	27	0.422		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	0.100	0.291	27	0.344	0.733
2	0.200	0.291	27	0.688	0.497
3	0.300	0.291	27	1.032	0.311

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.6. Frequency ANOVA.

ANOVA - freq_BNC

Cases	Sum of Squares	df	Mean Square	F	p
Classification	840.982	2	420.491	0.214	0.809
Residuals	52992.930	27	1962.701		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	7.303	19.813	27	0.369	0.715
2	5.630	19.813	27	0.284	0.778
3	12.933	19.813	27	0.653	0.519

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.7. Imagery ANOVA.

ANOVA - Imagery

Cases	Sum of Squares	df	Mean Square	F	p
Classification	1.999	2	1.000	0.638	0.536
Residuals	42.311	27	1.567		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	−0.609	0.560	27	−1.088	0.286
2	0.157	0.560	27	0.280	0.781
3	−0.452	0.560	27	−0.807	0.427

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.8. Concreteness ANOVA.

ANOVA - Concreteness

Cases	Sum of Squares	df	Mean Square	F	p
Classification	0.090	2	0.045	0.034	0.967
Residuals	35.611	27	1.319		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	−0.134	0.514	27	−0.261	0.796
2	0.068	0.514	27	0.132	0.896
3	−0.066	0.514	27	−0.129	0.899

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.9. Meaningfulness ANOVA.

ANOVA - Meaningfulness

Cases	Sum of Squares	df	Mean Square	F	p
Classification	0.124	2	0.062	0.325	0.725
Residuals	5.145	27	0.191		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	0.101	0.195	27	0.517	0.609
2	0.054	0.195	27	0.277	0.784
3	0.155	0.195	27	0.794	0.434

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.10. Familiarity ANOVA.

ANOVA - Familiarity

Cases	Sum of Squares	df	Mean Square	F	p
Classification	2.090	2	1.045	1.724	0.197
Residuals	16.362	27	0.606		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	0.148	0.348	27	0.425	0.674
2	0.471	0.348	27	1.353	0.187
3	0.619	0.348	27	1.778	0.087

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

A3.4.11. Emotionality ANOVA.

ANOVA - Emotionality

Cases	Sum of Squares	df	Mean Square	F	p
Classification	2.924	2	1.462	1.589	0.223
Residuals	24.839	27	0.920		

Note. Type III Sum of Squares

Contrast Tables

Custom Contrast - Classification

Comparison	Estimate	SE	df	t	p
1	0.171	0.429	27	0.399	0.693
2	0.560	0.429	27	1.306	0.203
3	0.731	0.429	27	1.704	0.100

Custom Contrast Coefficients - Classification

Classification	Comparison 1	Comparison 2	Comparison 3
NEG	-1	0	-1
NEU	1	-1	0
POS	0	1	1

Appendix 4. Statistical outputs.

A4.1. Statistical outputs for chapter 2.

A4.1.1. Descriptive statistics for regression models.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
AHS	86	100.0%	0	0.0%	86	100.0%
Total PCS	86	100.0%	0	0.0%	86	100.0%
Age	86	100.0%	0	0.0%	86	100.0%
Total Units	86	100.0%	0	0.0%	86	100.0%
eBAC (raw)	86	100.0%	0	0.0%	86	100.0%
eBAC (15% elimination)	86	100.0%	0	0.0%	86	100.0%
DehydrationSymptoms	86	100.0%	0	0.0%	86	100.0%
StressSymptoms	86	100.0%	0	0.0%	86	100.0%

Descriptives

			Statistic	Std. Error
AHS	Mean		4.1021	.12911
	95% Confidence Interval for Mean	Lower Bound	3.8454	
		Upper Bound	4.3588	
	5% Trimmed Mean		4.1025	
	Median		4.1111	
	Variance		1.434	
	Std. Deviation		1.19734	
	Minimum		1.89	
	Maximum		6.56	
	Range		4.67	
	Interquartile Range		1.72	
	Skewness		-.039	.260

	Kurtosis		-.860	.514
Total PCS	Mean		28.8140	1.25541
	95% Confidence Interval for Mean	Lower Bound	26.3179	
		Upper Bound	31.3101	
	5% Trimmed Mean		28.0129	
	Median		26.5000	
	Variance		135.541	
	Std. Deviation		11.64223	
	Minimum		13.00	
	Maximum		64.00	
	Range		51.00	
	Interquartile Range		16.25	
	Skewness		.865	.260
	Kurtosis		.643	.514
Age	Mean		25.93	.650
	95% Confidence Interval for Mean	Lower Bound	24.64	
		Upper Bound	27.22	
	5% Trimmed Mean		25.58	
	Median		25.00	
	Variance		36.324	
	Std. Deviation		6.027	
	Minimum		18	
	Maximum		46	
	Range		28	
	Interquartile Range		8	
	Skewness		.907	.260
	Kurtosis		.383	.514
Total Units	Mean		15.6244	.93217
		Lower Bound	13.7710	

	95% Confidence Interval for Mean	Upper Bound	17.4778	
	5% Trimmed Mean		14.9017	
	Median		13.4000	
	Variance		74.728	
	Std. Deviation		8.64456	
	Minimum		3.90	
	Maximum		44.50	
	Range		40.60	
	Interquartile Range		9.78	
	Skewness		1.332	.260
	Kurtosis		2.151	.514
eBAC (raw)	Mean		.2579	.01470
	95% Confidence Interval for Mean	Lower Bound	.2287	
		Upper Bound	.2871	
	5% Trimmed Mean		.2486	
	Median		.2244	
	Variance		.019	
	Std. Deviation		.13629	
	Minimum		.05	
	Maximum		.73	
	Range		.68	
	Interquartile Range		.16	
	Skewness		1.122	.260
	Kurtosis		1.250	.514
eBAC (15% elimination)	Mean		.1804	.01384
	95% Confidence Interval for Mean	Lower Bound	.1528	
		Upper Bound	.2079	
	5% Trimmed Mean		.1695	
	Median		.1444	

	Variance		.016	
	Std. Deviation		.12835	
	Minimum		.00	
	Maximum		.68	
	Range		.68	
	Interquartile Range		.15	
	Skewness		1.474	.260
	Kurtosis		2.492	.514
DehydrationSymptoms	Mean		5.3217	.12627
	95% Confidence Interval for Mean	Lower Bound	5.0707	
		Upper Bound	5.5728	
	5% Trimmed Mean		5.3531	
	Median		5.3333	
	Variance		1.371	
	Std. Deviation		1.17094	
	Minimum		2.33	
	Maximum		8.00	
	Range		5.67	
	Interquartile Range		1.75	
	Skewness		-.394	.260
	Kurtosis		-.287	.514
StressSymptoms	Mean		3.1977	.16479
	95% Confidence Interval for Mean	Lower Bound	2.8700	
		Upper Bound	3.5253	
	5% Trimmed Mean		3.1401	
	Median		3.0000	
	Variance		2.336	
	Std. Deviation		1.52824	
	Minimum		1.00	

	Maximum	7.00	
	Range	6.00	
	Interquartile Range	2.80	
	Skewness	.424	.260
	Kurtosis	-.817	.514

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AHS	.063	86	.200*	.975	86	.101
Total PCS	.117	86	.006	.935	86	.000
Age	.127	86	.002	.922	86	.000
Total Units	.119	86	.004	.896	86	.000
eBAC (raw)	.138	86	.000	.921	86	.000
eBAC (15% elimination)	.131	86	.001	.878	86	.000
DehydrationSymptoms	.126	86	.002	.972	86	.060
StressSymptoms	.141	86	.000	.948	86	.002

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

A4.1.2. Descriptive statistics for factor analysis.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Thirsty	86	100.0%	0	0.0%	86	100.0%
Tired	86	100.0%	0	0.0%	86	100.0%
Headache	86	100.0%	0	0.0%	86	100.0%
Dizziness/Faintness	86	100.0%	0	0.0%	86	100.0%
Loss of Appetite	86	100.0%	0	0.0%	86	100.0%
Stomach Ache	86	100.0%	0	0.0%	86	100.0%
Nausea	86	100.0%	0	0.0%	86	100.0%
Heart Racing	86	100.0%	0	0.0%	86	100.0%

Descriptives

			Statistic	Std. Error
Thirsty	Mean		5.31	.165
	95% Confidence Interval for Mean	Lower Bound	4.99	
		Upper Bound	5.64	
	5% Trimmed Mean		5.36	
	Median		5.00	
	Variance		2.336	
	Std. Deviation		1.528	
	Minimum		1	
	Maximum		8	
	Range		7	
	Interquartile Range		2	
	Skewness		-.407	.260
	Kurtosis		-.025	.514
Tired	Mean		5.94	.134

	95% Confidence Interval for Mean	Lower Bound	5.68	
		Upper Bound	6.21	
	5% Trimmed Mean		6.02	
	Median		6.00	
	Variance		1.538	
	Std. Deviation		1.240	
	Minimum		2	
	Maximum		8	
	Range		6	
	Interquartile Range		2	
	Skewness		-1.024	.260
	Kurtosis		1.604	.514
Headache	Mean		4.71	.222
	95% Confidence Interval for Mean	Lower Bound	4.27	
		Upper Bound	5.15	
	5% Trimmed Mean		4.73	
	Median		5.00	
	Variance		4.232	
	Std. Deviation		2.057	
	Minimum		1	
	Maximum		8	
	Range		7	
	Interquartile Range		3	
	Skewness		-.328	.260
	Kurtosis		-.890	.514
Dizziness/Faintness	Mean		3.22	.217
	95% Confidence Interval for Mean	Lower Bound	2.79	
		Upper Bound	3.65	
	5% Trimmed Mean		3.12	

	Median		3.00	
	Variance		4.033	
	Std. Deviation		2.008	
	Minimum		1	
	Maximum		8	
	Range		7	
	Interquartile Range		4	
	Skewness		.403	.260
	Kurtosis		-1.110	.514
Loss of Appetite	Mean		3.33	.224
	95% Confidence Interval for Mean	Lower Bound	2.88	
		Upper Bound	3.77	
	5% Trimmed Mean		3.21	
	Median		3.00	
	Variance		4.316	
	Std. Deviation		2.078	
	Minimum		1	
	Maximum		8	
	Range		7	
	Interquartile Range		4	
	Skewness		.511	.260
	Kurtosis		-.771	.514
Stomach Ache	Mean		3.06	.222
	95% Confidence Interval for Mean	Lower Bound	2.62	
		Upper Bound	3.50	
	5% Trimmed Mean		2.94	
	Median		2.00	
	Variance		4.220	
	Std. Deviation		2.054	

	Minimum		1	
	Maximum		8	
	Range		7	
	Interquartile Range		4	
	Skewness		.579	.260
	Kurtosis		-.929	.514
Nausea	Mean		3.66	.262
	95% Confidence Interval for Mean	Lower Bound	3.14	
		Upper Bound	4.18	
	5% Trimmed Mean		3.57	
	Median		3.00	
	Variance		5.920	
	Std. Deviation		2.433	
	Minimum		1	
	Maximum		8	
	Range		7	
	Interquartile Range		4	
	Skewness		.389	.260
	Kurtosis		-1.253	.514
Heart Racing	Mean		2.72	.226
	95% Confidence Interval for Mean	Lower Bound	2.27	
		Upper Bound	3.17	
	5% Trimmed Mean		2.57	
	Median		2.00	
	Variance		4.392	
	Std. Deviation		2.096	
	Minimum		1	
	Maximum		8	
	Range		7	

	Interquartile Range	4	
	Skewness	.859	.260
	Kurtosis	-.696	.514

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Thirsty	.174	86	.000	.945	86	.001
Tired	.240	86	.000	.880	86	.000
Headache	.172	86	.000	.933	86	.000
Dizziness/Faintness	.217	86	.000	.880	86	.000
Loss of Appetite	.180	86	.000	.896	86	.000
Stomach Ache	.220	86	.000	.855	86	.000
Nausea	.206	86	.000	.871	86	.000
Heart Racing	.271	86	.000	.788	86	.000

a. Lilliefors Significance Correction

A4.1.3 Statistical output for factor analysis.

Correlation Matrix[a]

		Thirsty	Tired	Headache	Dizziness/Faintness	Loss of Appetite	Stomach Ache	Nausea	Heart Racing
Correlation	Thirsty	1.000	.239	.276	-.031	.112	.084	.140	.226
	Tired	.239	1.000	.312	.156	.176	.223	.192	.161
	Headache	.276	.312	1.000	.241	.344	.182	.208	.183
	Dizziness/Faintness	-.031	.156	.241	1.000	.369	.251	.497	.409
	Loss of Appetite	.112	.176	.344	.369	1.000	.211	.473	.305
	Stomach Ache	.084	.223	.182	.251	.211	1.000	.529	.362
	Nausea	.140	.192	.208	.497	.473	.529	1.000	.434
	Heart Racing	.226	.161	.183	.409	.305	.362	.434	1.000
Sig. (1-tailed)	Thirsty		.013	.005	.390	.152	.221	.100	.018
	Tired	.013		.002	.075	.052	.020	.038	.069
	Headache	.005	.002		.013	.001	.047	.027	.046
	Dizziness/Faintness	.390	.075	.013		.000	.010	.000	.000
	Loss of Appetite	.152	.052	.001	.000		.026	.000	.002
	Stomach Ache	.221	.020	.047	.010	.026		.000	.000
	Nausea	.100	.038	.027	.000	.000	.000		.000
	Heart Racing	.018	.069	.046	.000	.002	.000	.000	

a. Determinant = .182

Inverse of Correlation Matrix

	Thirsty	Tired	Headache	Dizziness/Faintness	Loss of Appetite	Stomach Ache	Nausea	Heart Racing
Thirsty	1.212	-.198	-.288	.299	.032	.105	-.166	-.288
Tired	-.198	1.183	-.252	-.074	-.036	-.176	-.004	.006
Headache	-.288	-.252	1.315	-.209	-.348	-.116	.126	.044
Dizziness/Faintness	.299	-.074	-.209	1.543	-.152	.120	-.570	-.399
Loss of Appetite	.032	-.036	-.348	-.152	1.451	.142	-.556	-.128
Stomach Ache	.105	-.176	-.116	.120	.142	1.489	-.750	-.280
Nausea	-.166	-.004	.126	-.570	-.556	-.750	2.022	-.188
Heart Racing	-.288	.006	.044	-.399	-.128	-.280	-.188	1.441

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.722
Bartlett's Test of Sphericity	Approx. Chi-Square	138.762
	df	28
	Sig.	.000

Anti-image Matrices

	Thirsty	Tired	Headache	Dizziness/Faintness	Loss of Appetite	Stomach Ache	Nausea	Heart Racing

Anti-image Covariance	Thirsty	.825	-.138	-.181	.160	.018	.058	-.068	-.165
	Tired	-.138	.846	-.162	-.041	-.021	-.100	-.002	.004
	Headache	-.181	-.162	.760	-.103	-.182	-.059	.047	.023
	Dizziness/Faintness	.160	-.041	-.103	.648	-.068	.052	-.183	-.179
	Loss of Appetite	.018	-.021	-.182	-.068	.689	.066	-.190	-.061
	Stomach Ache	.058	-.100	-.059	.052	.066	.671	-.249	-.131
	Nausea	-.068	-.002	.047	-.183	-.190	-.249	.495	-.064
	Heart Racing	-.165	.004	.023	-.179	-.061	-.131	-.064	.694
Anti-image Correlation	Thirsty	.539[a]	-.165	-.228	.219	.024	.078	-.106	-.218
	Tired	-.165	.783[a]	-.202	-.055	-.027	-.132	-.002	.005
	Headache	-.228	-.202	.706[a]	-.147	-.252	-.083	.077	.032
	Dizziness/Faintness	.219	-.055	-.147	.725[a]	-.101	.079	-.323	-.267
	Loss of Appetite	.024	-.027	-.252	-.101	.770[a]	.096	-.325	-.089
	Stomach Ache	.078	-.132	-.083	.079	.096	.693[a]	-.432	-.191
	Nausea	-.106	-.002	.077	-.323	-.325	-.432	.709[a]	-.110
	Heart Racing	-.218	.005	.032	-.267	-.089	-.191	-.110	.796[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

	Initial	Extraction
Thirsty	.175	.230
Tired	.154	.243
Headache	.240	.395
Dizziness/Faintness	.352	.377
Loss of Appetite	.311	.318
Stomach Ache	.329	.295
Nausea	.505	.727
Heart Racing	.306	.337

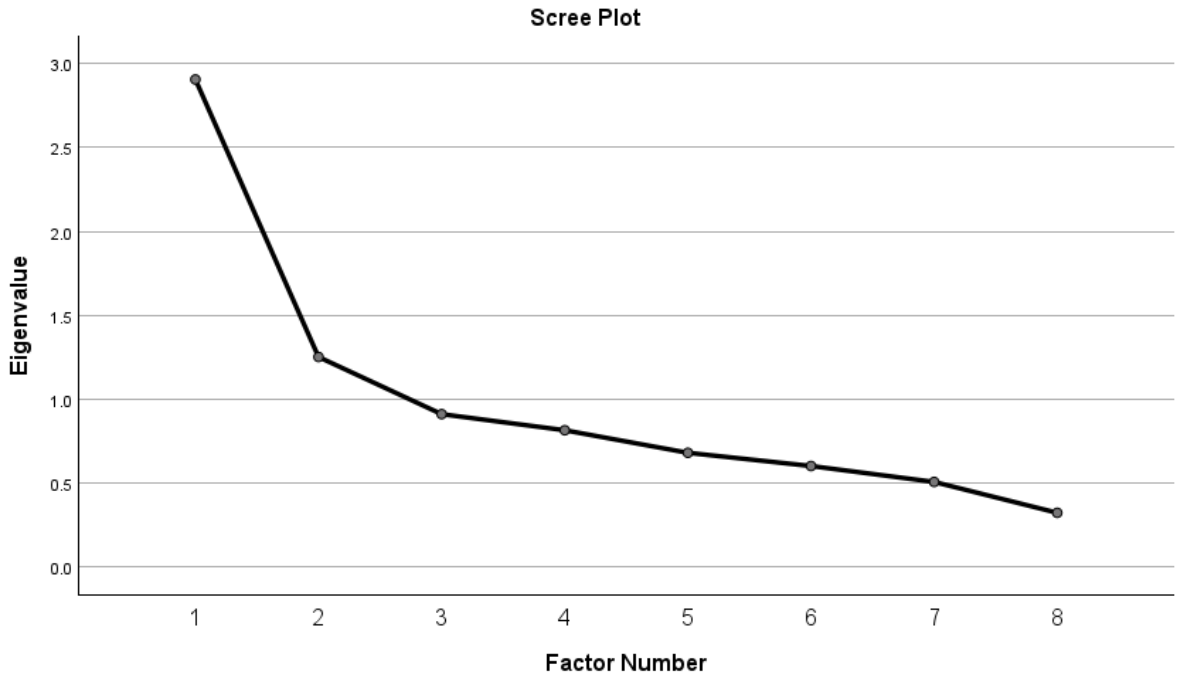
Extraction Method: Principal Axis Factoring.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.906	36.329	36.329	2.332	29.147	29.147	2.239
2	1.252	15.653	51.982	.589	7.367	36.514	1.317
3	.911	11.393	63.375				
4	.816	10.195	73.570				
5	.681	8.514	82.084				
6	.602	7.530	89.613				
7	.507	6.343	95.956				
8	.323	4.044	100.000				

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.



Factor Matrix[a]

	Factor	
	1	2
Thirsty	.260	.402
Tired	.365	.331
Headache	.459	.429
Dizziness/Faintness	.582	-.197
Loss of Appetite	.564	.016
Stomach Ache	.533	-.105
Nausea	.804	-.284
Heart Racing	.578	-.056

Extraction Method: Principal Axis Factoring.

a. 2 factors extracted. 16 iterations required.

Reproduced Correlations

		Thirsty	Tired	Headache	Dizziness/Faintness	Loss of Appetite	Stomach Ache	Nausea	Heart Racing
Reproduced Correlation	Thirsty	.230[a]	.228	.292	.072	.153	.097	.095	.128
	Tired	.228	.243[a]	.310	.147	.211	.160	.199	.192
	Headache	.292	.310	.395[a]	.183	.266	.200	.247	.241
	Dizziness/Faintness	.072	.147	.183	.377[a]	.325	.331	.524	.347
	Loss of Appetite	.153	.211	.266	.325	.318[a]	.299	.448	.325
	Stomach Ache	.097	.160	.200	.331	.299	.295[a]	.458	.314
	Nausea	.095	.199	.247	.524	.448	.458	.727[a]	.480
	Heart Racing	.128	.192	.241	.347	.325	.314	.480	.337[a]
Residual[b]	Thirsty		.011	-.016	-.103	-.041	-.013	.045	.098
	Tired	.011		.002	.009	-.035	.063	-.007	-.031
	Headache	-.016	.002		.058	.079	-.018	-.039	-.058
	Dizziness/Faintness	-.103	.009	.058		.044	-.080	-.027	.062
	Loss of Appetite	-.041	-.035	.079	.044		-.088	.025	-.020
	Stomach Ache	-.013	.063	-.018	-.080	-.088		.071	.048
	Nausea	.045	-.007	-.039	-.027	.025	.071		-.047
	Heart Racing	.098	-.031	-.058	.062	-.020	.048	-.047	

Extraction Method: Principal Axis Factoring.; a. Reproduced communalities, b. Residuals are computed between observed and reproduced correlations. There are 10 (35.0%) nonredundant residuals with absolute values greater than 0.05.

Pattern Matrix[a]

	Factor	
	1	2
Thirsty	-.069	.506
Tired	.072	.456
Headache	.082	.587
Dizziness/Faintness	.641	-.065
Loss of Appetite	.470	.164
Stomach Ache	.532	.024
Nausea	.894	-.102
Heart Racing	.535	.088

Extraction Method: Principal Axis Factoring.

Rotation Method: Oblimin with Kaiser Normalization.[a]

a. Rotation converged in 4 iterations.

Structure Matrix

	Factor	
	1	2
Thirsty	.160	.475
Tired	.278	.489
Headache	.348	.624
Dizziness/Faintness	.612	.225
Loss of Appetite	.545	.377
Stomach Ache	.543	.264
Nausea	.848	.303
Heart Racing	.575	.331

Extraction Method: Principal Axis Factoring.

Rotation Method: Oblimin with Kaiser Normalization.

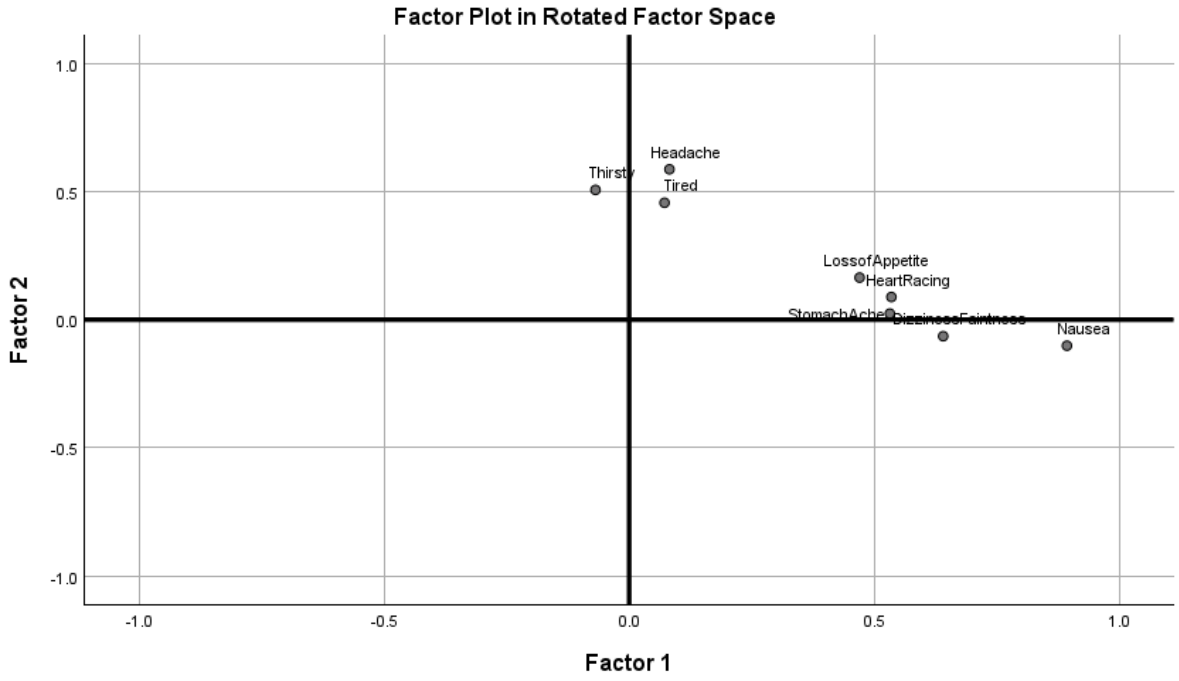
Factor Correlation Matrix

Factor	1	2
1	1.000	.452

2	.452	1.000

Extraction Method: Principal Axis Factoring.

Rotation Method: Oblimin with Kaiser Normalization.



Factor Score Coefficient Matrix

	Factor	
	1	2
Thirsty	-.009	.261
Tired	.051	.251
Headache	.092	.404
Dizziness/Faintness	.169	-.006
Loss of Appetite	.104	.120
Stomach Ache	.090	.046
Nausea	.563	.011
Heart Racing	.175	.101

Extraction Method: Principal Axis Factoring.

Rotation Method: Oblimin with Kaiser Normalization.

Factor Scores Method: Regression.

Factor Score Covariance Matrix

Factor	1	2
1	1.321	1.134
2	1.134	1.082

Extraction Method: Principal Axis Factoring.

Rotation Method: Oblimin with Kaiser Normalization.

Factor Scores Method: Regression.

A4.1.4. Statistical output for regression models.

A4.1.4.1. Model 1.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Age, Total Units, Total PCS, SexDummy[b]	.	Enter

a. Dependent Variable: AHS

b. All requested variables entered.

Model Summary[b]

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.432[a]	.187	.147	1.10598	.187	4.656	4	81	.002	1.789

a. Predictors: (Constant), Age, Total Units, Total PCS, SexDummy

b. Dependent Variable: AHS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.779	4	5.695	4.656	.002[b]
	Residual	99.078	81	1.223		
	Total	121.857	85			

a. Dependent Variable: AHS

b. Predictors: (Constant), Age, Total Units, Total PCS, SexDummy

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.955	.709		4.170	.000	1.545	4.365					
	Total Units	.033	.014	.239	2.342	.022	.005	.061	.175	.252	.235	.967	1.034
	SexDummy	.366	.250	.151	1.460	.148	-.133	.864	.186	.160	.146	.939	1.065
	Total PCS	.032	.011	.314	3.038	.003	.011	.053	.326	.320	.304	.940	1.063
	Age	-.020	.020	-.100	-.991	.324	-.060	.020	-.148	-.109	-.099	.981	1.019

a. Dependent Variable: AHS

Coefficient Correlations[a]

Model			Age	Total Units	Total PCS	SexDummy
1	Correlations	Age	1.000	.008	.106	.067
		Total Units	.008	1.000	.098	.132
		Total PCS	.106	.098	1.000	-.175
		SexDummy	.067	.132	-.175	1.000
	Covariances	Age	.000	2.388E-6	2.265E-5	.000
		Total Units	2.388E-6	.000	1.475E-5	.000
		Total PCS	2.265E-5	1.475E-5	.000	.000
		SexDummy	.000	.000	.000	.063

a. Dependent Variable: AHS

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Total Units	SexDummy	Total PCS	Age
1	1	4.300	1.000	.00	.01	.01	.01	.00
	2	.396	3.296	.00	.14	.68	.00	.00
	3	.184	4.830	.00	.57	.27	.23	.01
	4	.101	6.539	.02	.19	.00	.57	.20
	5	.019	14.956	.97	.09	.03	.19	.78

a. Dependent Variable: AHS

Casewise Diagnostics[a]

Case Number	Std. Residual	AHS	Predicted Value	Residual
28	2.331	6.56	3.9775	2.57801

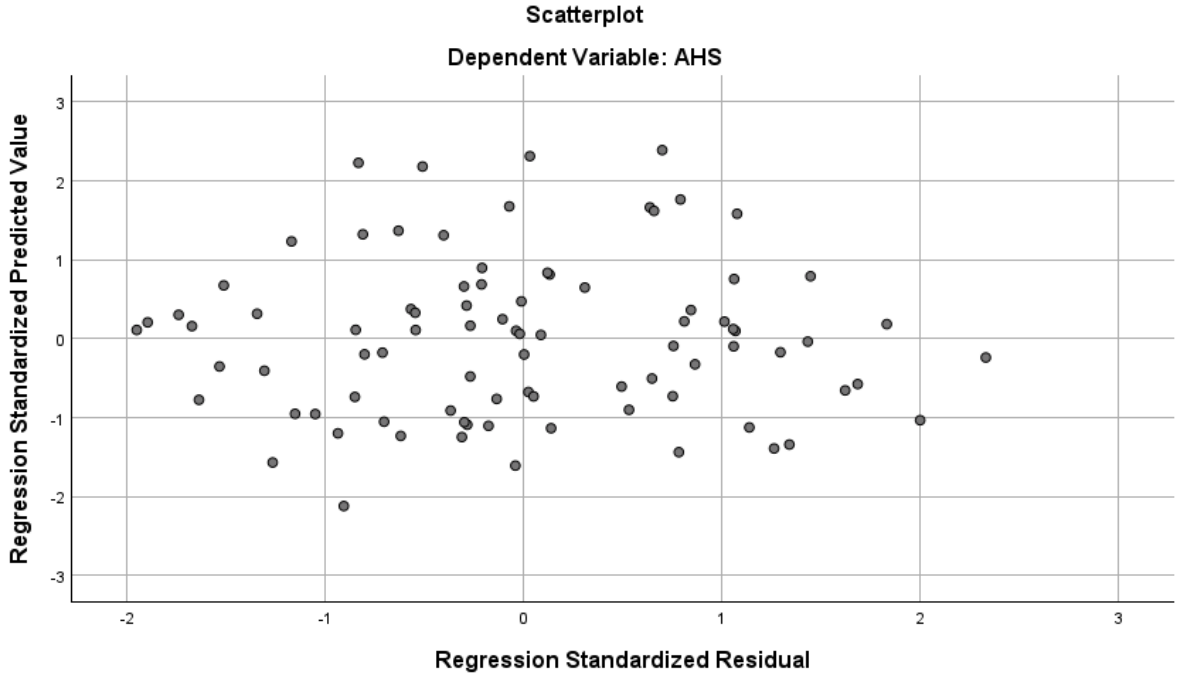
a. Dependent Variable: AHS

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.0031	5.3382	4.1021	.51767	86
Std. Predicted Value	-2.123	2.388	.000	1.000	86
Standard Error of Predicted Value	.164	.456	.258	.068	86
Adjusted Predicted Value	3.0951	5.4433	4.1062	.52483	86
Residual	-2.15830	2.57801	.00000	1.07964	86
Std. Residual	-1.951	2.331	.000	.976	86
Stud. Residual	-2.110	2.361	-.002	1.008	86
Deleted Residual	-2.52249	2.64410	-.00410	1.15110	86
Stud. Deleted Residual	-2.157	2.431	-.001	1.017	86
Mahal. Distance	.892	13.449	3.953	2.876	86
Cook's Distance	.000	.150	.013	.022	86
Centered Leverage Value	.010	.158	.047	.034	86

a. Dependent Variable: AHS

Charts


Scatterplot
Dependent Variable: AHS
Regression Standardized Predicted Value
Regression Standardized Residual
3
2
1
0
-1
-2
-3
-2
-1
0
1
2
3

A4.1.4.2. Model 2.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Age, Total PCS, eBAC (15% elimination)[b]	.	Enter

a. Dependent Variable: AHS

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.397[a]	.158	.127	1.11879	.158	5.118	3	82	.003	1.771

a. Predictors: (Constant), Age, Total PCS, eBAC (15% elimination)

b. Dependent Variable: AHS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.218	3	6.406	5.118	.003[b]
	Residual	102.639	82	1.252		
	Total	121.857	85			

a. Dependent Variable: AHS

b. Predictors: (Constant), Age, Total PCS, eBAC (15% elimination)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	3.255	.695		4.682	.000	1.872	4.637					
	eBAC (15% elimination)	1.867	.954	.200	1.957	.054	-.030	3.765	.209	.211	.198	.982	1.018
	Total PCS	.033	.011	.317	3.106	.003	.012	.054	.326	.324	.315	.985	1.015
	Age	-.017	.020	-.083	-.809	.421	-.057	.024	-.148	-.089	-.082	.968	1.033

a. Dependent Variable: AHS

Coefficient Correlations[a]

Model			Age	Total PCS	eBAC (15% elimination)
1	Correlations	Age	1.000	.123	.133
		Total PCS	.123	1.000	.021
		eBAC (15% elimination)	.133	.021	1.000
	Covariances	Age	.000	2.636E-5	.003
		Total PCS	2.636E-5	.000	.000
		eBAC (15% elimination)	.003	.000	.910

a. Dependent Variable: AHS

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	eBAC (15% elimination)	Total PCS	Age
1	1	3.579	1.000	.00	.02	.01	.00
	2	.288	3.527	.00	.88	.05	.01
	3	.113	5.618	.02	.01	.73	.14
	4	.019	13.559	.98	.09	.20	.84

a. Dependent Variable: AHS

Casewise Diagnostics[a]

Case Number	Std. Residual	AHS	Predicted Value	Residual
12	2.091	5.78	3.4387	2.33909
28	2.388	6.56	3.8841	2.67148
71	-2.078	2.11	4.4358	-2.32471

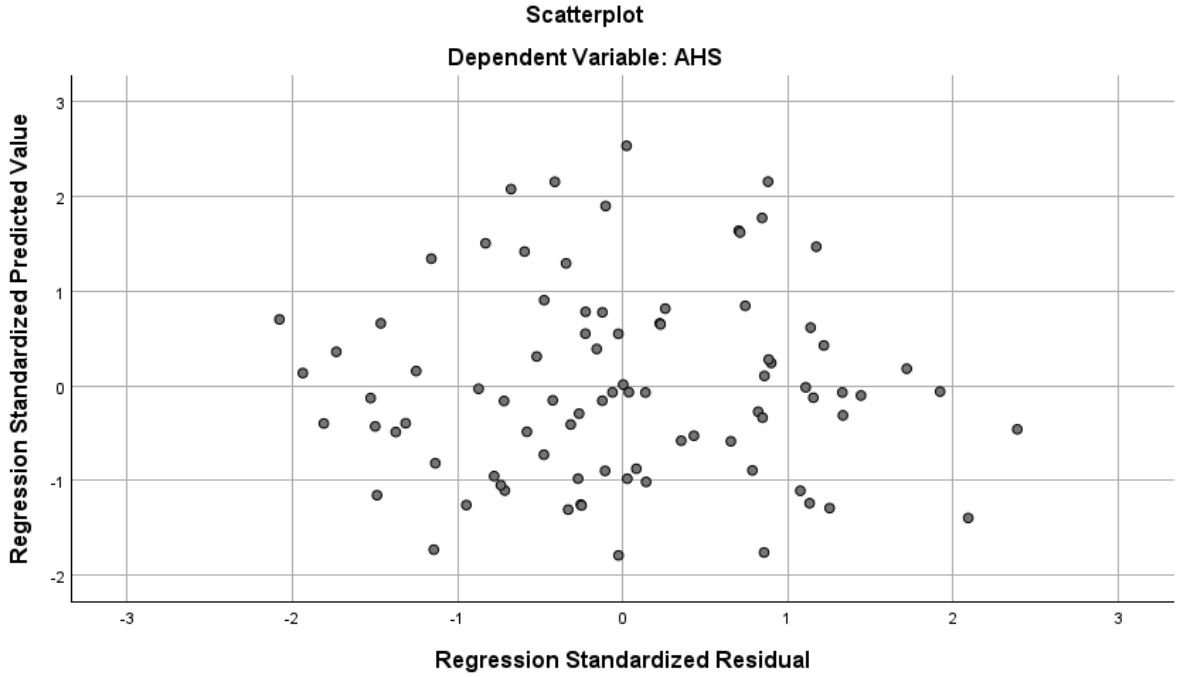
a. Dependent Variable: AHS

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.2511	5.3075	4.1021	.47549	86
Std. Predicted Value	-1.790	2.535	.000	1.000	86
Standard Error of Predicted Value	.128	.494	.229	.076	86
Adjusted Predicted Value	3.1011	5.3034	4.1076	.48329	86
Residual	-2.32471	2.67148	.00000	1.09887	86
Std. Residual	-2.078	2.388	.000	.982	86
Stud. Residual	-2.112	2.405	-.002	1.006	86
Deleted Residual	-2.50867	2.70985	-.00553	1.15326	86
Stud. Deleted Residual	-2.159	2.479	-.002	1.015	86
Mahal. Distance	.120	15.602	2.965	2.917	86
Cook's Distance	.000	.171	.013	.022	86
Centered Leverage Value	.001	.184	.035	.034	86

a. Dependent Variable: AHS

Charts


Scatterplot
Dependent Variable: AHS
Regression Standardized Predicted Value
Regression Standardized Residual
3
2
1
0
-1
-2
-3
-2
-1
0
1
2
3

A4.1.4.3. Model 3.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Age, eBAC (raw), Total PCS[b]	.	Enter

a. Dependent Variable: AHS

b. All requested variables entered.

Model Summary[b]

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.429[a]	.184	.154	1.10119	.184	6.163	3	82	.001	1.802

a. Predictors: (Constant), Age, eBAC (raw), Total PCS

b. Dependent Variable: AHS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.422	3	7.474	6.163	.001[b]
	Residual	99.435	82	1.213		
	Total	121.857	85			

a. Dependent Variable: AHS

b. Predictors: (Constant), Age, eBAC (raw), Total PCS

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	3.005	.700		4.292	.000	1.612	4.398					
	eBAC (raw)	2.262	.881	.257	2.568	.012	.510	4.014	.260	.273	.256	.990	1.010
	Total PCS	.033	.010	.321	3.189	.002	.012	.054	.326	.332	.318	.984	1.016
	Age	-.017	.020	-.085	-.839	.404	-.057	.023	-.148	-.092	-.084	.976	1.025

a. Dependent Variable: AHS

Coefficient Correlations[a]

Model			Age	eBAC (raw)	Total PCS
1	Correlations	Age	1.000	.098	.123
		eBAC (raw)	.098	1.000	.030
		Total PCS	.123	.030	1.000
	Covariances	Age	.000	.002	2.555E-5
		eBAC (raw)	.002	.776	.000
		Total PCS	2.555E-5	.000	.000

a. Dependent Variable: AHS

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	eBAC (raw)	Total PCS	Age
1	1	3.678	1.000	.00	.01	.01	.00
	2	.193	4.369	.00	.80	.16	.01
	3	.110	5.785	.02	.08	.63	.17
	4	.019	13.884	.98	.11	.20	.81

a. Dependent Variable: AHS

Casewise Diagnostics[a]

Case Number	Std. Residual	AHS	Predicted Value	Residual
12	2.095	5.78	3.4705	2.30725
28	2.411	6.56	3.9011	2.65451
31	-2.022	2.00	4.2262	-2.22617
71	-2.012	2.11	4.3268	-2.21571

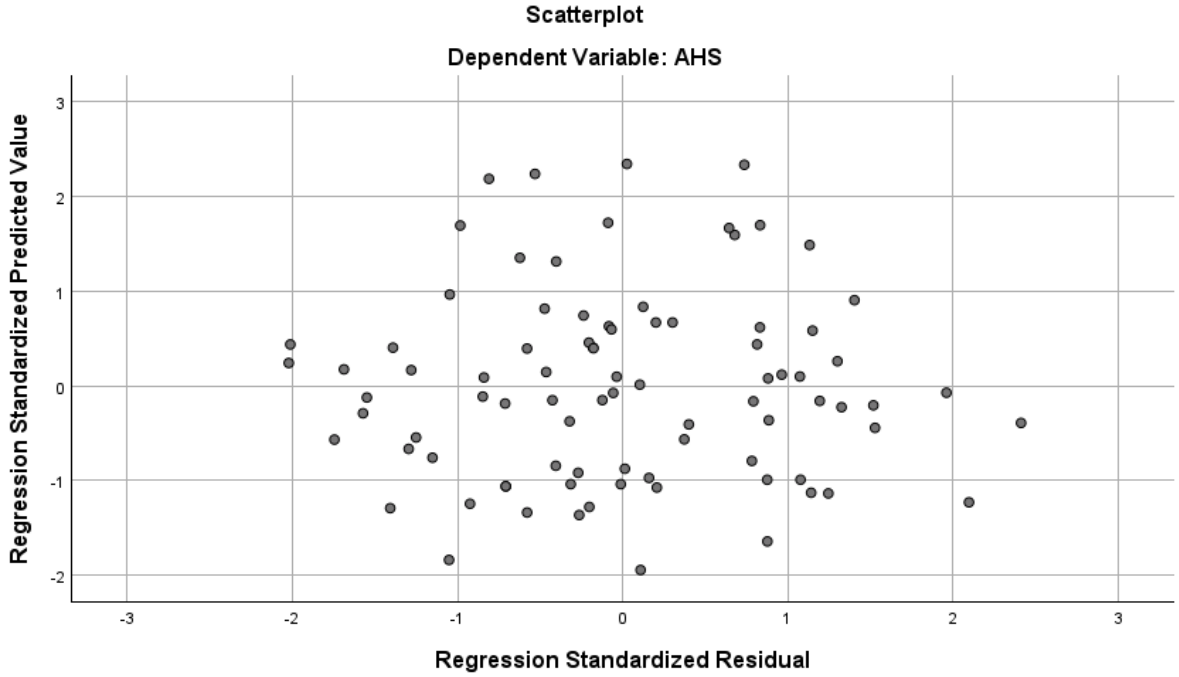
a. Dependent Variable: AHS

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.1035	5.3058	4.1021	.51360	86
Std. Predicted Value	-1.944	2.344	.000	1.000	86
Standard Error of Predicted Value	.128	.442	.226	.073	86
Adjusted Predicted Value	3.0928	5.3961	4.1066	.51933	86
Residual	-2.22617	2.65451	.00000	1.08159	86
Std. Residual	-2.022	2.411	.000	.982	86
Stud. Residual	-2.140	2.428	-.002	1.006	86
Deleted Residual	-2.49563	2.69192	-.00456	1.13503	86
Stud. Deleted Residual	-2.189	2.504	-.002	1.015	86
Mahal. Distance	.162	12.682	2.965	2.747	86
Cook's Distance	.000	.139	.013	.019	86
Centered Leverage Value	.002	.149	.035	.032	86

a. Dependent Variable: AHS

Charts


Scatterplot
Dependent Variable: AHS
Regression Standardized Predicted Value
Regression Standardized Residual
3
2
1
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-1
-2
-3
-2
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1
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3

A4.1.4.4. Model 4.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Age, eBAC (raw), Total PCS[b]	.	Enter

a. Dependent Variable: DehydrationSymptoms

b. All requested variables entered.

Model Summary[b]

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.307[a]	.094	.061	1.13461	.094	2.844	3	82	.043	1.612

a. Predictors: (Constant), Age, eBAC (raw), Total PCS

b. Dependent Variable: DehydrationSymptoms

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.983	3	3.661	2.844	.043[b]
	Residual	105.561	82	1.287		
	Total	116.544	85			

a. Dependent Variable: DehydrationSymptoms

b. Predictors: (Constant), Age, eBAC (raw), Total PCS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	4.288	.721		5.943	.000	2.852	5.723					
	eBAC (raw)	1.876	.907	.218	2.067	.042	.070	3.681	.216	.223	.217	.990	1.010
	Total PCS	.022	.011	.216	2.039	.045	.001	.043	.214	.220	.214	.984	1.016
	Age	-.003	.021	-.015	-.141	.888	-.044	.038	-.062	-.016	-.015	.976	1.025

a. Dependent Variable: DehydrationSymptoms

Coefficient Correlations[a]

Model			Age	eBAC (raw)	Total PCS
1	Correlations	Age	1.000	.098	.123
		eBAC (raw)	.098	1.000	.030
		Total PCS	.123	.030	1.000
	Covariances	Age	.000	.002	2.713E-5
		eBAC (raw)	.002	.824	.000
		Total PCS	2.713E-5	.000	.000

a. Dependent Variable: DehydrationSymptoms

Collinearity Diagnostics[a]

				Variance Proportions			
Model	Dimension	Eigenvalue	Condition Index	(Constant)	eBAC (raw)	Total PCS	Age
1	1	3.678	1.000	.00	.01	.01	.00
	2	.193	4.369	.00	.80	.16	.01
	3	.110	5.785	.02	.08	.63	.17
	4	.019	13.884	.98	.11	.20	.81

a. Dependent Variable: DehydrationSymptoms

Casewise Diagnostics[a]

Case Number	Std. Residual	DehydrationSymptoms	Predicted Value	Residual
23	2.081	7.33	4.9724	2.36088
31	-2.265	3.00	5.5694	-2.56941
41	-2.335	3.00	5.6493	-2.64927
49	-2.188	2.33	4.8162	-2.48284
68	-2.001	3.00	5.2708	-2.27080

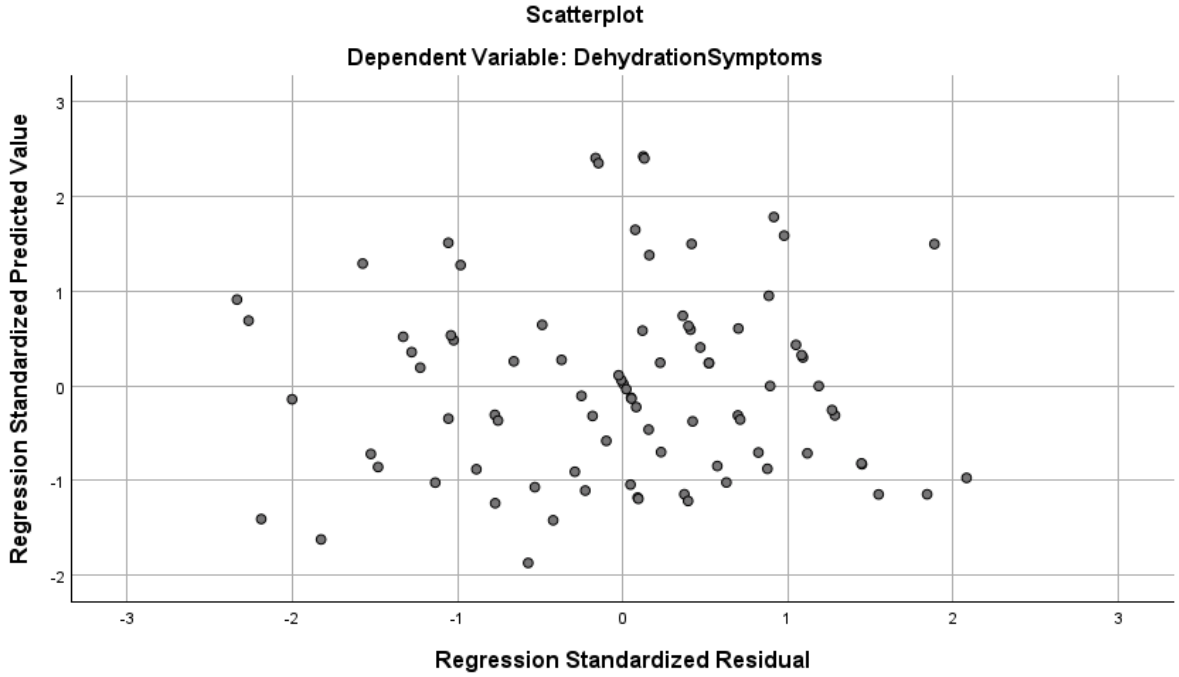
a. Dependent Variable: DehydrationSymptoms

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	4.6496	6.1929	5.3217	.35946	86
Std. Predicted Value	-1.870	2.424	.000	1.000	86
Standard Error of Predicted Value	.132	.455	.233	.075	86
Adjusted Predicted Value	4.5511	6.2223	5.3223	.36718	86
Residual	-2.64927	2.36088	.00000	1.11440	86
Std. Residual	-2.335	2.081	.000	.982	86
Stud. Residual	-2.398	2.110	.000	1.008	86
Deleted Residual	-2.88042	2.44889	-.00057	1.17357	86
Stud. Deleted Residual	-2.471	2.156	-.002	1.019	86
Mahal. Distance	.162	12.682	2.965	2.747	86
Cook's Distance	.000	.174	.013	.028	86
Centered Leverage Value	.002	.149	.035	.032	86

a. Dependent Variable: DehydrationSymptoms

Charts


Scatterplot
Dependent Variable: DehydrationSymptoms
Regression Standardized Predicted Value
Regression Standardized Residual
3
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-1
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-2
-1
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1
2
3

A4.1.4.5. Model 5.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Age, eBAC (raw), Total PCS[b]	.	Enter

a. Dependent Variable: StressSymptoms

b. All requested variables entered.

Model Summary[b]

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.398[a]	.158	.128	1.42748	.158	5.141	3	82	.003	1.906

a. Predictors: (Constant), Age, eBAC (raw), Total PCS

b. Dependent Variable: StressSymptoms

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.427	3	10.476	5.141	.003[b]
	Residual	167.092	82	2.038		
	Total	198.520	85			

a. Dependent Variable: StressSymptoms

b. Predictors: (Constant), Age, eBAC (raw), Total PCS

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.323	.908		2.559	.012	.517	4.129					
	eBAC (raw)	2.258	1.142	.201	1.978	.051	-.013	4.529	.208	.213	.200	.990	1.010
	Total PCS	.039	.013	.299	2.931	.004	.013	.066	.311	.308	.297	.984	1.016
	Age	-.032	.026	-.128	-1.245	.217	-.084	.019	-.183	-.136	-.126	.976	1.025

a. Dependent Variable: StressSymptoms

Coefficient Correlations[a]

Model			Age	eBAC (raw)	Total PCS
1	Correlations	Age	1.000	.098	.123
		eBAC (raw)	.098	1.000	.030
		Total PCS	.123	.030	1.000
	Covariances	Age	.001	.003	4.294E-5
		eBAC (raw)	.003	1.304	.000
		Total PCS	4.294E-5	.000	.000

a. Dependent Variable: StressSymptoms

Collinearity Diagnostics[a]

				Variance Proportions			
Model	Dimension	Eigenvalue	Condition Index	(Constant)	eBAC (raw)	Total PCS	Age
1	1	3.678	1.000	.00	.01	.01	.00
	2	.193	4.369	.00	.80	.16	.01
	3	.110	5.785	.02	.08	.63	.17
	4	.019	13.884	.98	.11	.20	.81

a. Dependent Variable: StressSymptoms

Casewise Diagnostics[a]

Case Number	Std. Residual	StressSymptoms	Predicted Value	Residual
28	2.837	7.00	2.9497	4.05026
43	2.015	6.00	3.1235	2.87650

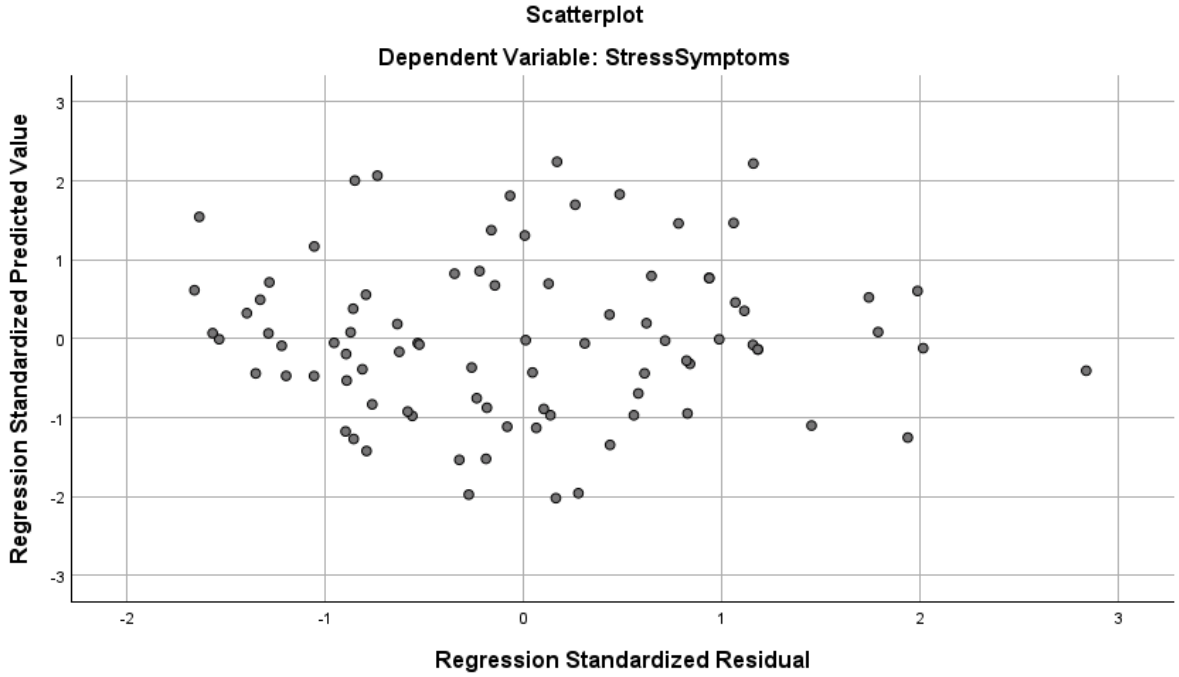
a. Dependent Variable: StressSymptoms

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.9679	4.5598	3.1977	.60805	86
Std. Predicted Value	-2.022	2.240	.000	1.000	86
Standard Error of Predicted Value	.166	.572	.293	.095	86
Adjusted Predicted Value	1.9280	4.6479	3.2031	.61398	86
Residual	-2.36998	4.05026	.00000	1.40207	86
Std. Residual	-1.660	2.837	.000	.982	86
Stud. Residual	-1.732	2.857	-.002	1.005	86
Deleted Residual	-2.61784	4.10735	-.00541	1.46910	86
Stud. Deleted Residual	-1.754	2.993	.001	1.016	86
Mahal. Distance	.162	12.682	2.965	2.747	86
Cook's Distance	.000	.106	.012	.018	86
Centered Leverage Value	.002	.149	.035	.032	86

a. Dependent Variable: StressSymptoms

Charts


Scatterplot
Dependent Variable: StressSymptoms
Regression Standardized Predicted Value
Regression Standardized Residual
3
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-1
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A4.1.5. Statistical output for bootstrapped regression models.

A4.1.5.1. Model 3.

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	2000
Confidence Interval Level	95.0%
Confidence Interval Type	Bias-corrected and accelerated (BCa)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Age, eBAC (raw), Total PCS[b]	.	Enter

a. Dependent Variable: AHS

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.429[a]	.184	.154	1.10119	.184	6.163	3	82	.001	1.802

a. Predictors: (Constant), Age, eBAC (raw), Total PCS

b. Dependent Variable: AHS

Bootstrap for Model Summary

Model	Durbin-Watson	Bootstrap[a]			
				BCa 95% Confidence Interval	
		Bias	Std. Error	Lower	Upper
1	1.802	-.594	.184	.	.

a. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.422	3	7.474	6.163	.001[b]
	Residual	99.435	82	1.213		
	Total	121.857	85			

a. Dependent Variable: AHS

b. Predictors: (Constant), Age, eBAC (raw), Total PCS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	3.005	.700		4.292	.000	1.612	4.398					
	eBAC (raw)	2.262	.881	.257	2.568	.012	.510	4.014	.260	.273	.256	.990	1.010
	Total PCS	.033	.010	.321	3.189	.002	.012	.054	.326	.332	.318	.984	1.016
	Age	-.017	.020	-.085	-.839	.404	-.057	.023	-.148	-.092	-.084	.976	1.025

a. Dependent Variable: AHS

Bootstrap for Coefficients

Model		B	Bootstrap[a]				
						BCa 95% Confidence Interval	
			Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
1	(Constant)	3.005	.009	.725	.000	1.612	4.491
	eBAC (raw)	2.262	.027	.959	.022	.483	4.280
	Total PCS	.033	.000	.009	.000	.015	.051
	Age	-.017	.000	.020	.401	-.058	.021

a. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	eBAC (raw)	Total PCS	Age
1	1	3.678	1.000	.00	.01	.01	.00
	2	.193	4.369	.00	.80	.16	.01
	3	.110	5.785	.02	.08	.63	.17
	4	.019	13.884	.98	.11	.20	.81

a. Dependent Variable: AHS

Casewise Diagnostics[a]

Case Number	Std. Residual	AHS	Predicted Value	Residual
12	2.095	5.78	3.4705	2.30725
28	2.411	6.56	3.9011	2.65451
31	-2.022	2.00	4.2262	-2.22617
71	-2.012	2.11	4.3268	-2.21571

a. Dependent Variable: AHS

Residuals Statistics[a]

			Bootstrap[b]			
					BCa 95% Confidence Interval	
		Statistic	Bias	Std. Error	Lower	Upper
Predicted Value	Minimum	3.1035				
	Maximum	5.3058				
	Mean	4.1021	-.0032	.1267	3.8682	4.3282
	Std. Deviation	.51360	.02422	.10343	.27054	.79001
	N	86	0	0	.	.
Residual	Minimum	-2.22617				
	Maximum	2.65451				
	Mean	.00000	.00000	.00000	.00000	.00000
	Std. Deviation	1.08159	-.03103	.07062	.97992	1.12116
	N	86	0	0	.	.
Std. Predicted Value	Minimum	-1.944				
	Maximum	2.344				
	Mean	.000	.000	.000	.000	.000
	Std. Deviation	1.000	.000	.000	1.000	1.000
	N	86	0	0	.	.

Std. Residual	Minimum	-2.022				
	Maximum	2.411				
	Mean	.000	.000	.000	.000	.000
	Std. Deviation	.982	.000	.000	.982	.982
	N	86	0	0	.	.

a. Dependent Variable: AHS

b. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

A4.1.5.2. Model 4.

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	2000
Confidence Interval Level	95.0%
Confidence Interval Type	Bias-corrected and accelerated (BCa)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Age, eBAC (raw), Total PCS[b]	.	Enter

a. Dependent Variable: DehydrationSymptoms

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.307[a]	.094	.061	1.13461	.094	2.844	3	82	.043	1.612

a. Predictors: (Constant), Age, eBAC (raw), Total PCS

b. Dependent Variable: DehydrationSymptoms

Bootstrap for Model Summary

Model	Durbin-Watson	Bootstrap[a]			
				BCa 95% Confidence Interval	
		Bias	Std. Error	Lower	Upper
1	1.612	-.418	.185	.807	1.643

a. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.983	3	3.661	2.844	.043[b]
	Residual	105.561	82	1.287		
	Total	116.544	85			

a. Dependent Variable: DehydrationSymptoms

b. Predictors: (Constant), Age, eBAC (raw), Total PCS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	4.288	.721		5.943	.000	2.852	5.723					
	eBAC (raw)	1.876	.907	.218	2.067	.042	.070	3.681	.216	.223	.217	.990	1.010
	Total PCS	.022	.011	.216	2.039	.045	.001	.043	.214	.220	.214	.984	1.016
	Age	-.003	.021	-.015	-.141	.888	-.044	.038	-.062	-.016	-.015	.976	1.025

a. Dependent Variable: DehydrationSymptoms

Bootstrap for Coefficients

Model			Bootstrap[a]				
						BCa 95% Confidence Interval	
		B	Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
1	(Constant)	4.288	.046	.658	.000	2.975	5.840
	eBAC (raw)	1.876	.032	.950	.046	.049	3.812
	Total PCS	.022	.000	.010	.026	.003	.040
	Age	-.003	-.002	.022	.890	-.047	.035

a. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	eBAC (raw)	Total PCS	Age
1	1	3.678	1.000	.00	.01	.01	.00
	2	.193	4.369	.00	.80	.16	.01
	3	.110	5.785	.02	.08	.63	.17
	4	.019	13.884	.98	.11	.20	.81

a. Dependent Variable: DehydrationSymptoms

Casewise Diagnostics[a]

Case Number	Std. Residual	DehydrationSymptoms	Predicted Value	Residual
23	2.081	7.33	4.9724	2.36088
31	-2.265	3.00	5.5694	-2.56941
41	-2.335	3.00	5.6493	-2.64927
49	-2.188	2.33	4.8162	-2.48284
68	-2.001	3.00	5.2708	-2.27080

a. Dependent Variable: DehydrationSymptoms

Residuals Statistics[a]

			Bootstrap[b]			
					BCa 95% Confidence Interval	
		Statistic	Bias	Std. Error	Lower	Upper
Predicted Value	Minimum	4.6496				
	Maximum	6.1929				
	Mean	5.3217	.0014	.1286	5.0543	5.5853
	Std. Deviation	.35946	.04029	.11871	.08100	.74751
	N	86	0	0	.	.
Residual	Minimum	-2.64927				
	Maximum	2.36088				
	Mean	.00000	.00000	.00000	.00000	.00000
	Std. Deviation	1.11440	-.02770	.08101	.98418	1.18824
	N	86	0	0	.	.
Std. Predicted Value	Minimum	-1.870				
	Maximum	2.424				
	Mean	.000	.000	.000	.000	.000
	Std. Deviation	1.000	.000	.000	1.000	1.000
	N	86	0	0	.	.

Std. Residual	Minimum	-2.335				
	Maximum	2.081				
	Mean	.000	.000	.000	.000	.000
	Std. Deviation	.982	.000	.000	.982	.982
	N	86	0	0	.	.

a. Dependent Variable: DehydrationSymptoms

b. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

A4.1.5.3. Model 5.

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	2000
Confidence Interval Level	95.0%
Confidence Interval Type	Bias-corrected and accelerated (BCa)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Age, eBAC (raw), Total PCS[b]	.	Enter

a. Dependent Variable: StressSymptoms

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.398[a]	.158	.128	1.42748	.158	5.141	3	82	.003	1.906

a. Predictors: (Constant), Age, eBAC (raw), Total PCS

b. Dependent Variable: StressSymptoms

Bootstrap for Model Summary

Model	Durbin-Watson	Bootstrap[a]			
		Bias	Std. Error	BCa 95% Confidence Interval	
				Lower	Upper
1	1.906	-.672	.189	.	.

a. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.427	3	10.476	5.141	.003[b]
	Residual	167.092	82	2.038		
	Total	198.520	85			

a. Dependent Variable: StressSymptoms

b. Predictors: (Constant), Age, eBAC (raw), Total PCS

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.323	.908		2.559	.012	.517	4.129					
	eBAC (raw)	2.258	1.142	.201	1.978	.051	-.013	4.529	.208	.213	.200	.990	1.010
	Total PCS	.039	.013	.299	2.931	.004	.013	.066	.311	.308	.297	.984	1.016
	Age	-.032	.026	-.128	-1.245	.217	-.084	.019	-.183	-.136	-.126	.976	1.025

a. Dependent Variable: StressSymptoms

Bootstrap for Coefficients

Model			Bootstrap[a]				
						BCa 95% Confidence Interval	
		B	Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
1	(Constant)	2.323	-.002	.922	.014	.577	4.119
	eBAC (raw)	2.258	.007	1.233	.066	-.060	4.654
	Total PCS	.039	.000	.013	.004	.013	.064
	Age	-.032	.000	.024	.165	-.080	.015

a. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	eBAC (raw)	Total PCS	Age
1	1	3.678	1.000	.00	.01	.01	.00
	2	.193	4.369	.00	.80	.16	.01
	3	.110	5.785	.02	.08	.63	.17
	4	.019	13.884	.98	.11	.20	.81

a. Dependent Variable: StressSymptoms

Casewise Diagnostics[a]

Case Number	Std. Residual	StressSymptoms	Predicted Value	Residual
28	2.837	7.00	2.9497	4.05026
43	2.015	6.00	3.1235	2.87650

a. Dependent Variable: StressSymptoms

Residuals Statistics[a]

			Bootstrap[b]			
					BCa 95% Confidence Interval	
		Statistic	Bias	Std. Error	Lower	Upper
Predicted Value	Minimum	1.9679				
	Maximum	4.5598				
	Mean	3.1977	-.0039	.1629	2.8641	3.5116
	Std. Deviation	.60805	.03381	.12646	.31511	.94467
	N	86	0	0	.	.
Residual	Minimum	-2.36998				
	Maximum	4.05026				
	Mean	.00000	.00000	.00000	.	.
	Std. Deviation	1.40207	-.03535	.09789	1.23674	1.49066
	N	86	0	0	.	.
Std. Predicted Value	Minimum	-2.022				
	Maximum	2.240				
	Mean	.000	.000	.000	.000	.000
	Std. Deviation	1.000	.000	.000	1.000	1.000
	N	86	0	0	.	.

Std. Residual	Minimum	-1.660				
	Maximum	2.837				
	Mean	.000	.000	.000	.	.
	Std. Deviation	.982	.000	.000	.	.
	N	86	0	0	.	.

a. Dependent Variable: StressSymptoms

b. Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

A4.2. Statistical outputs for chapter 3.

A4.2.1. Descriptive statistics.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
incomePA_ChangePercent	129	100.0%	0	0.0%	129	100.0%
priorIncome_PA	129	100.0%	0	0.0%	129	100.0%
BRS_Score	129	100.0%	0	0.0%	129	100.0%
MLS_score	129	100.0%	0	0.0%	129	100.0%
AHS_Score	129	100.0%	0	0.0%	129	100.0%
withResorp	129	100.0%	0	0.0%	129	100.0%
DASS_Stress	129	100.0%	0	0.0%	129	100.0%
DASS_Anxiety	129	100.0%	0	0.0%	129	100.0%
DASS_depression	129	100.0%	0	0.0%	129	100.0%

Descriptives

			Statistic	Std. Error
incomePA_ChangePercent	Mean		-10.5162426553	3.44227397666
	95% Confidence Interval for Mean	Lower Bound	-17.3273698301	
		Upper Bound	-3.7051154805	
	5% Trimmed Mean		-10.8608136885	
	Median		.0000000000	
	Variance		1528.553	
	Std. Deviation		39.09671682922	
	Minimum		-100.00000000	
	Maximum		200.00000000	

	Range		300.00000000	
	Interquartile Range		20.00000000	
	Skewness		.658	.213
	Kurtosis		7.849	.423
priorIncome_PA	Mean		16723.1166	2090.40881
	95% Confidence Interval for Mean	Lower Bound	12586.8856	
		Upper Bound	20859.3476	
	5% Trimmed Mean		13221.7916	
	Median		10200.0000	
	Variance		563705360.125	
	Std. Deviation		23742.48008	
	Minimum		.00	
	Maximum		192000.00	
	Range		192000.00	
	Interquartile Range		19800.00	
	Skewness		4.435	.213
	Kurtosis		26.552	.423
BRS_Score	Mean		18.63	.463
	95% Confidence Interval for Mean	Lower Bound	17.71	
		Upper Bound	19.54	
	5% Trimmed Mean		18.60	
	Median		20.00	
	Variance		27.642	
	Std. Deviation		5.258	
	Minimum		6	
	Maximum		30	
	Range		24	

	Interquartile Range		8	
	Skewness		-.048	.213
	Kurtosis		-.673	.423
MLS_score	Mean		5.40	.167
	95% Confidence Interval for Mean	Lower Bound	5.06	
		Upper Bound	5.73	
	5% Trimmed Mean		5.33	
	Median		5.00	
	Variance		3.600	
	Std. Deviation		1.897	
	Minimum		3	
	Maximum		9	
	Range		6	
	Interquartile Range		3	
	Skewness		.349	.213
	Kurtosis		-.993	.423
AHS_Score	Mean		1.0444	.08130
	95% Confidence Interval for Mean	Lower Bound	.8836	
		Upper Bound	1.2053	
	5% Trimmed Mean		.9576	
	Median		.7800	
	Variance		.853	
	Std. Deviation		.92334	
	Minimum		.11	
	Maximum		4.22	
	Range		4.11	
	Interquartile Range		1.06	

	Skewness		1.313	.213
	Kurtosis		1.264	.423
withResorp	Mean		.70288729443	.040348639986
	95% Confidence Interval for Mean	Lower Bound	.62305061666	
		Upper Bound	.78272397220	
	5% Trimmed Mean		.66066364193	
	Median		.63282833300	
	Variance		.210	
	Std. Deviation		.458272456711	
	Minimum		.154081429	
	Maximum		2.558338066	
	Range		2.404256637	
	Interquartile Range		.551285491	
	Skewness		1.509	.213
	Kurtosis		3.195	.423
DASS_Stress	Mean		15.98	.893
	95% Confidence Interval for Mean	Lower Bound	14.22	
		Upper Bound	17.75	
	5% Trimmed Mean		15.67	
	Median		14.00	
	Variance		102.844	
	Std. Deviation		10.141	
	Minimum		0	
	Maximum		40	
	Range		40	
	Interquartile Range		16	
	Skewness		.423	.213

	Kurtosis		-.778	.423
DASS_Anxiety	Mean		10.23	.697
	95% Confidence Interval for Mean	Lower Bound	8.85	
		Upper Bound	11.61	
	5% Trimmed Mean		9.56	
	Median		8.00	
	Variance		62.727	
	Std. Deviation		7.920	
	Minimum		2	
	Maximum		34	
	Range		32	
	Interquartile Range		12	
	Skewness		1.070	.213
	Kurtosis		.440	.423
DASS_depression	Mean		14.12	.955
	95% Confidence Interval for Mean	Lower Bound	12.23	
		Upper Bound	16.01	
	5% Trimmed Mean		13.60	
	Median		12.00	
	Variance		117.734	
	Std. Deviation		10.851	
	Minimum		0	
	Maximum		40	
	Range		40	
	Interquartile Range		20	
	Skewness		.589	.213
	Kurtosis		-.673	.423

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
incomePA_ChangePercent	.316	129	<.001	.697	129	<.001
priorIncome_PA	.241	129	<.001	.585	129	<.001
BRS_Score	.107	129	.001	.979	129	.041
MLS_score	.141	129	<.001	.912	129	<.001
AHS_Score	.156	129	<.001	.856	129	<.001
withResorp	.116	129	<.001	.879	129	<.001
DASS_Stress	.118	129	<.001	.956	129	<.001
DASS_Anxiety	.176	129	<.001	.873	129	<.001
DASS_depression	.136	129	<.001	.927	129	<.001

a. Lilliefors Significance Correction

Statistics

		employment	Employment_change	DrinkingFrequency	@7.5_unitFrequency
N	Valid	129	128	129	129
	Missing	0	1	0	0

Frequency Table

employment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Education	23	17.8	17.8	17.8
	Health and social care	23	17.8	17.8	35.7
	Hospitality and leisure	6	4.7	4.7	40.3
	Manufactoring	1	.8	.8	41.1
	Other (please specify)	6	4.7	4.7	45.7
	Professional Services	3	2.3	2.3	48.1
	Retail	7	5.4	5.4	53.5
	Student	60	46.5	46.5	100.0
	Total	129	100.0	100.0	

Employment_change

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	30	23.3	23.4	23.4
	2	10	7.8	7.8	31.3
	3	43	33.3	33.6	64.8
	4	5	3.9	3.9	68.8
	5	40	31.0	31.3	100.0
	Total	128	99.2	100.0	
Missing	System	1	.8		
Total		129	100.0		

DrinkingFrequency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2-3 times a week	59	45.7	45.7	45.7
	2-4 times a month	39	30.2	30.2	76.0
	4 or more times a week	18	14.0	14.0	89.9
	Monthly or less	13	10.1	10.1	100.0
	Total	129	100.0	100.0	

@7.5_unitFrequency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Daily or almost daily	2	1.6	1.6	1.6
	Less than monthly	47	36.4	36.4	38.0
	Monthly	37	28.7	28.7	66.7
	Never	18	14.0	14.0	80.6
	Weekly	25	19.4	19.4	100.0
	Total	129	100.0	100.0	

lonely

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hardly ever	23	17.8	17.8	17.8
	Never	28	21.7	21.7	39.5
	Occasionally	26	20.2	20.2	59.7
	Often/always	18	14.0	14.0	73.6
	Some of the time	34	26.4	26.4	100.0
	Total	129	100.0	100.0	

A4.2.2. one sample t-test of income change.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
incomePA_ChangePercent	129	-10.5162426553	39.09671682922	3.44227397666

One-Sample Test

	Test Value = 0						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
incomePA_ChangePercent	-3.055	128	.001	.003	-10.51624265527	-17.3273698301	-3.7051154805

One-Sample Effect Sizes

				95% Confidence Interval	
		Standardizer[a]	Point Estimate	Lower	Upper
incomePA_ChangePercent	Cohen's d	39.09671682922	-.269	-.444	-.093
	Hedges' correction	39.32767884288	-.267	-.442	-.092

a. The denominator used in estimating the effect sizes.

Cohen's d uses the sample standard deviation.

Hedges' correction uses the sample standard deviation, plus a correction factor.

A4.2.3. t-test comparing income between students and non-students.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
priorIncome_PA	Equal variances assumed	1.666	.199	3.527	127	<.001	<.001	14162.92232	4015.42043	6217.12993	22108.71471
	Equal variances not assumed			3.487	116.371	<.001	<.001	14162.92232	4061.84340	6118.20027	22207.64437

Independent Samples Effect Sizes

				95% Confidence Interval	
		Standardizer[a]	Point Estimate	Lower	Upper
priorIncome_PA	Cohen's d	22747.63965	.623	.267	.976
	Hedges' correction	22883.08713	.619	.266	.970
	Glass's delta	24679.71907	.574	.211	.933

a. The denominator used in estimating the effect sizes.

Cohen's d uses the pooled standard deviation.

Hedges' correction uses the pooled standard deviation, plus a correction factor.

Glass's delta uses the sample standard deviation of the control (i.e., the second) group.

A4.2.4. Correlations between variables included in structural models.

Variable		age	Distress	Gastric_Cardio	Headache_Thirst	priorIncome_PA	incomePA_ChangePercent
1. age	Pearson's r	—					
	p-value	—					
2. Distress	Pearson's r	-0.211	—				
	p-value	0.013	—				
3. Gastric_Cardio	Pearson's r	-0.002	0.254	—			
	p-value	0.979	0.003	—			
4. Headache_Thirst	Pearson's r	0.007	0.187	0.573	—		
	p-value	0.935	0.029	< .001	—		
5. priorIncome_PA	Pearson's r	0.219	-0.131	0.014	0.046	—	
	p-value	0.01	0.128	0.872	0.598	—	
6. incomePA_ChangePercent	Pearson's r	0.094	0.029	-0.005	0.076	-0.02	—
	p-value	0.274	0.734	0.958	0.378	0.819	—
7. MaladaptiveCoping	Pearson's r	-0.258	0.781	0.131	0.185	-0.057	0.03
	p-value	0.002	< .001	0.128	0.031	0.512	0.727

Kaiser-Meyer-Olkin Test

	MSA
Overall MSA	0.776
COPE1	0.741
COPE2	0.775
COPE3	0.716
COPE4	0.619
COPE5	0.852
COPE6	0.700
COPE7	0.893
COPE8	0.752
COPE9	0.841
COPE10	0.822
COPE11	0.599
COPE12	0.860
COPE13	0.772
COPE14	0.881
COPE15	0.866
COPE16	0.745
COPE17	0.843
COPE18	0.661
COPE19	0.744
COPE20	0.751
COPE21	0.898
COPE22	0.569
COPE23	0.847
COPE24	0.762
COPE25	0.867

A4.2.5. EFA of brief-COPE.

Exploratory Factor Analysis

Kaiser-Meyer-Olkin Test

	MSA
COPE26	0.785
COPE27	0.558
COPE28	0.610

Bartlett's Test

X^2	df	p
3463.273	378.000	< .001

Mardia's Test of Multivariate Normality

	Value	Statistic	df	p
Skewness	142.627	6727.240	4060	< .001
Small Sample Skewness	142.627	6803.510	4060	< .001
Kurtosis	936.829	19.871		< .001

Note. The statistic for skewness is assumed to be Chi^2 distributed and the statistic for kurtosis standard normal.

Chi-squared Test

	Value	df	p
Model	630.125	225	< .001

Factor Loadings

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Uniqueness
COPE7	0.674						0.385
COPE2	0.639						0.452
COPE14	0.634						0.442
COPE12	0.553						0.467

Factor Loadings

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Uniqueness
COPE25	0.546						0.404
COPE1	0.536						0.774
COPE17	0.452						0.448
COPE24	0.427						0.581
COPE20	0.402						0.629
COPE10		0.875					0.173
COPE5		0.837					0.285
COPE15		0.742					0.296
COPE23		0.657					0.324
COPE13			0.805				0.563
COPE6			0.585				0.408
COPE26			0.571				0.546
COPE16			0.428				0.296
COPE28				0.917			0.307
COPE18				0.871			0.304
COPE27					0.726		0.259
COPE22					0.725		0.204
COPE11						0.752	0.089
COPE4						0.714	0.212
COPE3							0.523
COPE8							0.292
COPE9							0.472
COPE19							0.730
COPE21							0.565

Note. Applied rotation method is promax.

Factor Loadings (Structure Matrix)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
COPE1	0.448					
COPE2	0.535					
COPE3						
COPE4						0.659
COPE5	0.417	0.796				
COPE6			0.488			
COPE7	0.669	0.425				
COPE8						
COPE9			0.411			
COPE10		0.766				
COPE11						0.679
COPE12	0.627					
COPE13			0.725			
COPE14	0.659	0.417				
COPE15	0.531	0.767				
COPE16			0.439			
COPE17	0.576			0.421		
COPE18				0.860		
COPE19						
COPE20						
COPE21		0.443				
COPE22					0.727	
COPE23		0.664				
COPE24						
COPE25	0.627	0.440				
COPE26			0.566			

Factor Loadings (Structure Matrix)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
COPE27					0.735	
COPE28				0.849		

Note. Applied rotation method is promax.

Factor Characteristics

		Unrotated solution			Rotated solution		
	Eigenvalues	SumSq. Loadings	Proportion var.	Cumulative	SumSq. Loadings	Proportion var.	Cumulative
Factor 1	5.175	4.772	0.208	0.208	2.831	0.123	0.123
Factor 2	2.605	2.201	0.096	0.304	2.602	0.113	0.237
Factor 3	1.936	1.588	0.069	0.373	1.858	0.081	0.318
Factor 4	1.461	1.135	0.049	0.423	1.829	0.080	0.398
Factor 5	1.322	0.954	0.042	0.464	1.198	0.052	0.450
Factor 6	1.179	0.854	0.037	0.502	1.186	0.052	0.502

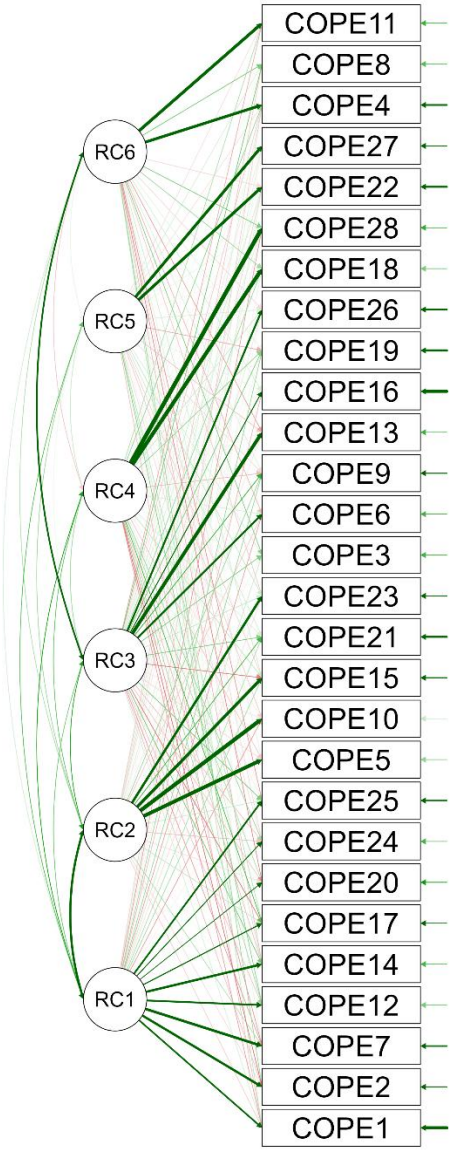
Factor Correlations

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Factor 1	1.000	0.562	0.188	0.330	0.203	0.054
Factor 2	0.562	1.000	0.327	0.206	0.135	0.108
Factor 3	0.188	0.327	1.000	0.103	0.015	0.497
Factor 4	0.330	0.206	0.103	1.000	0.060	-0.112
Factor 5	0.203	0.135	0.015	0.060	1.000	0.042
Factor 6	0.054	0.108	0.497	-0.112	0.042	1.000

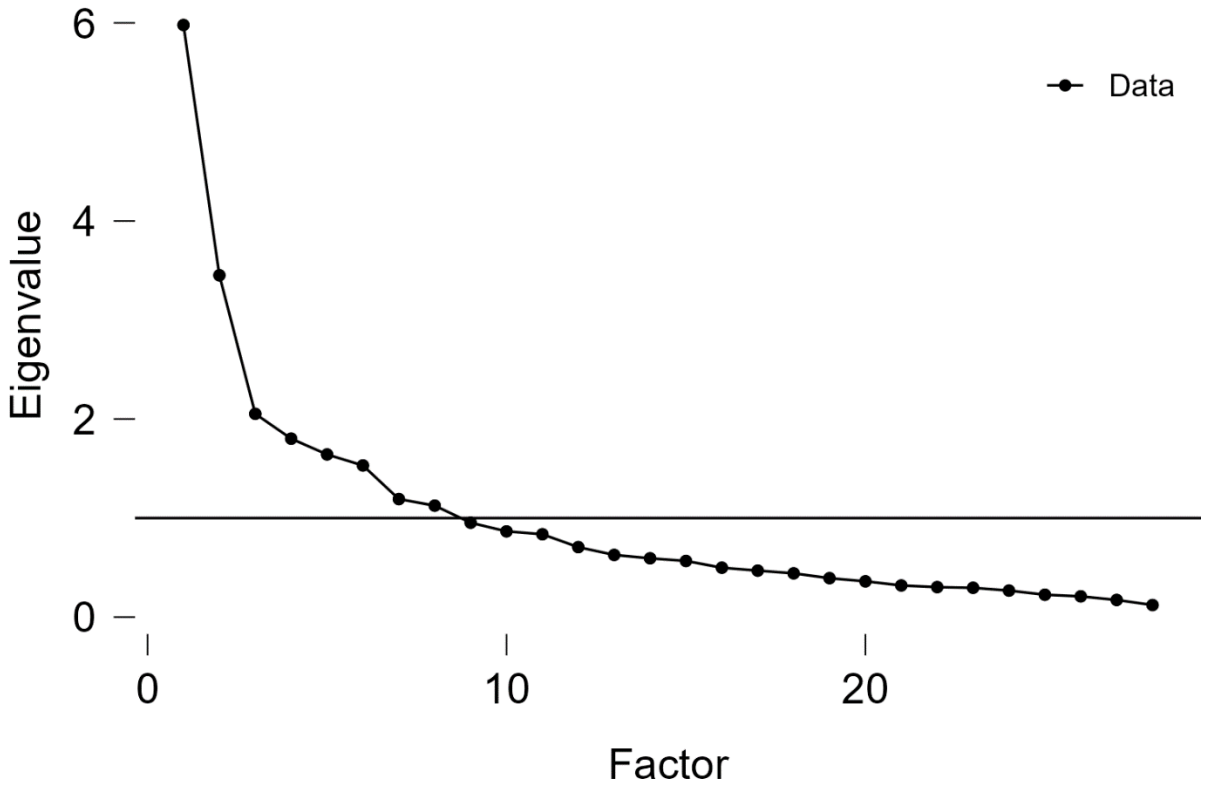
Additional fit indices

RMSEA	RMSEA 90% confidence	SRMR	TLI	CFI	BIC
0.080	0.073 - 0.087	0.033	0.797	0.881	-640.101

Path Diagram



Scree plot



A4.2.6. SEM outputs.

A4.2.6.1. CFA of AHS.

Variable counts (Group number 1)

Number of variables in your model: 18

Number of observed variables: 8

Number of unobserved variables: 10

Number of exogenous variables: 10

Number of endogenous variables: 8

Parameter Summary (Group number 1)

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
AHS9_heartRacing	.000	6.000	2.282	10.583	4.508	10.451
AHS8_nausea	.000	5.000	2.857	13.248	7.496	17.380
AHS7_stomachAche	.000	6.000	2.993	13.876	9.899	22.950
AHS6_appetiteLoss	.000	6.000	2.570	11.918	5.624	13.038
AHS5_dizzinessFaintness	.000	5.000	3.223	14.942	9.540	22.117
AHS4_headache	.000	7.000	1.721	7.978	2.357	5.464
AHS3_Tired	.000	7.000	.330	1.529	-1.121	-2.598
AHS2_thirsty	.000	6.000	.311	1.443	-1.332	-3.089
Multivariate					77.291	34.701

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 36

Number of distinct parameters to be estimated: 17

Degrees of freedom (36 - 17): 19

Result (Default model)

Minimum was achieved

Chi-square = 31.835

Degrees of freedom = 19

Probability level = .033

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
AHS2_thirsty	<---	HeadacheThirst	1.000				
AHS3_Tired	<---	HeadacheThirst	1.655	.315	5.251	***	
AHS4_headache	<---	HeadacheThirst	1.057	.218	4.847	***	
AHS5_dizzinessFaintness	<---	GastricCardio	1.000				
AHS6_appetiteLoss	<---	GastricCardio	1.466	.285	5.149	***	
AHS7_stomachAche	<---	GastricCardio	1.048	.225	4.648	***	
AHS8_nausea	<---	GastricCardio	1.423	.256	5.552	***	
AHS9_heartRacing	<---	GastricCardio	1.340	.273	4.910	***	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
AHS2_thirsty	<---	HeadacheThirst	.543
AHS3_Tired	<---	HeadacheThirst	.814
AHS4_headache	<---	HeadacheThirst	.619
AHS5_dizzinessFaintness	<---	GastricCardio	.562
AHS6_appetiteLoss	<---	GastricCardio	.640
AHS7_stomachAche	<---	GastricCardio	.547
AHS8_nausea	<---	GastricCardio	.739
AHS9_heartRacing	<---	GastricCardio	.593

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
HeadacheThirst	<-->	GastricCardio	.406	.111	3.647	***	

Correlations: (Group number 1 - Default model)

			Estimate
HeadacheThirst	<-->	GastricCardio	.752

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
AHS9_heartRacing	.352
AHS8_nausea	.546
AHS7_stomachAche	.299
AHS6_appetiteLoss	.410
AHS5_dizzinessFaintness	.316
AHS4_headache	.383
AHS3_Tired	.662
AHS2_thirsty	.295

Matrices (Group number 1 - Default model)

Total Effects (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	1.340	.000
AHS8_nausea	1.423	.000
AHS7_stomachAche	1.048	.000
AHS6_appetiteLoss	1.466	.000
AHS5_dizzinessFaintness	1.000	.000
AHS4_headache	.000	1.057
AHS3_Tired	.000	1.655
AHS2_thirsty	.000	1.000

Standardized Total Effects (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.593	.000
AHS8_nausea	.739	.000
AHS7_stomachAche	.547	.000
AHS6_appetiteLoss	.640	.000

	GastricCardio	HeadacheThirst
AHS5_dizzinessFaintness	.562	.000
AHS4_headache	.000	.619
AHS3_Tired	.000	.814
AHS2_thirsty	.000	.543

Direct Effects (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	1.340	.000
AHS8_nausea	1.423	.000
AHS7_stomachAche	1.048	.000
AHS6_appetiteLoss	1.466	.000
AHS5_dizzinessFaintness	1.000	.000
AHS4_headache	.000	1.057
AHS3_Tired	.000	1.655
AHS2_thirsty	.000	1.000

Standardized Direct Effects (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.593	.000
AHS8_nausea	.739	.000
AHS7_stomachAche	.547	.000
AHS6_appetiteLoss	.640	.000
AHS5_dizzinessFaintness	.562	.000
AHS4_headache	.000	.619
AHS3_Tired	.000	.814
AHS2_thirsty	.000	.543

Indirect Effects (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.000	.000
AHS8_nausea	.000	.000
AHS7_stomachAche	.000	.000
AHS6_appetiteLoss	.000	.000
AHS5_dizzinessFaintness	.000	.000
AHS4_headache	.000	.000
AHS3_Tired	.000	.000
AHS2_thirsty	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.000	.000
AHS8_nausea	.000	.000
AHS7_stomachAche	.000	.000
AHS6_appetiteLoss	.000	.000
AHS5_dizzinessFaintness	.000	.000
AHS4_headache	.000	.000
AHS3_Tired	.000	.000
AHS2_thirsty	.000	.000

Regression Weights: (Group number 1 - Default model)

			M.I.	Par Change
AHS9_heartRacing	<---	AHS4_headache	6.271	.150
AHS4_headache	<---	AHS9_heartRacing	4.142	.190

Bootstrap (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
AHS2_thirsty	<---	HeadacheThirst	.000	.000			
AHS3_Tired	<---	HeadacheThirst	.328	.005			
AHS4_headache	<---	HeadacheThirst	.308	.005			
AHS5_dizzinessFaintness	<---	GastricCardio	.000	.000			
AHS6_appetiteLoss	<---	GastricCardio	.650	.010			
AHS7_stomachAche	<---	GastricCardio	.433	.007			
AHS8_nausea	<---	GastricCardio	.650	.010			
AHS9_heartRacing	<---	GastricCardio	.622	.010			

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
AHS2_thirsty	<---	HeadacheThirst	.085	.001			
AHS3_Tired	<---	HeadacheThirst	.068	.001			
AHS4_headache	<---	HeadacheThirst	.075	.001			
AHS5_dizzinessFaintness	<---	GastricCardio	.122	.002			
AHS6_appetiteLoss	<---	GastricCardio	.114	.002			
AHS7_stomachAche	<---	GastricCardio	.129	.002			
AHS8_nausea	<---	GastricCardio	.098	.002			
AHS9_heartRacing	<---	GastricCardio	.129	.002			

Covariances: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
HeadacheThirst	<-->	GastricCardio	.150	.002			

Correlations: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
HeadacheThirst	<-->	GastricCardio	.099	.002			

Total Effects - Standard Errors (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.622	.000
AHS8_nausea	.650	.000
AHS7_stomachAche	.433	.000
AHS6_appetiteLoss	.650	.000
AHS5_dizzinessFaintness	.000	.000
AHS4_headache	.000	.308
AHS3_Tired	.000	.328
AHS2_thirsty	.000	.000

Standardized Total Effects - Standard Errors (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.129	.000

	GastricCardio	HeadacheThirst
AHS8_nausea	.098	.000
AHS7_stomachAche	.129	.000
AHS6_appetiteLoss	.114	.000
AHS5_dizzinessFaintness	.122	.000
AHS4_headache	.000	.075
AHS3_Tired	.000	.068
AHS2_thirsty	.000	.085

Direct Effects - Standard Errors (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.622	.000
AHS8_nausea	.650	.000
AHS7_stomachAche	.433	.000
AHS6_appetiteLoss	.650	.000
AHS5_dizzinessFaintness	.000	.000
AHS4_headache	.000	.308
AHS3_Tired	.000	.328
AHS2_thirsty	.000	.000

Standardized Direct Effects - Standard Errors (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.129	.000
AHS8_nausea	.098	.000
AHS7_stomachAche	.129	.000
AHS6_appetiteLoss	.114	.000
AHS5_dizzinessFaintness	.122	.000
AHS4_headache	.000	.075
AHS3_Tired	.000	.068
AHS2_thirsty	.000	.085

Indirect Effects - Standard Errors (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.000	.000
AHS8_nausea	.000	.000
AHS7_stomachAche	.000	.000
AHS6_appetiteLoss	.000	.000
AHS5_dizzinessFaintness	.000	.000
AHS4_headache	.000	.000
AHS3_Tired	.000	.000
AHS2_thirsty	.000	.000

Standardized Indirect Effects - Standard Errors (Group number 1 - Default model)

	GastricCardio	HeadacheThirst
AHS9_heartRacing	.000	.000
AHS8_nausea	.000	.000
AHS7_stomachAche	.000	.000
AHS6_appetiteLoss	.000	.000
AHS5_dizzinessFaintness	.000	.000
AHS4_headache	.000	.000
AHS3_Tired	.000	.000
AHS2_thirsty	.000	.000

Bootstrap (Default model)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	17	31.835	19	.033	1.676
Saturated model	36	.000	0		
Independence model	8	281.137	28	.000	10.041

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.115	.941	.887	.496
Saturated model	.000	1.000		
Independence model	.655	.524	.388	.408

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.887	.833	.951	.925	.949
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.679	.602	.644
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	12.835	1.079	32.449
Saturated model	.000	.000	.000
Independence model	253.137	203.049	310.688

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.249	.100	.008	.254
Saturated model	.000	.000	.000	.000
Independence model	2.196	1.978	1.586	2.427

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.073	.021	.116	.187
Independence model	.266	.238	.294	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	65.835	68.406	114.452	131.452
Saturated model	72.000	77.445	174.953	210.953
Independence model	297.137	298.347	320.015	328.015

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	.514	.422	.668	.534
Saturated model	.563	.563	.563	.605
Independence model	2.321	1.930	2.771	2.331

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	122	146
Independence model	19	22

Execution time summary

Minimization: .023

Miscellaneous: .502

Bootstrap: .420

Total: .945

A4.2.6.2. CFA of psychological distress.

Variable counts (Group number 1)

Number of variables in your model: 11

Number of observed variables: 5

Number of unobserved variables: 6

Number of exogenous variables: 6

Number of endogenous variables: 5

Parameter Summary (Group number 1)

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	6	0	0	0	0	6
Labeled	0	0	0	0	0	0
Unlabeled	4	2	6	0	0	12
Total	10	2	6	0	0	18

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
lonely_no	1.000	5.000	.057	.263	-1.257	-2.914
MLS_score	3.000	9.000	.345	1.599	-1.001	-2.321
DASS_depression	.000	40.000	.582	2.701	-.693	-1.607
DASS_Anxiety	2.000	34.000	1.058	4.904	.377	.874
DASS_Stress	.000	40.000	.418	1.937	-.794	-1.841
Multivariate					5.065	3.438

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 15

Number of distinct parameters to be estimated: 12

Degrees of freedom (15 - 12): 3

Result (Default model)

Minimum was achieved

Chi-square = 4.644

Degrees of freedom = 3

Probability level = .200

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
DASS_Stress	<---	Psych_Distress	1.000				
DASS_Anxiety	<---	Psych_Distress	.703	.055	12.745	***	
DASS_depression	<---	Psych_Distress	.955	.076	12.547	***	
MLS_score	<---	Psych_Distress	.121	.016	7.602	***	
lonely_no	<---	Psych_Distress	-.069	.012	-5.685	***	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
DASS_Stress	<---	Psych_Distress	.932
DASS_Anxiety	<---	Psych_Distress	.839
DASS_depression	<---	Psych_Distress	.832
MLS_score	<---	Psych_Distress	.607
lonely_no	<---	Psych_Distress	-.478

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
lonely_no	.228
MLS_score	.368
DASS_depression	.691
DASS_Anxiety	.704
DASS_Stress	.869

Implied Covariances (Group number 1 - Default model)

	lonely_no	MLS_score	DASS_depression	DASS_Anxiety	DASS_Stress
lonely_no	1.863				
MLS_score	-1.151	3.528			
DASS_depression	-5.862	12.906	116.822		
DASS_Anxiety	-4.318	7.546	59.490	62.240	
DASS_Stress	-6.141	10.732	84.613	62.318	102.046

Implied Correlations (Group number 1 - Default model)

	lonely_no	MLS_score	DASS_depression	DASS_Anxiety	DASS_Stress
lonely_no	1.000				
MLS_score	-.449	1.000			
DASS_depression	-.397	.636	1.000		
DASS_Anxiety	-.401	.509	.698	1.000	
DASS_Stress	-.445	.566	.775	.782	1.000

Residual Covariances (Group number 1 - Default model)

	lonely_no	MLS_score	DASS_depression	DASS_Anxiety	DASS_Stress
lonely_no	.000				
MLS_score	-.078	.044			
DASS_depression	-1.061	.301	.000		
DASS_Anxiety	.550	-.010	-.449	.000	
DASS_Stress	.096	-.152	-.456	.476	.000

Standardized Residual Covariances (Group number 1 - Default model)

	lonely_no	MLS_score	DASS_depression	DASS_Anxiety	DASS_Stress
lonely_no	.000				
MLS_score	-.315	.101			
DASS_depression	-.756	.141	.000		
DASS_Anxiety	.536	-.007	-.049	.000	
DASS_Stress	.072	-.079	-.037	.053	.000

Total Effects (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.069
MLS_score	.121
DASS_depression	.955
DASS_Anxiety	.703
DASS_Stress	1.000

Standardized Total Effects (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.478
MLS_score	.607
DASS_depression	.832
DASS_Anxiety	.839
DASS_Stress	.932

Direct Effects (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.069
MLS_score	.121
DASS_depression	.955
DASS_Anxiety	.703
DASS_Stress	1.000

Standardized Direct Effects (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.478
MLS_score	.607
DASS_depression	.832
DASS_Anxiety	.839
DASS_Stress	.932

Indirect Effects (Group number 1 - Default model)

	Psych_Distress
lonely_no	.000
MLS_score	.000
DASS_depression	.000
DASS_Anxiety	.000
DASS_Stress	.000

Standardized Indirect Effects (Group number 1 - Default model)

	Psych_Distress
lonely_no	.000
MLS_score	.000
DASS_depression	.000
DASS_Anxiety	.000
DASS_Stress	.000

Bootstrap (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
DASS_Stress	<---	Psych_Distress	.000	.000	1.000	.000	.000
DASS_Anxiety	<---	Psych_Distress	.060	.001	.704	.001	.001
DASS_depression	<---	Psych_Distress	.084	.001	.955	.001	.002
MLS_score	<---	Psych_Distress	.018	.000	.122	.000	.000
lonely_no	<---	Psych_Distress	.012	.000	-.069	.000	.000

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
DASS_Stress	<---	Psych_Distress	.032	.001	.932	.000	.001
DASS_Anxiety	<---	Psych_Distress	.032	.001	.840	.001	.001
DASS_depression	<---	Psych_Distress	.042	.001	.832	.000	.001
MLS_score	<---	Psych_Distress	.069	.001	.607	.000	.002
lonely_no	<---	Psych_Distress	.078	.001	-.477	.001	.002
e4	<-->	e5	.078	.001	-.232	-.004	.002

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
lonely_no	.074	.001	.234	.006	.002
MLS_score	.084	.001	.373	.005	.002
DASS_depression	.070	.001	.694	.002	.002
DASS_Anxiety	.053	.001	.707	.003	.001
DASS_Stress	.060	.001	.870	.001	.001

Total Effects - Standard Errors (Group number 1 - Default model)

	Psych_Distress
lonely_no	.012
MLS_score	.018
DASS_depression	.084
DASS_Anxiety	.060
DASS_Stress	.000

Standardized Total Effects - Standard Errors (Group number 1 - Default model)

	Psych_Distress
lonely_no	.078
MLS_score	.069
DASS_depression	.042
DASS_Anxiety	.032
DASS_Stress	.032

Direct Effects - Standard Errors (Group number 1 - Default model)

	Psych_Distress
lonely_no	.012
MLS_score	.018
DASS_depression	.084
DASS_Anxiety	.060
DASS_Stress	.000

Standardized Direct Effects - Standard Errors (Group number 1 - Default model)

	Psych_Distress
lonely_no	.078
MLS_score	.069
DASS_depression	.042
DASS_Anxiety	.032
DASS_Stress	.032

Indirect Effects - Standard Errors (Group number 1 - Default model)

	Psych_Distress
lonely_no	.000
MLS_score	.000
DASS_depression	.000
DASS_Anxiety	.000
DASS_Stress	.000

Standardized Indirect Effects - Standard Errors (Group number 1 - Default model)

	Psych_Distress
lonely_no	.000
MLS_score	.000
DASS_depression	.000
DASS_Anxiety	.000
DASS_Stress	.000

Bootstrap Confidence (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			Estimate	Lower	Upper	P
DASS_Stress	<---	Psych_Distress	1.000	1.000	1.000	...
DASS_Anxiety	<---	Psych_Distress	.703	.589	.829	.001
DASS_depression	<---	Psych_Distress	.955	.790	1.120	.001
MLS_score	<---	Psych_Distress	.121	.086	.155	.001
lonely_no	<---	Psych_Distress	-.069	-.092	-.046	.001

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			Estimate	Lower	Upper	P
DASS_Stress	<---	Psych_Distress	.932	.863	.992	.001
DASS_Anxiety	<---	Psych_Distress	.839	.771	.896	.001
DASS_depression	<---	Psych_Distress	.832	.731	.902	.002
MLS_score	<---	Psych_Distress	.607	.460	.737	.001
lonely_no	<---	Psych_Distress	-.478	-.619	-.316	.001

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	Estimate	Lower	Upper	P
lonely_no	.228	.100	.384	.001
MLS_score	.368	.212	.543	.001
DASS_depression	.691	.534	.813	.002
DASS_Anxiety	.704	.595	.802	.001
DASS_Stress	.869	.744	.983	.001

Total Effects (Group number 1 - Default model)

Total Effects - Lower Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.092
MLS_score	.086
DASS_depression	.790
DASS_Anxiety	.589
DASS_Stress	1.000

Total Effects - Upper Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.046
MLS_score	.155
DASS_depression	1.120
DASS_Anxiety	.829
DASS_Stress	1.000

Total Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	.001
MLS_score	.001
DASS_depression	.001
DASS_Anxiety	.001
DASS_Stress	...

Standardized Total Effects - Lower Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.619
MLS_score	.460
DASS_depression	.731
DASS_Anxiety	.771
DASS_Stress	.863

Standardized Total Effects - Upper Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.316
MLS_score	.737
DASS_depression	.902
DASS_Anxiety	.896
DASS_Stress	.992

Standardized Total Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	.001
MLS_score	.001
DASS_depression	.002
DASS_Anxiety	.001
DASS_Stress	.001

Direct Effects - Lower Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.092
MLS_score	.086
DASS_depression	.790
DASS_Anxiety	.589
DASS_Stress	1.000

Direct Effects - Upper Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.046
MLS_score	.155
DASS_depression	1.120
DASS_Anxiety	.829
DASS_Stress	1.000

Direct Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	.001
MLS_score	.001
DASS_depression	.001
DASS_Anxiety	.001
DASS_Stress	...

Standardized Direct Effects - Lower Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.619
MLS_score	.460
DASS_depression	.731
DASS_Anxiety	.771
DASS_Stress	.863

Standardized Direct Effects - Upper Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	-.316
MLS_score	.737
DASS_depression	.902
DASS_Anxiety	.896
DASS_Stress	.992

Standardized Direct Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	.001
MLS_score	.001
DASS_depression	.002
DASS_Anxiety	.001
DASS_Stress	.001

Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	.000
MLS_score	.000
DASS_depression	.000
DASS_Anxiety	.000
DASS_Stress	.000

Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	.000
MLS_score	.000
DASS_depression	.000
DASS_Anxiety	.000
DASS_Stress	.000

Indirect Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	...
MLS_score	...
DASS_depression	...
DASS_Anxiety	...
DASS_Stress	...

Standardized Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	.000
MLS_score	.000
DASS_depression	.000
DASS_Anxiety	.000
DASS_Stress	.000

Standardized Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	.000
MLS_score	.000
DASS_depression	.000
DASS_Anxiety	.000
DASS_Stress	.000

Standardized Indirect Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	Psych_Distress
lonely_no	...
MLS_score	...
DASS_depression	...
DASS_Anxiety	...
DASS_Stress	...

Bootstrap (Default model)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	12	4.644	3	.200	1.548
Saturated model	15	.000	0		
Independence model	5	359.596	10	.000	35.960

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.383	.986	.928	.197
Saturated model	.000	1.000		
Independence model	31.575	.421	.132	.281

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.987	.957	.995	.984	.995
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.300	.296	.299
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	1.644	.000	11.734
Saturated model	.000	.000	.000
Independence model	349.596	291.309	415.299

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.036	.013	.000	.092
Saturated model	.000	.000	.000	.000
Independence model	2.809	2.731	2.276	3.245

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.065	.000	.175	.322
Independence model	.523	.477	.570	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	28.644	29.824	62.962	74.962
Saturated model	30.000	31.475	72.897	87.897
Independence model	369.596	370.087	383.895	388.895

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	.224	.211	.303	.233
Saturated model	.234	.234	.234	.246
Independence model	2.887	2.432	3.401	2.891

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	216	313
Independence model	7	9

Execution time summary

Minimization: .014

Miscellaneous: .339

Bootstrap: .228

Total: .581

A4.2.6.3. CFA of brief-COPE.

Variable counts (Group number 1)

Number of variables in your model: 52

Number of observed variables: 23

Number of unobserved variables: 29

Number of exogenous variables: 29

Number of endogenous variables: 23

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
COPE4	1.000	4.000	.731	3.390	-.478	-1.108
COPE11	1.000	4.000	.876	4.064	-.180	-.418
COPE22	1.000	4.000	2.613	12.116	6.810	15.788
COPE27	1.000	4.000	1.928	8.940	3.121	7.235
COPE18	1.000	4.000	.182	.845	-1.015	-2.354
COPE28	1.000	4.000	.435	2.016	-.901	-2.088
COPE16	1.000	4.000	2.275	10.548	5.296	12.279
COPE26	1.000	4.000	1.472	6.823	.930	2.157
COPE6	1.000	4.000	1.495	6.931	1.949	4.519
COPE13	1.000	4.000	.383	1.774	-1.118	-2.592
COPE23	1.000	4.000	.473	2.193	-.338	-.784
COPE15	1.000	4.000	.205	.949	-.748	-1.734
COPE5	1.000	4.000	.154	.713	-.683	-1.583
COPE10	1.000	4.000	.304	1.412	-.460	-1.066
COPE20	1.000	4.000	-.260	-1.205	-.849	-1.968
COPE24	1.000	4.000	-.083	-.386	-.780	-1.809
COPE17	1.000	4.000	.192	.891	-.735	-1.703
COPE1	1.000	4.000	.112	.520	-1.135	-2.632
COPE25	1.000	4.000	.247	1.143	-.758	-1.757
COPE12	1.000	4.000	.017	.079	-.994	-2.305

Variable	min	max	skew	c.r.	kurtosis	c.r.
COPE14	1.000	4.000	.134	.622	-.789	-1.830
COPE2	1.000	4.000	.484	2.243	-.653	-1.513
COPE7	1.000	4.000	.087	.402	-.824	-1.911
Multivariate					47.882	8.018

Models

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 276

Number of distinct parameters to be estimated: 71

Degrees of freedom (276 - 71): 205

Result (Default model)

Minimum was achieved

Chi-square = 291.147

Degrees of freedom = 205

Probability level = .000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
COPE7	<---	Reframing	1.000				
COPE2	<---	Reframing	.867	.112	7.734	***	
COPE14	<---	Reframing	.956	.105	9.082	***	
COPE12	<---	Reframing	1.008	.109	9.245	***	
COPE25	<---	Reframing	1.032	.104	9.902	***	
COPE1	<---	Reframing	.666	.126	5.263	***	
COPE17	<---	Reframing	.779	.106	7.351	***	
COPE24	<---	Reframing	.559	.106	5.280	***	
COPE20	<---	Reframing	.597	.116	5.127	***	
COPE10	<---	SocialSupport	1.000				

			Estimate	S.E.	C.R.	P	Label
COPE5	<---	SocialSupport	1.077	.148	7.282	***	
COPE15	<---	SocialSupport	1.245	.155	8.033	***	
COPE23	<---	SocialSupport	.733	.107	6.879	***	
COPE13	<---	Maladaptive	1.000				
COPE6	<---	Maladaptive	1.166	.252	4.626	***	
COPE26	<---	Maladaptive	.522	.147	3.552	***	
COPE16	<---	Maladaptive	.993	.212	4.693	***	
COPE28	<---	humour	1.000				
COPE18	<---	humour	1.217	.267	4.560	***	
COPE27	<---	Spirituality	1.000				
COPE22	<---	Spirituality	.364	.162	2.244	.025	
COPE11	<---	SubstanceUse	1.000				
COPE4	<---	SubstanceUse	1.218	.185	6.576	***	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
COPE7	<---	Reframing	.794
COPE2	<---	Reframing	.661
COPE14	<---	Reframing	.761
COPE12	<---	Reframing	.766
COPE25	<---	Reframing	.814
COPE1	<---	Reframing	.469
COPE17	<---	Reframing	.635
COPE24	<---	Reframing	.471
COPE20	<---	Reframing	.458
COPE10	<---	SocialSupport	.805
COPE5	<---	SocialSupport	.784
COPE15	<---	SocialSupport	.882
COPE23	<---	SocialSupport	.591

			Estimate
COPE13	<---	Maladaptive	.474
COPE6	<---	Maladaptive	.831
COPE26	<---	Maladaptive	.291
COPE16	<---	Maladaptive	.748
COPE28	<---	humour	.735
COPE18	<---	humour	.908
COPE27	<---	Spirituality	1.315
COPE22	<---	Spirituality	.535
COPE11	<---	SubstanceUse	.883
COPE4	<---	SubstanceUse	1.031

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
COPE4	1.062
COPE11	.779
COPE22	.286
COPE27	1.729
COPE18	.825
COPE28	.541
COPE16	.559
COPE26	.085
COPE6	.690
COPE13	.224
COPE23	.349
COPE15	.778
COPE5	.615
COPE10	.648
COPE20	.210

	Estimate
COPE24	.222
COPE17	.404
COPE1	.220
COPE25	.663
COPE12	.587
COPE14	.579
COPE2	.436
COPE7	.630

Total Effects (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	1.218	.000	.000	.000	.000	.000
COPE11	1.000	.000	.000	.000	.000	.000
COPE22	.000	.364	.000	.000	.000	.000
COPE27	.000	1.000	.000	.000	.000	.000
COPE18	.000	.000	1.217	.000	.000	.000
COPE28	.000	.000	1.000	.000	.000	.000
COPE16	.000	.000	.000	.993	.000	.000
COPE26	.000	.000	.000	.522	.000	.000
COPE6	.000	.000	.000	1.166	.000	.000
COPE13	.000	.000	.000	1.000	.000	.000
COPE23	.000	.000	.000	.000	.733	.000
COPE15	.000	.000	.000	.000	1.245	.000
COPE5	.000	.000	.000	.000	1.077	.000
COPE10	.000	.000	.000	.000	1.000	.000
COPE20	.000	.000	.000	.000	.000	.597
COPE24	.000	.000	.000	.000	.000	.559
COPE17	.000	.000	.000	.000	.000	.779
COPE1	.000	.000	.000	.000	.000	.666

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE25	.000	.000	.000	.000	.000	1.032
COPE12	.000	.000	.000	.000	.000	1.008
COPE14	.000	.000	.000	.000	.000	.956
COPE2	.000	.000	.000	.000	.000	.867
COPE7	.000	.000	.000	.000	.000	1.000

Standardized Total Effects (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	1.031	.000	.000	.000	.000	.000
COPE11	.883	.000	.000	.000	.000	.000
COPE22	.000	.535	.000	.000	.000	.000
COPE27	.000	1.315	.000	.000	.000	.000
COPE18	.000	.000	.908	.000	.000	.000
COPE28	.000	.000	.735	.000	.000	.000
COPE16	.000	.000	.000	.748	.000	.000
COPE26	.000	.000	.000	.291	.000	.000
COPE6	.000	.000	.000	.831	.000	.000
COPE13	.000	.000	.000	.474	.000	.000
COPE23	.000	.000	.000	.000	.591	.000
COPE15	.000	.000	.000	.000	.882	.000
COPE5	.000	.000	.000	.000	.784	.000
COPE10	.000	.000	.000	.000	.805	.000
COPE20	.000	.000	.000	.000	.000	.458
COPE24	.000	.000	.000	.000	.000	.471
COPE17	.000	.000	.000	.000	.000	.635
COPE1	.000	.000	.000	.000	.000	.469
COPE25	.000	.000	.000	.000	.000	.814
COPE12	.000	.000	.000	.000	.000	.766

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE14	.000	.000	.000	.000	.000	.761
COPE2	.000	.000	.000	.000	.000	.661
COPE7	.000	.000	.000	.000	.000	.794

Direct Effects (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	1.218	.000	.000	.000	.000	.000
COPE11	1.000	.000	.000	.000	.000	.000
COPE22	.000	.364	.000	.000	.000	.000
COPE27	.000	1.000	.000	.000	.000	.000
COPE18	.000	.000	1.217	.000	.000	.000
COPE28	.000	.000	1.000	.000	.000	.000
COPE16	.000	.000	.000	.993	.000	.000
COPE26	.000	.000	.000	.522	.000	.000
COPE6	.000	.000	.000	1.166	.000	.000
COPE13	.000	.000	.000	1.000	.000	.000
COPE23	.000	.000	.000	.000	.733	.000
COPE15	.000	.000	.000	.000	1.245	.000
COPE5	.000	.000	.000	.000	1.077	.000
COPE10	.000	.000	.000	.000	1.000	.000
COPE20	.000	.000	.000	.000	.000	.597
COPE24	.000	.000	.000	.000	.000	.559
COPE17	.000	.000	.000	.000	.000	.779
COPE1	.000	.000	.000	.000	.000	.666
COPE25	.000	.000	.000	.000	.000	1.032
COPE12	.000	.000	.000	.000	.000	1.008
COPE14	.000	.000	.000	.000	.000	.956
COPE2	.000	.000	.000	.000	.000	.867

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE7	.000	.000	.000	.000	.000	1.000

Standardized Direct Effects (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	1.031	.000	.000	.000	.000	.000
COPE11	.883	.000	.000	.000	.000	.000
COPE22	.000	.535	.000	.000	.000	.000
COPE27	.000	1.315	.000	.000	.000	.000
COPE18	.000	.000	.908	.000	.000	.000
COPE28	.000	.000	.735	.000	.000	.000
COPE16	.000	.000	.000	.748	.000	.000
COPE26	.000	.000	.000	.291	.000	.000
COPE6	.000	.000	.000	.831	.000	.000
COPE13	.000	.000	.000	.474	.000	.000
COPE23	.000	.000	.000	.000	.591	.000
COPE15	.000	.000	.000	.000	.882	.000
COPE5	.000	.000	.000	.000	.784	.000
COPE10	.000	.000	.000	.000	.805	.000
COPE20	.000	.000	.000	.000	.000	.458
COPE24	.000	.000	.000	.000	.000	.471
COPE17	.000	.000	.000	.000	.000	.635
COPE1	.000	.000	.000	.000	.000	.469
COPE25	.000	.000	.000	.000	.000	.814
COPE12	.000	.000	.000	.000	.000	.766
COPE14	.000	.000	.000	.000	.000	.761
COPE2	.000	.000	.000	.000	.000	.661
COPE7	.000	.000	.000	.000	.000	.794

Indirect Effects (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	.000	.000	.000	.000	.000	.000
COPE11	.000	.000	.000	.000	.000	.000
COPE22	.000	.000	.000	.000	.000	.000
COPE27	.000	.000	.000	.000	.000	.000
COPE18	.000	.000	.000	.000	.000	.000
COPE28	.000	.000	.000	.000	.000	.000
COPE16	.000	.000	.000	.000	.000	.000
COPE26	.000	.000	.000	.000	.000	.000
COPE6	.000	.000	.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.000
COPE23	.000	.000	.000	.000	.000	.000
COPE15	.000	.000	.000	.000	.000	.000
COPE5	.000	.000	.000	.000	.000	.000
COPE10	.000	.000	.000	.000	.000	.000
COPE20	.000	.000	.000	.000	.000	.000
COPE24	.000	.000	.000	.000	.000	.000
COPE17	.000	.000	.000	.000	.000	.000
COPE1	.000	.000	.000	.000	.000	.000
COPE25	.000	.000	.000	.000	.000	.000
COPE12	.000	.000	.000	.000	.000	.000
COPE14	.000	.000	.000	.000	.000	.000
COPE2	.000	.000	.000	.000	.000	.000
COPE7	.000	.000	.000	.000	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	.000	.000	.000	.000	.000	.000

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE11	.000	.000	.000	.000	.000	.000
COPE22	.000	.000	.000	.000	.000	.000
COPE27	.000	.000	.000	.000	.000	.000
COPE18	.000	.000	.000	.000	.000	.000
COPE28	.000	.000	.000	.000	.000	.000
COPE16	.000	.000	.000	.000	.000	.000
COPE26	.000	.000	.000	.000	.000	.000
COPE6	.000	.000	.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.000
COPE23	.000	.000	.000	.000	.000	.000
COPE15	.000	.000	.000	.000	.000	.000
COPE5	.000	.000	.000	.000	.000	.000
COPE10	.000	.000	.000	.000	.000	.000
COPE20	.000	.000	.000	.000	.000	.000
COPE24	.000	.000	.000	.000	.000	.000
COPE17	.000	.000	.000	.000	.000	.000
COPE1	.000	.000	.000	.000	.000	.000
COPE25	.000	.000	.000	.000	.000	.000
COPE12	.000	.000	.000	.000	.000	.000
COPE14	.000	.000	.000	.000	.000	.000
COPE2	.000	.000	.000	.000	.000	.000
COPE7	.000	.000	.000	.000	.000	.000

Regression Weights: (Group number 1 - Default model)

			M.I.	Par Change
COPE16	<---	SocialSupport	6.961	-.193
COPE16	<---	COPE5	5.647	-.124
COPE16	<---	COPE10	7.577	-.159

			M.I.	Par Change
COPE16	<---	COPE7	5.338	-.116
COPE13	<---	COPE4	4.655	.170
COPE13	<---	COPE11	6.614	.212
COPE13	<---	COPE23	4.330	.193
COPE13	<---	COPE5	4.582	.179
COPE23	<---	Maladaptive	4.384	.206
COPE23	<---	COPE16	7.085	.177
COPE23	<---	COPE13	5.570	.098
COPE5	<---	COPE1	4.866	.108
COPE10	<---	COPE16	5.012	-.146
COPE24	<---	humour	6.540	.229
COPE24	<---	Maladaptive	4.309	.280
COPE24	<---	COPE18	6.757	.161
COPE24	<---	COPE6	5.012	.193
COPE24	<---	COPE23	7.118	-.207
COPE24	<---	COPE10	5.655	-.184
COPE17	<---	Maladaptive	5.797	-.293
COPE17	<---	COPE16	5.168	-.187
COPE17	<---	COPE6	4.770	-.170
COPE1	<---	Maladaptive	4.688	.386
COPE1	<---	COPE6	5.183	.259
COPE1	<---	COPE13	6.685	.196
COPE1	<---	COPE5	5.153	.210
COPE12	<---	COPE14	4.725	.129
COPE14	<---	COPE12	5.048	.121
COPE2	<---	humour	5.031	-.214
COPE2	<---	COPE18	5.113	-.149
COPE2	<---	COPE17	4.225	-.152

			M.I.	Par Change
COPE7	<---	humour	4.709	-.170
COPE7	<---	COPE28	7.007	-.141

Bootstrap (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
COPE7	<---	Reframing	.000	.000			
COPE2	<---	Reframing	.098	.002			
COPE14	<---	Reframing	.113	.002			
COPE12	<---	Reframing	.124	.002			
COPE25	<---	Reframing	.095	.002			
COPE1	<---	Reframing	.124	.002			
COPE17	<---	Reframing	.121	.002			
COPE24	<---	Reframing	.116	.002			
COPE20	<---	Reframing	.116	.002			
COPE10	<---	SocialSupport	.000	.000			
COPE5	<---	SocialSupport	.168	.003			
COPE15	<---	SocialSupport	.158	.003			
COPE23	<---	SocialSupport	.115	.002			
COPE13	<---	Maladaptive	.000	.000			
COPE6	<---	Maladaptive	.401	.006			
COPE26	<---	Maladaptive	.168	.003			
COPE16	<---	Maladaptive	.352	.006			
COPE28	<---	humour	.000	.000			
COPE18	<---	humour	.459	.007			
COPE27	<---	Spirituality	.000	.000			
COPE22	<---	Spirituality	.276	.004			
COPE11	<---	SubstanceUse	.000	.000			
COPE4	<---	SubstanceUse	.527	.008			

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
COPE7	<---	Reframing	.044	.001			
COPE2	<---	Reframing	.065	.001			
COPE14	<---	Reframing	.052	.001			
COPE12	<---	Reframing	.044	.001			
COPE25	<---	Reframing	.039	.001			
COPE1	<---	Reframing	.084	.001			
COPE17	<---	Reframing	.069	.001			
COPE24	<---	Reframing	.088	.001			
COPE20	<---	Reframing	.080	.001			
COPE10	<---	SocialSupport	.076	.001			
COPE5	<---	SocialSupport	.056	.001			
COPE15	<---	SocialSupport	.056	.001			
COPE23	<---	SocialSupport	.076	.001			
COPE13	<---	Maladaptive	.103	.002			
COPE6	<---	Maladaptive	.093	.001			
COPE26	<---	Maladaptive	.117	.002			
COPE16	<---	Maladaptive	.079	.001			
COPE28	<---	humour	.140	.002			
COPE18	<---	humour	.162	.003			
COPE27	<---	Spirituality	.539	.009			
COPE22	<---	Spirituality	.217	.003			
COPE11	<---	SubstanceUse	.157	.002			
COPE4	<---	SubstanceUse	.195	.003			

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
COPE4	.444	.007			

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
COPE11	.270	.004			
COPE22	.228	.004			
COPE27	1.695	.027			
COPE18	.298	.005			
COPE28	.206	.003			
COPE16	.118	.002			
COPE26	.069	.001			
COPE6	.153	.002			
COPE13	.098	.002			
COPE23	.089	.001			
COPE15	.099	.002			
COPE5	.088	.001			
COPE10	.122	.002			
COPE20	.073	.001			
COPE24	.082	.001			
COPE17	.087	.001			
COPE1	.080	.001			
COPE25	.063	.001			
COPE12	.068	.001			
COPE14	.079	.001			
COPE2	.085	.001			
COPE7	.070	.001			

Total Effects - Standard Errors (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	.527	.000	.000	.000	.000	.000
COPE11	.000	.000	.000	.000	.000	.000
COPE22	.000	.276	.000	.000	.000	.000

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE27	.000	.000	.000	.000	.000	.000
COPE18	.000	.000	.459	.000	.000	.000
COPE28	.000	.000	.000	.000	.000	.000
COPE16	.000	.000	.000	.352	.000	.000
COPE26	.000	.000	.000	.168	.000	.000
COPE6	.000	.000	.000	.401	.000	.000
COPE13	.000	.000	.000	.000	.000	.000
COPE23	.000	.000	.000	.000	.115	.000
COPE15	.000	.000	.000	.000	.158	.000
COPE5	.000	.000	.000	.000	.168	.000
COPE10	.000	.000	.000	.000	.000	.000
COPE20	.000	.000	.000	.000	.000	.116
COPE24	.000	.000	.000	.000	.000	.116
COPE17	.000	.000	.000	.000	.000	.121
COPE1	.000	.000	.000	.000	.000	.124
COPE25	.000	.000	.000	.000	.000	.095
COPE12	.000	.000	.000	.000	.000	.124
COPE14	.000	.000	.000	.000	.000	.113
COPE2	.000	.000	.000	.000	.000	.098
COPE7	.000	.000	.000	.000	.000	.000

Standardized Total Effects - Standard Errors (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	.195	.000	.000	.000	.000	.000
COPE11	.157	.000	.000	.000	.000	.000
COPE22	.000	.217	.000	.000	.000	.000
COPE27	.000	.539	.000	.000	.000	.000
COPE18	.000	.000	.162	.000	.000	.000

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE28	.000	.000	.140	.000	.000	.000
COPE16	.000	.000	.000	.079	.000	.000
COPE26	.000	.000	.000	.117	.000	.000
COPE6	.000	.000	.000	.093	.000	.000
COPE13	.000	.000	.000	.103	.000	.000
COPE23	.000	.000	.000	.000	.076	.000
COPE15	.000	.000	.000	.000	.056	.000
COPE5	.000	.000	.000	.000	.056	.000
COPE10	.000	.000	.000	.000	.076	.000
COPE20	.000	.000	.000	.000	.000	.080
COPE24	.000	.000	.000	.000	.000	.088
COPE17	.000	.000	.000	.000	.000	.069
COPE1	.000	.000	.000	.000	.000	.084
COPE25	.000	.000	.000	.000	.000	.039
COPE12	.000	.000	.000	.000	.000	.044
COPE14	.000	.000	.000	.000	.000	.052
COPE2	.000	.000	.000	.000	.000	.065
COPE7	.000	.000	.000	.000	.000	.044

Direct Effects - Standard Errors (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	.527	.000	.000	.000	.000	.000
COPE11	.000	.000	.000	.000	.000	.000
COPE22	.000	.276	.000	.000	.000	.000
COPE27	.000	.000	.000	.000	.000	.000
COPE18	.000	.000	.459	.000	.000	.000
COPE28	.000	.000	.000	.000	.000	.000
COPE16	.000	.000	.000	.352	.000	.000

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE26	.000	.000	.000	.168	.000	.000
COPE6	.000	.000	.000	.401	.000	.000
COPE13	.000	.000	.000	.000	.000	.000
COPE23	.000	.000	.000	.000	.115	.000
COPE15	.000	.000	.000	.000	.158	.000
COPE5	.000	.000	.000	.000	.168	.000
COPE10	.000	.000	.000	.000	.000	.000
COPE20	.000	.000	.000	.000	.000	.116
COPE24	.000	.000	.000	.000	.000	.116
COPE17	.000	.000	.000	.000	.000	.121
COPE1	.000	.000	.000	.000	.000	.124
COPE25	.000	.000	.000	.000	.000	.095
COPE12	.000	.000	.000	.000	.000	.124
COPE14	.000	.000	.000	.000	.000	.113
COPE2	.000	.000	.000	.000	.000	.098
COPE7	.000	.000	.000	.000	.000	.000

Standardized Direct Effects - Standard Errors (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	.195	.000	.000	.000	.000	.000
COPE11	.157	.000	.000	.000	.000	.000
COPE22	.000	.217	.000	.000	.000	.000
COPE27	.000	.539	.000	.000	.000	.000
COPE18	.000	.000	.162	.000	.000	.000
COPE28	.000	.000	.140	.000	.000	.000
COPE16	.000	.000	.000	.079	.000	.000
COPE26	.000	.000	.000	.117	.000	.000
COPE6	.000	.000	.000	.093	.000	.000

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE13	.000	.000	.000	.103	.000	.000
COPE23	.000	.000	.000	.000	.076	.000
COPE15	.000	.000	.000	.000	.056	.000
COPE5	.000	.000	.000	.000	.056	.000
COPE10	.000	.000	.000	.000	.076	.000
COPE20	.000	.000	.000	.000	.000	.080
COPE24	.000	.000	.000	.000	.000	.088
COPE17	.000	.000	.000	.000	.000	.069
COPE1	.000	.000	.000	.000	.000	.084
COPE25	.000	.000	.000	.000	.000	.039
COPE12	.000	.000	.000	.000	.000	.044
COPE14	.000	.000	.000	.000	.000	.052
COPE2	.000	.000	.000	.000	.000	.065
COPE7	.000	.000	.000	.000	.000	.044

Indirect Effects - Standard Errors (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	.000	.000	.000	.000	.000	.000
COPE11	.000	.000	.000	.000	.000	.000
COPE22	.000	.000	.000	.000	.000	.000
COPE27	.000	.000	.000	.000	.000	.000
COPE18	.000	.000	.000	.000	.000	.000
COPE28	.000	.000	.000	.000	.000	.000
COPE16	.000	.000	.000	.000	.000	.000
COPE26	.000	.000	.000	.000	.000	.000
COPE6	.000	.000	.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.000
COPE23	.000	.000	.000	.000	.000	.000

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE15	.000	.000	.000	.000	.000	.000
COPE5	.000	.000	.000	.000	.000	.000
COPE10	.000	.000	.000	.000	.000	.000
COPE20	.000	.000	.000	.000	.000	.000
COPE24	.000	.000	.000	.000	.000	.000
COPE17	.000	.000	.000	.000	.000	.000
COPE1	.000	.000	.000	.000	.000	.000
COPE25	.000	.000	.000	.000	.000	.000
COPE12	.000	.000	.000	.000	.000	.000
COPE14	.000	.000	.000	.000	.000	.000
COPE2	.000	.000	.000	.000	.000	.000
COPE7	.000	.000	.000	.000	.000	.000

Standardized Indirect Effects - Standard Errors (Group number 1 - Default model)

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE4	.000	.000	.000	.000	.000	.000
COPE11	.000	.000	.000	.000	.000	.000
COPE22	.000	.000	.000	.000	.000	.000
COPE27	.000	.000	.000	.000	.000	.000
COPE18	.000	.000	.000	.000	.000	.000
COPE28	.000	.000	.000	.000	.000	.000
COPE16	.000	.000	.000	.000	.000	.000
COPE26	.000	.000	.000	.000	.000	.000
COPE6	.000	.000	.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.000
COPE23	.000	.000	.000	.000	.000	.000
COPE15	.000	.000	.000	.000	.000	.000
COPE5	.000	.000	.000	.000	.000	.000

	SubstanceUse	Spirituality	humour	Maladaptive	SocialSupport	Reframing
COPE10	.000	.000	.000	.000	.000	.000
COPE20	.000	.000	.000	.000	.000	.000
COPE24	.000	.000	.000	.000	.000	.000
COPE17	.000	.000	.000	.000	.000	.000
COPE1	.000	.000	.000	.000	.000	.000
COPE25	.000	.000	.000	.000	.000	.000
COPE12	.000	.000	.000	.000	.000	.000
COPE14	.000	.000	.000	.000	.000	.000
COPE2	.000	.000	.000	.000	.000	.000
COPE7	.000	.000	.000	.000	.000	.000

Bootstrap (Default model)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	71	291.147	205	.000	1.420
Saturated model	276	.000	0		
Independence model	23	1675.501	253	.000	6.623

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.068	.841	.786	.625
Saturated model	.000	1.000		
Independence model	.219	.366	.309	.336

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.826	.786	.941	.925	.939
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.810	.669	.761
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	86.147	44.933	135.384
Saturated model	.000	.000	.000
Independence model	1422.501	1296.711	1555.743

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	2.275	.673	.351	1.058
Saturated model	.000	.000	.000	.000
Independence model	13.090	11.113	10.131	12.154

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.057	.041	.072	.211
Independence model	.210	.200	.219	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	433.147	465.916	636.194	707.194
Saturated model	552.000	679.385	1341.308	1617.308
Independence model	1721.501	1732.116	1787.277	1810.277

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	3.384	3.062	3.769	3.640
Saturated model	4.313	4.313	4.313	5.308
Independence model	13.449	12.466	14.490	13.532

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	106	113
Independence model	23	24

Execution time summary

Minimization: .051

Miscellaneous: .805

Bootstrap: 3.667

Total: 4.523

A4.2.6.4. Structural model for headache and thirst symptoms.

Variable counts (Group number 1)

Number of variables in your model: 36

Number of observed variables: 16

Number of unobserved variables: 20

Number of exogenous variables: 19

Number of endogenous variables: 17

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
age	18.000	66.000	.991	4.716	-.015	-.035
priorIncome_PA	.000	420000.000	6.143	29.247	40.849	97.240
incomePA_ChangePercent	-100.000	566.667	5.360	25.521	35.958	85.597
withResorp	.154	2.558	1.470	6.998	3.051	7.264
lonely_no	1.000	5.000	.024	.113	-1.284	-3.057
MLS_score	3.000	9.000	.341	1.623	-1.020	-2.429
DASS_depression	.000	40.000	.564	2.685	-.753	-1.793
DASS_Anxiety	2.000	34.000	1.016	4.839	.211	.502
DASS_Stress	.000	40.000	.426	2.028	-.758	-1.803
COPE13	1.000	4.000	.347	1.654	-1.169	-2.783
COPE6	1.000	4.000	1.383	6.585	1.620	3.857
COPE26	1.000	4.000	1.457	6.935	.842	2.003
COPE16	1.000	4.000	2.139	10.184	4.630	11.021
AHS4_headache	.000	7.000	1.676	7.981	2.210	5.261
AHS3_Tired	.000	7.000	.277	1.316	-1.188	-2.828
AHS2_thirsty	.000	6.000	.311	1.480	-1.305	-3.107
Multivariate					96.124	23.354

Models

Default model (Default model)

Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments:	136
Number of distinct parameters to be estimated:	43
Degrees of freedom (136 - 43):	93

Result (Default model)

Minimum was achieved

Chi-square = 114.598

Degrees of freedom = 93

Probability level = .064

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	-.230	.818	
PsychDistress	<---	priorIncome_PA	.000	.000	-.751	.453	
PsychDistress	<---	incomePA_ChangePercent	.003	.010	.286	.775	p1
PsychDistress	<---	age	-.156	.070	-2.220	.026	
MaladaptiveCoping	<---	PsychDistress	.042	.006	7.388	***	p2
withResorp	<---	PsychDistress	.003	.004	.609	.543	p4
MaladaptiveCoping	<---	age	-.004	.002	-1.855	.064	
HeadacheAndThirst	<---	MaladaptiveCoping	-.665	1.040	-.639	.523	p3
HeadacheAndThirst	<---	withResorp	.343	.202	1.699	.089	p5
HeadacheAndThirst	<---	PsychDistress	.045	.045	1.004	.316	
AHS2_thirsty	<---	HeadacheAndThirst	1.000				

			Estimate	S.E.	C.R.	P	Label
AHS3_Tired	<---	HeadacheAndThirst	1.909	.461	4.144	***	
AHS4_headache	<---	HeadacheAndThirst	.952	.200	4.767	***	
COPE16	<---	MaladaptiveCoping	1.000				
COPE26	<---	MaladaptiveCoping	1.350	.248	5.437	***	
COPE6	<---	MaladaptiveCoping	1.096	.144	7.604	***	
COPE13	<---	MaladaptiveCoping	1.919	.310	6.189	***	
DASS_Stress	<---	PsychDistress	1.000				
DASS_Anxiety	<---	PsychDistress	.742	.055	13.585	***	
DASS_depression	<---	PsychDistress	1.015	.073	13.865	***	
MLS_score	<---	PsychDistress	.130	.016	8.324	***	
lonely_no	<---	PsychDistress	-.070	.012	-5.831	***	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
incomePA_ChangePercent	<---	priorIncome_PA	-.020
PsychDistress	<---	priorIncome_PA	-.067
PsychDistress	<---	incomePA_ChangePercent	.025
PsychDistress	<---	age	-.201
MaladaptiveCoping	<---	PsychDistress	1.042
withResorp	<---	PsychDistress	.054

			Estimate
MaladaptiveCoping	<---	age	-.129
HeadacheAndThirst	<---	MaladaptiveCoping	-.265
HeadacheAndThirst	<---	withResorp	.166
HeadacheAndThirst	<---	PsychDistress	.453
AHS2_thirsty	<---	HeadacheAndThirst	.529
AHS3_Tired	<---	HeadacheAndThirst	.907
AHS4_headache	<---	HeadacheAndThirst	.549
COPE16	<---	MaladaptiveCoping	.541
COPE26	<---	MaladaptiveCoping	.538
COPE6	<---	MaladaptiveCoping	.565
COPE13	<---	MaladaptiveCoping	.653
DASS_Stress	<---	PsychDistress	.905
DASS_Anxiety	<---	PsychDistress	.846
DASS_depression	<---	PsychDistress	.856
MLS_score	<---	PsychDistress	.633
lonely_no	<---	PsychDistress	-.477

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
incomePA_ChangePercent	.000
PsychDistress	.051
withResorp	.003
MaladaptiveCoping	1.160
HeadacheAndThirst	.049
lonely_no	.227
MLS_score	.401
DASS_depression	.732
DASS_Anxiety	.716

	Estimate
DASS_Stress	.818
COPE13	.426
COPE6	.319
COPE26	.289
COPE16	.292
AHS4_headache	.302
AHS3_Tired	.822
AHS2_thirsty	.279

User-defined estimands: (Group number 1 - Default model)

Income_Distress_Coping_Headache	.000
Income_Distress_BAC_Headache	.000
Distress_Coping_Headache	-.028
Distress_BAC_Headache	.001

Matrices (Group number 1 - Default model)

Total Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.156	.000	.003	.000	.000	.000	.000
withResorp	.000	.000	.000	.003	.000	.000	.000
MaladaptiveCoping	-.010	.000	.000	.042	.000	.000	.000
HeadacheAndThirst	.000	.000	.000	.019	.343	-.665	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
lonely_no	.011	.000	.000	-.070	.000	.000	.000
MLS_score	-.020	.000	.000	.130	.000	.000	.000
DASS_depression	-.158	.000	.003	1.015	.000	.000	.000
DASS_Anxiety	-.115	.000	.002	.742	.000	.000	.000
DASS_Stress	-.156	.000	.003	1.000	.000	.000	.000
COPE13	-.020	.000	.000	.080	.000	1.919	.000
COPE6	-.011	.000	.000	.046	.000	1.096	.000
COPE26	-.014	.000	.000	.056	.000	1.350	.000
COPE16	-.010	.000	.000	.042	.000	1.000	.000
AHS4_headache	.000	.000	.000	.018	.326	-.633	.952
AHS3_Tired	.000	.000	.000	.035	.654	-1.269	1.909
AHS2_thirsty	.000	.000	.000	.019	.343	-.665	1.000

Standardized Total Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	-.020	.000	.000	.000	.000	.000
PsychDistress	-.201	-.068	.025	.000	.000	.000	.000
withResorp	-.011	-.004	.001	.054	.000	.000	.000
MaladaptiveCoping	-.338	-.071	.026	1.042	.000	.000	.000
HeadacheAndThirst	-.003	-.013	.005	.186	.166	-.265	.000
lonely_no	.096	.032	-.012	-.477	.000	.000	.000
MLS_score	-.127	-.043	.016	.633	.000	.000	.000
DASS_depression	-.172	-.058	.021	.856	.000	.000	.000
DASS_Anxiety	-.170	-.057	.021	.846	.000	.000	.000
DASS_Stress	-.182	-.061	.023	.905	.000	.000	.000
COPE13	-.221	-.046	.017	.680	.000	.653	.000
COPE6	-.191	-.040	.015	.589	.000	.565	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE26	-.182	-.038	.014	.560	.000	.538	.000
COPE16	-.183	-.038	.014	.564	.000	.541	.000
AHS4_headache	-.002	-.007	.003	.102	.091	-.146	.549
AHS3_Tired	-.003	-.011	.004	.168	.151	-.241	.907
AHS2_thirsty	-.002	-.007	.002	.098	.088	-.140	.529

Direct Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.156	.000	.003	.000	.000	.000	.000
withResorp	.000	.000	.000	.003	.000	.000	.000
MaladaptiveCoping	-.004	.000	.000	.042	.000	.000	.000
HeadacheAndThirst	.000	.000	.000	.045	.343	-.665	.000
lonely_no	.000	.000	.000	-.070	.000	.000	.000
MLS_score	.000	.000	.000	.130	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
DASS_depression	.000	.000	.000	1.015	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.742	.000	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	1.919	.000
COPE6	.000	.000	.000	.000	.000	1.096	.000
COPE26	.000	.000	.000	.000	.000	1.350	.000
COPE16	.000	.000	.000	.000	.000	1.000	.000
AHS4_headache	.000	.000	.000	.000	.000	.000	.952
AHS3_Tired	.000	.000	.000	.000	.000	.000	1.909
AHS2_thirsty	.000	.000	.000	.000	.000	.000	1.000

Standardized Direct Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	-.020	.000	.000	.000	.000	.000
PsychDistress	-.201	-.067	.025	.000	.000	.000	.000
withResorp	.000	.000	.000	.054	.000	.000	.000
MaladaptiveCoping	-.129	.000	.000	1.042	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
HeadacheAndThirst	.000	.000	.000	.453	.166	-.265	.000
lonely_no	.000	.000	.000	-.477	.000	.000	.000
MLS_score	.000	.000	.000	.633	.000	.000	.000
DASS_depression	.000	.000	.000	.856	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.846	.000	.000	.000
DASS_Stress	.000	.000	.000	.905	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.653	.000
COPE6	.000	.000	.000	.000	.000	.565	.000
COPE26	.000	.000	.000	.000	.000	.538	.000
COPE16	.000	.000	.000	.000	.000	.541	.000
AHS4_headache	.000	.000	.000	.000	.000	.000	.549
AHS3_Tired	.000	.000	.000	.000	.000	.000	.907
AHS2_thirsty	.000	.000	.000	.000	.000	.000	.529

Indirect Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	.000	.000	.000	.000	.000	.000	.000
MaladaptiveCoping	-.006	.000	.000	.000	.000	.000	.000
HeadacheAndThirst	.000	.000	.000	-.027	.000	.000	.000
lonely_no	.011	.000	.000	.000	.000	.000	.000
MLS_score	-.020	.000	.000	.000	.000	.000	.000
DASS_depression	-.158	.000	.003	.000	.000	.000	.000
DASS_Anxiety	-.115	.000	.002	.000	.000	.000	.000
DASS_Stress	-.156	.000	.003	.000	.000	.000	.000
COPE13	-.020	.000	.000	.080	.000	.000	.000
COPE6	-.011	.000	.000	.046	.000	.000	.000
COPE26	-.014	.000	.000	.056	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE16	-.010	.000	.000	.042	.000	.000	.000
AHS4_headache	.000	.000	.000	.018	.326	-.633	.000
AHS3_Tired	.000	.000	.000	.035	.654	-1.269	.000
AHS2_thirsty	.000	.000	.000	.019	.343	-.665	.000

Standardized Indirect Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	-.011	-.004	.001	.000	.000	.000	.000
MaladaptiveCoping	-.209	-.071	.026	.000	.000	.000	.000
HeadacheAndThirst	-.003	-.013	.005	-.267	.000	.000	.000
lonely_no	.096	.032	-.012	.000	.000	.000	.000
MLS_score	-.127	-.043	.016	.000	.000	.000	.000
DASS_depression	-.172	-.058	.021	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
DASS_Anxiety	-.170	-.057	.021	.000	.000	.000	.000
DASS_Stress	-.182	-.061	.023	.000	.000	.000	.000
COPE13	-.221	-.046	.017	.680	.000	.000	.000
COPE6	-.191	-.040	.015	.589	.000	.000	.000
COPE26	-.182	-.038	.014	.560	.000	.000	.000
COPE16	-.183	-.038	.014	.564	.000	.000	.000
AHS4_headache	-.002	-.007	.003	.102	.091	-.146	.000
AHS3_Tired	-.003	-.011	.004	.168	.151	-.241	.000
AHS2_thirsty	-.002	-.007	.002	.098	.088	-.140	.000

Regression Weights: (Group number 1 - Default model)

			M.I.	Par Change
lonely_no	<---	age	5.963	.021
DASS_depression	<---	withResorp	5.512	2.774
DASS_Anxiety	<---	AHS4_headache	4.799	.564
DASS_Stress	<---	withResorp	6.657	-2.645
COPE26	<---	withResorp	4.521	-.298

			M.I.	Par Change
COPE16	<---	withResorp	4.152	.199
AHS4_headache	<---	withResorp	4.490	-.564
AHS4_headache	<---	DASS_Anxiety	5.177	.033
AHS3_Tired	<---	priorIncome_PA	4.336	.000

Bootstrap (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	.000	.000	.000
PsychDistress	<---	priorIncome_PA	.000	.000	.000	.000	.000
PsychDistress	<---	incomePA_ChangePercent	.021	.000	-.003	-.006	.000
PsychDistress	<---	age	.075	.001	-.146	.010	.002
MaladaptiveCoping	<---	PsychDistress	.008	.000	.042	.000	.000
withResorp	<---	PsychDistress	.004	.000	.003	.000	.000
MaladaptiveCoping	<---	age	.002	.000	-.003	.001	.000
HeadacheAndThirst	<---	MaladaptiveCoping	5.064	.080	-1.217	-.552	.113
HeadacheAndThirst	<---	withResorp	.226	.004	.347	.004	.005
HeadacheAndThirst	<---	PsychDistress	.210	.003	.066	.020	.005
AHS2_thirsty	<---	HeadacheAndThirst	.000	.000	1.000	.000	.000
AHS3_Tired	<---	HeadacheAndThirst	3.895	.062	2.391	.482	.087

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
AHS4_headache	<---	HeadacheAndThirst	9.436	.149	1.219	.267	.211
COPE16	<---	MaladaptiveCoping	.000	.000	1.000	.000	.000
COPE26	<---	MaladaptiveCoping	.328	.005	1.391	.040	.007
COPE6	<---	MaladaptiveCoping	.174	.003	1.121	.024	.004
COPE13	<---	MaladaptiveCoping	.441	.007	1.985	.065	.010
DASS_Stress	<---	PsychDistress	.000	.000	1.000	.000	.000
DASS_Anxiety	<---	PsychDistress	.059	.001	.745	.004	.001
DASS_depression	<---	PsychDistress	.077	.001	1.017	.002	.002
MLS_score	<---	PsychDistress	.016	.000	.130	-.001	.000
lonely_no	<---	PsychDistress	.012	.000	-.070	.000	.000

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	<---	priorIncome_PA	.038	.001	-.015	.005	.001
PsychDistress	<---	priorIncome_PA	.065	.001	-.070	-.003	.001
PsychDistress	<---	incomePA_ChangePercent	.133	.002	.008	-.017	.003
PsychDistress	<---	age	.098	.002	-.190	.011	.002
MaladaptiveCoping	<---	PsychDistress	.090	.001	1.057	.015	.002

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
withResorp	<---	PsychDistress	.086	.001	.056	.002	.002
MaladaptiveCoping	<---	age	.077	.001	-.117	.012	.002
HeadacheAndThirst	<---	MaladaptiveCoping	2.195	.035	-.512	-.247	.049
HeadacheAndThirst	<---	withResorp	.093	.001	.164	-.002	.002
HeadacheAndThirst	<---	PsychDistress	2.200	.035	.693	.240	.049
AHS2_thirsty	<---	HeadacheAndThirst	.120	.002	.526	-.003	.003
AHS3_Tired	<---	HeadacheAndThirst	.215	.003	.943	.037	.005
AHS4_headache	<---	HeadacheAndThirst	.105	.002	.543	-.006	.002
COPE16	<---	MaladaptiveCoping	.076	.001	.538	-.003	.002
COPE26	<---	MaladaptiveCoping	.071	.001	.532	-.005	.002
COPE6	<---	MaladaptiveCoping	.074	.001	.565	.000	.002
COPE13	<---	MaladaptiveCoping	.072	.001	.647	-.006	.002
DASS_Stress	<---	PsychDistress	.029	.000	.903	-.001	.001
DASS_Anxiety	<---	PsychDistress	.031	.000	.847	.001	.001
DASS_depression	<---	PsychDistress	.035	.001	.853	-.002	.001
MLS_score	<---	PsychDistress	.059	.001	.628	-.005	.001
lonely_no	<---	PsychDistress	.078	.001	-.473	.003	.002

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	.003	.000	.002	.001	.000
PsychDistress	.045	.001	.080	.028	.001
withResorp	.015	.000	.011	.008	.000
MaladaptiveCoping	.190	.003	1.188	.028	.004
HeadacheAndThirst	.242	.004	.061	.012	.005
lonely_no	.073	.001	.230	.003	.002
MLS_score	.074	.001	.398	-.003	.002
DASS_depression	.059	.001	.730	-.002	.001
DASS_Anxiety	.052	.001	.718	.003	.001
DASS_Stress	.052	.001	.817	-.002	.001
COPE13	.092	.001	.424	-.003	.002
COPE6	.083	.001	.325	.005	.002
COPE26	.075	.001	.288	.000	.002
COPE16	.081	.001	.295	.003	.002
AHS4_headache	.124	.002	.306	.004	.003
AHS3_Tired	.624	.010	.936	.114	.014
AHS2_thirsty	.119	.002	.291	.011	.003

User-defined estimands: (Group number 1 - Default model)

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
Income_Distress_Coping_Headache	.005	.000	.000	.000	.000
Income_Distress_BAC_Headache	.000	.000	.000	.000	.000
Distress_Coping_Headache	.209	.003	-.046	-.018	.005
Distress_BAC_Headache	.002	.000	.001	.000	.000

Matrices (Group number 1 - Default model)

Total Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.075	.000	.021	.000	.000	.000	.000
withResorp	.001	.000	.000	.004	.000	.000	.000
MaladaptiveCoping	.004	.000	.001	.008	.000	.000	.000
HeadacheAndThirst	.007	.000	.001	.015	.226	5.064	.000
lonely_no	.006	.000	.002	.012	.000	.000	.000
MLS_score	.010	.000	.003	.016	.000	.000	.000
DASS_depression	.079	.000	.022	.077	.000	.000	.000
DASS_Anxiety	.058	.000	.016	.059	.000	.000	.000
DASS_Stress	.075	.000	.021	.000	.000	.000	.000
COPE13	.006	.000	.002	.009	.000	.441	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE6	.004	.000	.001	.008	.000	.174	.000
COPE26	.005	.000	.001	.010	.000	.328	.000
COPE16	.004	.000	.001	.008	.000	.000	.000
AHS4_headache	.007	.000	.001	.015	.182	5.631	9.436
AHS3_Tired	.014	.000	.001	.023	.360	10.775	3.895
AHS2_thirsty	.007	.000	.001	.015	.226	5.064	.000

Standardized Total Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.038	.000	.000	.000	.000	.000
PsychDistress	.098	.064	.133	.000	.000	.000	.000
withResorp	.019	.009	.014	.086	.000	.000	.000
MaladaptiveCoping	.094	.069	.142	.090	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
HeadacheAndThirst	.094	.017	.032	.129	.093	2.195	.000
lonely_no	.052	.031	.063	.078	.000	.000	.000
MLS_score	.065	.041	.083	.059	.000	.000	.000
DASS_depression	.085	.055	.114	.035	.000	.000	.000
DASS_Anxiety	.084	.054	.113	.031	.000	.000	.000
DASS_Stress	.088	.059	.120	.029	.000	.000	.000
COPE13	.064	.045	.091	.056	.000	.072	.000
COPE6	.062	.038	.080	.068	.000	.074	.000
COPE26	.054	.037	.076	.070	.000	.071	.000
COPE16	.060	.036	.077	.076	.000	.076	.000
AHS4_headache	.054	.010	.019	.082	.052	1.270	.105
AHS3_Tired	.087	.015	.028	.108	.084	2.064	.215

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
AHS2_thirsty	.050	.010	.018	.078	.059	1.083	.120

Direct Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.075	.000	.021	.000	.000	.000	.000
withResorp	.000	.000	.000	.004	.000	.000	.000
MaladaptiveCoping	.002	.000	.000	.008	.000	.000	.000
HeadacheAndThirst	.000	.000	.000	.210	.226	5.064	.000
lonely_no	.000	.000	.000	.012	.000	.000	.000
MLS_score	.000	.000	.000	.016	.000	.000	.000
DASS_depression	.000	.000	.000	.077	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.059	.000	.000	.000
DASS_Stress	.000	.000	.000	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE13	.000	.000	.000	.000	.000	.441	.000
COPE6	.000	.000	.000	.000	.000	.174	.000
COPE26	.000	.000	.000	.000	.000	.328	.000
COPE16	.000	.000	.000	.000	.000	.000	.000
AHS4_headache	.000	.000	.000	.000	.000	.000	9.436
AHS3_Tired	.000	.000	.000	.000	.000	.000	3.895
AHS2_thirsty	.000	.000	.000	.000	.000	.000	.000

Standardized Direct Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.038	.000	.000	.000	.000	.000
PsychDistress	.098	.065	.133	.000	.000	.000	.000
withResorp	.000	.000	.000	.086	.000	.000	.000
MaladaptiveCoping	.077	.000	.000	.090	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
HeadacheAndThirst	.000	.000	.000	2.200	.093	2.195	.000
lonely_no	.000	.000	.000	.078	.000	.000	.000
MLS_score	.000	.000	.000	.059	.000	.000	.000
DASS_depression	.000	.000	.000	.035	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.031	.000	.000	.000
DASS_Stress	.000	.000	.000	.029	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.072	.000
COPE6	.000	.000	.000	.000	.000	.074	.000
COPE26	.000	.000	.000	.000	.000	.071	.000
COPE16	.000	.000	.000	.000	.000	.076	.000
AHS4_headache	.000	.000	.000	.000	.000	.000	.105
AHS3_Tired	.000	.000	.000	.000	.000	.000	.215

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
AHS2_thirsty	.000	.000	.000	.000	.000	.000	.120

Indirect Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	.001	.000	.000	.000	.000	.000	.000
MaladaptiveCoping	.004	.000	.001	.000	.000	.000	.000
HeadacheAndThirst	.007	.000	.001	.209	.000	.000	.000
lonely_no	.006	.000	.002	.000	.000	.000	.000
MLS_score	.010	.000	.003	.000	.000	.000	.000
DASS_depression	.079	.000	.022	.000	.000	.000	.000
DASS_Anxiety	.058	.000	.016	.000	.000	.000	.000
DASS_Stress	.075	.000	.021	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE13	.006	.000	.002	.009	.000	.000	.000
COPE6	.004	.000	.001	.008	.000	.000	.000
COPE26	.005	.000	.001	.010	.000	.000	.000
COPE16	.004	.000	.001	.008	.000	.000	.000
AHS4_headache	.007	.000	.001	.015	.182	5.631	.000
AHS3_Tired	.014	.000	.001	.023	.360	10.775	.000
AHS2_thirsty	.007	.000	.001	.015	.226	5.064	.000

Standardized Indirect Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.006	.000	.000	.000	.000	.000
withResorp	.019	.009	.014	.000	.000	.000	.000
MaladaptiveCoping	.105	.069	.142	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
HeadacheAndThirst	.094	.017	.032	2.191	.000	.000	.000
lonely_no	.052	.031	.063	.000	.000	.000	.000
MLS_score	.065	.041	.083	.000	.000	.000	.000
DASS_depression	.085	.055	.114	.000	.000	.000	.000
DASS_Anxiety	.084	.054	.113	.000	.000	.000	.000
DASS_Stress	.088	.059	.120	.000	.000	.000	.000
COPE13	.064	.045	.091	.056	.000	.000	.000
COPE6	.062	.038	.080	.068	.000	.000	.000
COPE26	.054	.037	.076	.070	.000	.000	.000
COPE16	.060	.036	.077	.076	.000	.000	.000
AHS4_headache	.054	.010	.019	.082	.052	1.270	.000
AHS3_Tired	.087	.015	.028	.108	.084	2.064	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
AHS2_thirsty	.050	.010	.018	.078	.059	1.083	.000

Bootstrap Confidence (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			Estimate	Lower	Upper	P
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	.000	.516
PsychDistress	<---	priorIncome_PA	.000	.000	.000	.324
PsychDistress	<---	incomePA_ChangePercent	.003	-.057	.028	.783
PsychDistress	<---	age	-.156	-.297	-.007	.044
MaladaptiveCoping	<---	PsychDistress	.042	.028	.059	.001
withResorp	<---	PsychDistress	.003	-.005	.010	.536
MaladaptiveCoping	<---	age	-.004	-.009	.000	.045
HeadacheAndThirst	<---	MaladaptiveCoping	-.665	-18.959	1.898	.452
HeadacheAndThirst	<---	withResorp	.343	.001	.869	.049
HeadacheAndThirst	<---	PsychDistress	.045	-.054	.787	.275
AHS2_thirsty	<---	HeadacheAndThirst	1.000	1.000	1.000	...
AHS3_Tired	<---	HeadacheAndThirst	1.909	1.204	7.518	.001
AHS4_headache	<---	HeadacheAndThirst	.952	.579	1.754	.001

Parameter			Estimate	Lower	Upper	P
COPE16	<---	MaladaptiveCoping	1.000	1.000	1.000	...
COPE26	<---	MaladaptiveCoping	1.350	.865	2.107	.001
COPE6	<---	MaladaptiveCoping	1.096	.837	1.512	.001
COPE13	<---	MaladaptiveCoping	1.919	1.299	2.957	.001
DASS_Stress	<---	PsychDistress	1.000	1.000	1.000	...
DASS_Anxiety	<---	PsychDistress	.742	.628	.859	.001
DASS_depression	<---	PsychDistress	1.015	.863	1.167	.001
MLS_score	<---	PsychDistress	.130	.100	.164	.001
lonely_no	<---	PsychDistress	-.070	-.094	-.047	.001

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			Estimate	Lower	Upper	P
incomePA_ChangePercent	<---	priorIncome_PA	-.020	-.075	.077	.535
PsychDistress	<---	priorIncome_PA	-.067	-.201	.051	.304
PsychDistress	<---	incomePA_ChangePercent	.025	-.243	.280	.790
PsychDistress	<---	age	-.201	-.384	-.004	.048
MaladaptiveCoping	<---	PsychDistress	1.042	.899	1.244	.001
withResorp	<---	PsychDistress	.054	-.101	.229	.526

Parameter			Estimate	Lower	Upper	P
MaladaptiveCoping	<---	age	-.129	-.284	.013	.062
HeadacheAndThirst	<---	MaladaptiveCoping	-.265	-8.112	.699	.454
HeadacheAndThirst	<---	withResorp	.166	-.010	.350	.068
HeadacheAndThirst	<---	PsychDistress	.453	-.533	7.642	.284
AHS2_thirsty	<---	HeadacheAndThirst	.529	.238	.713	.002
AHS3_Tired	<---	HeadacheAndThirst	.907	.709	1.478	.001
AHS4_headache	<---	HeadacheAndThirst	.549	.333	.731	.001
COPE16	<---	MaladaptiveCoping	.541	.376	.680	.001
COPE26	<---	MaladaptiveCoping	.538	.404	.675	.001
COPE6	<---	MaladaptiveCoping	.565	.418	.713	.001
COPE13	<---	MaladaptiveCoping	.653	.493	.776	.001
DASS_Stress	<---	PsychDistress	.905	.840	.954	.001
DASS_Anxiety	<---	PsychDistress	.846	.773	.897	.002
DASS_depression	<---	PsychDistress	.856	.778	.914	.001
MLS_score	<---	PsychDistress	.633	.509	.745	.001
lonely_no	<---	PsychDistress	-.477	-.620	-.313	.001

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	Estimate	Lower	Upper	P
incomePA_ChangePercent	.000	.000	.004	.011
PsychDistress	.051	.004	.118	.027
withResorp	.003	.000	.035	.005
MaladaptiveCoping	1.160	.901	1.606	.001
HeadacheAndThirst	.049	-.236	.275	.476
lonely_no	.227	.098	.385	.001
MLS_score	.401	.259	.554	.001
DASS_depression	.732	.606	.835	.001
DASS_Anxiety	.716	.598	.805	.002
DASS_Stress	.818	.706	.910	.001
COPE13	.426	.243	.602	.001
COPE6	.319	.175	.508	.001
COPE26	.289	.163	.455	.001
COPE16	.292	.141	.463	.001
AHS4_headache	.302	.111	.534	.001
AHS3_Tired	.822	.503	2.184	.001
AHS2_thirsty	.279	.057	.508	.002

User-defined estimands: (Group number 1 - Default model)

Parameter	Estimate	Lower	Upper	P
Income_Distress_Coping_Headache	.000	-.009	.002	.614
Income_Distress_BAC_Headache	.000	.000	.000	.467
Distress_Coping_Headache	-.028	-.853	.075	.437
Distress_BAC_Headache	.001	-.001	.007	.245

Matrices (Group number 1 - Default model)

Total Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.297	.000	-.057	.000	.000	.000	.000
withResorp	-.002	.000	.000	-.005	.000	.000	.000
MaladaptiveCoping	-.019	.000	-.002	.028	.000	.000	.000
HeadacheAndThirst	-.015	.000	-.001	-.003	.001	-18.959	.000
lonely_no	.001	.000	-.002	-.094	.000	.000	.000
MLS_score	-.043	.000	-.007	.100	.000	.000	.000
DASS_depression	-.315	.000	-.056	.863	.000	.000	.000
DASS_Anxiety	-.231	.000	-.042	.628	.000	.000	.000
DASS_Stress	-.297	.000	-.057	1.000	.000	.000	.000
COPE13	-.034	.000	-.004	.063	.000	1.299	.000
COPE6	-.021	.000	-.003	.032	.000	.837	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE26	-.025	.000	-.003	.037	.000	.865	.000
COPE16	-.019	.000	-.002	.028	.000	1.000	.000
AHS4_headache	-.013	.000	-.001	-.003	.003	-23.903	.579
AHS3_Tired	-.022	.000	-.002	-.012	-.081	-34.188	1.204
AHS2_thirsty	-.015	.000	-.001	-.003	.001	-18.959	1.000

Total Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.007	.000	.028	.000	.000	.000	.000
withResorp	.001	.000	.000	.010	.000	.000	.000
MaladaptiveCoping	-.005	.000	.001	.059	.000	.000	.000
HeadacheAndThirst	.015	.000	.001	.052	.869	1.898	.000
lonely_no	.025	.000	.004	-.047	.000	.000	.000
MLS_score	-.001	.000	.004	.164	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
DASS_depression	-.005	.000	.029	1.167	.000	.000	.000
DASS_Anxiety	-.005	.000	.022	.859	.000	.000	.000
DASS_Stress	-.007	.000	.028	1.000	.000	.000	.000
COPE13	-.010	.000	.002	.098	.000	2.957	.000
COPE6	-.005	.000	.001	.063	.000	1.512	.000
COPE26	-.006	.000	.002	.077	.000	2.107	.000
COPE16	-.005	.000	.001	.059	.000	1.000	.000
AHS4_headache	.017	.000	.001	.051	.693	1.630	1.754
AHS3_Tired	.035	.000	.002	.076	1.309	3.330	7.518
AHS2_thirsty	.015	.000	.001	.052	.869	1.898	1.000

Total Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	...	.516	...	...	...	...	...
PsychDistress	.044	.315	.783	...	...	...	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
withResorp	.324	.375	.618	.536	…	…	…
MaladaptiveCoping	.000	.307	.783	.001	…	…	…
HeadacheAndThirst	.988	.220	.570	.152	.049	.452	…
lonely_no	.039	.301	.769	.001	…	…	…
MLS_score	.039	.311	.775	.001	…	…	…
DASS_depression	.047	.308	.769	.001	…	…	…
DASS_Anxiety	.045	.311	.779	.001	…	…	…
DASS_Stress	.044	.315	.783	…	…	…	…
COPE13	.000	.301	.777	.001	…	.001	…
COPE6	.000	.294	.788	.001	…	.001	…
COPE26	.000	.303	.773	.001	…	.001	…
COPE16	.000	.307	.783	.001	…	…	…

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
AHS4_headache	.982	.220	.556	.136	.046	.433	.001
AHS3_Tired	.995	.231	.639	.152	.084	.485	.001
AHS2_thirsty	.988	.220	.570	.152	.049	.452	...

Standardized Total Effects (Group number 1 - Default model)

Standardized Total Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	-.075	.000	.000	.000	.000	.000
PsychDistress	-.384	-.200	-.243	.000	.000	.000	.000
withResorp	-.065	-.038	-.018	-.101	.000	.000	.000
MaladaptiveCoping	-.519	-.215	-.258	.899	.000	.000	.000
HeadacheAndThirst	-.157	-.063	-.044	-.044	-.010	-8.112	.000
lonely_no	.005	-.021	-.124	-.620	.000	.000	.000
MLS_score	-.259	-.129	-.150	.509	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
DASS_depression	-.331	-.174	-.204	.778	.000	.000	.000
DASS_Anxiety	-.335	-.170	-.207	.773	.000	.000	.000
DASS_Stress	-.347	-.181	-.219	.840	.000	.000	.000
COPE13	-.350	-.141	-.162	.561	.000	.493	.000
COPE6	-.328	-.115	-.143	.448	.000	.418	.000
COPE26	-.292	-.116	-.131	.409	.000	.404	.000
COPE16	-.310	-.116	-.132	.383	.000	.376	.000
AHS4_headache	-.095	-.038	-.025	-.018	-.003	-5.904	.333
AHS3_Tired	-.131	-.055	-.039	-.057	-.018	-7.931	.709
AHS2_thirsty	-.097	-.037	-.023	-.018	-.001	-4.480	.238

Standardized Total Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.077	.000	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
PsychDistress	-.004	.048	.280	.000	.000	.000	.000
withResorp	.015	.005	.041	.229	.000	.000	.000
MaladaptiveCoping	-.158	.053	.297	1.244	.000	.000	.000
HeadacheAndThirst	.215	.006	.101	.436	.350	.699	.000
lonely_no	.213	.099	.115	-.313	.000	.000	.000
MLS_score	-.005	.030	.165	.745	.000	.000	.000
DASS_depression	-.004	.042	.235	.914	.000	.000	.000
DASS_Anxiety	-.001	.042	.239	.897	.000	.000	.000
DASS_Stress	-.007	.043	.247	.954	.000	.000	.000
COPE13	-.104	.032	.191	.783	.000	.776	.000
COPE6	-.082	.029	.183	.716	.000	.713	.000
COPE26	-.081	.027	.173	.689	.000	.675	.000
COPE16	-.079	.027	.177	.692	.000	.680	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
AHS4_headache	.120	.003	.072	.290	.195	.367	.731
AHS3_Tired	.216	.006	.082	.354	.310	.607	1.478
AHS2_thirsty	.103	.003	.063	.267	.231	.357	.713

Standardized Total Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	...	.535	...	...	...	...	...
PsychDistress	.048	.295	.790	...	...	...	...
withResorp	.343	.353	.600	.526	...	...	...
MaladaptiveCoping	.000	.302	.792	.001	...	...	...
HeadacheAndThirst	.999	.211	.589	.149	.068	.454	...
lonely_no	.038	.291	.771	.001	...	...	...
MLS_score	.043	.282	.783	.001	...	...	...
DASS_depression	.048	.302	.783	.001	...	...	...
DASS_Anxiety	.049	.303	.786	.002	...	...	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
DASS_Stress	.046	.298	.785	.001	...	...	...
COPE13	.000	.277	.785	.001	...	.001	...
COPE6	.000	.302	.785	.002	...	.001	...
COPE26	.000	.292	.777	.001	...	.001	...
COPE16	.000	.287	.785	.002	...	.001	...
AHS4_headache	.982	.213	.561	.147	.056	.421	.001
AHS3_Tired	.997	.211	.627	.155	.085	.465	.001
AHS2_thirsty	.988	.207	.561	.153	.053	.415	.002

Direct Effects (Group number 1 - Default model)

Direct Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.297	.000	-.057	.000	.000	.000	.000
withResorp	.000	.000	.000	-.005	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
MaladaptiveCoping	-.009	.000	.000	.028	.000	.000	.000
HeadacheAndThirst	.000	.000	.000	-.054	.001	-18.959	.000
lonely_no	.000	.000	.000	-.094	.000	.000	.000
MLS_score	.000	.000	.000	.100	.000	.000	.000
DASS_depression	.000	.000	.000	.863	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.628	.000	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	1.299	.000
COPE6	.000	.000	.000	.000	.000	.837	.000
COPE26	.000	.000	.000	.000	.000	.865	.000
COPE16	.000	.000	.000	.000	.000	1.000	.000
AHS4_headache	.000	.000	.000	.000	.000	.000	.579
AHS3_Tired	.000	.000	.000	.000	.000	.000	1.204
AHS2_thirsty	.000	.000	.000	.000	.000	.000	1.000

Direct Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
PsychDistress	-.007	.000	.028	.000	.000	.000	.000
withResorp	.000	.000	.000	.010	.000	.000	.000
MaladaptiveCoping	.000	.000	.000	.059	.000	.000	.000
HeadacheAndThirst	.000	.000	.000	.787	.869	1.898	.000
lonely_no	.000	.000	.000	-.047	.000	.000	.000
MLS_score	.000	.000	.000	.164	.000	.000	.000
DASS_depression	.000	.000	.000	1.167	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.859	.000	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	2.957	.000
COPE6	.000	.000	.000	.000	.000	1.512	.000
COPE26	.000	.000	.000	.000	.000	2.107	.000
COPE16	.000	.000	.000	.000	.000	1.000	.000
AHS4_headache	.000	.000	.000	.000	.000	.000	1.754
AHS3_Tired	.000	.000	.000	.000	.000	.000	7.518
AHS2_thirsty	.000	.000	.000	.000	.000	.000	1.000

Direct Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	...	.516	...	...	...	...	...
PsychDistress	.044	.324	.783	...	...	...	...
withResorp	...	...	...	.536	...	...	...
MaladaptiveCoping	.045	...	...	.001	...	...	...
HeadacheAndThirst	...	...	...	.275	.049	.452	...
lonely_no	...	...	...	.001	...	...	...
MLS_score	...	...	...	.001	...	...	...
DASS_depression	...	...	...	.001	...	...	...
DASS_Anxiety	...	...	...	.001	...	...	...
DASS_Stress	...	...	...	...	...	...	...
COPE13	...	...	...	...	...	.001	...
COPE6	...	...	...	...	...	.001	...
COPE26	...	...	...	...	...	.001	...
COPE16	...	...	...	...	...	...	...
AHS4_headache	...	...	...	...	...	...	.001
AHS3_Tired	...	...	...	...	...	...	.001
AHS2_thirsty	...	...	...	...	...	...	...

Standardized Direct Effects (Group number 1 - Default model)

Standardized Direct Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	-.075	.000	.000	.000	.000	.000
PsychDistress	-.384	-.201	-.243	.000	.000	.000	.000
withResorp	.000	.000	.000	-.101	.000	.000	.000
MaladaptiveCoping	-.284	.000	.000	.899	.000	.000	.000
HeadacheAndThirst	.000	.000	.000	-.533	-.010	-8.112	.000
lonely_no	.000	.000	.000	-.620	.000	.000	.000
MLS_score	.000	.000	.000	.509	.000	.000	.000
DASS_depression	.000	.000	.000	.778	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.773	.000	.000	.000
DASS_Stress	.000	.000	.000	.840	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.493	.000
COPE6	.000	.000	.000	.000	.000	.418	.000
COPE26	.000	.000	.000	.000	.000	.404	.000
COPE16	.000	.000	.000	.000	.000	.376	.000
AHS4_headache	.000	.000	.000	.000	.000	.000	.333

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
AHS3_Tired	.000	.000	.000	.000	.000	.000	.709
AHS2_thirsty	.000	.000	.000	.000	.000	.000	.238

Standardized Direct Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.077	.000	.000	.000	.000	.000
PsychDistress	-.004	.051	.280	.000	.000	.000	.000
withResorp	.000	.000	.000	.229	.000	.000	.000
MaladaptiveCoping	.013	.000	.000	1.244	.000	.000	.000
HeadacheAndThirst	.000	.000	.000	7.642	.350	.699	.000
lonely_no	.000	.000	.000	-.313	.000	.000	.000
MLS_score	.000	.000	.000	.745	.000	.000	.000
DASS_depression	.000	.000	.000	.914	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.897	.000	.000	.000
DASS_Stress	.000	.000	.000	.954	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.776	.000
COPE6	.000	.000	.000	.000	.000	.713	.000
COPE26	.000	.000	.000	.000	.000	.675	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE16	.000	.000	.000	.000	.000	.680	.000
AHS4_headache	.000	.000	.000	.000	.000	.000	.731
AHS3_Tired	.000	.000	.000	.000	.000	.000	1.478
AHS2_thirsty	.000	.000	.000	.000	.000	.000	.713

Standardized Direct Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	...	.535	...	...	...	...	...
PsychDistress	.048	.304	.790	...	...	...	...
withResorp	...	...	...	.526	...	...	...
MaladaptiveCoping	.062	...	...	.001	...	...	...
HeadacheAndThirst	...	...	...	.284	.068	.454	...
lonely_no	...	...	...	.001	...	...	...
MLS_score	...	...	...	.001	...	...	...
DASS_depression	...	...	...	.001	...	...	...
DASS_Anxiety	...	...	...	.002	...	...	...
DASS_Stress	...	...	...	.001	...	...	...
COPE13	...	...	...	...	...	.001	...
COPE6	...	...	...	...	...	.001	...
COPE26	...	...	...	...	...	.001	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE16	…	…	…	…	…	.001	…
AHS4_headache	…	…	…	…	…	…	.001
AHS3_Tired	…	…	…	…	…	…	.001
AHS2_thirsty	…	…	…	…	…	…	.002

Indirect Effects (Group number 1 - Default model)

Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	-.002	.000	.000	.000	.000	.000	.000
MaladaptiveCoping	-.016	.000	-.002	.000	.000	.000	.000
HeadacheAndThirst	-.015	.000	-.001	-.838	.000	.000	.000
lonely_no	.001	.000	-.002	.000	.000	.000	.000
MLS_score	-.043	.000	-.007	.000	.000	.000	.000
DASS_depression	-.315	.000	-.056	.000	.000	.000	.000
DASS_Anxiety	-.231	.000	-.042	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
DASS_Stress	-.297	.000	-.057	.000	.000	.000	.000
COPE13	-.034	.000	-.004	.063	.000	.000	.000
COPE6	-.021	.000	-.003	.032	.000	.000	.000
COPE26	-.025	.000	-.003	.037	.000	.000	.000
COPE16	-.019	.000	-.002	.028	.000	.000	.000
AHS4_headache	-.013	.000	-.001	-.003	.003	-23.903	.000
AHS3_Tired	-.022	.000	-.002	-.012	-.081	-34.188	.000
AHS2_thirsty	-.015	.000	-.001	-.003	.001	-18.959	.000

Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	.001	.000	.000	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
MaladaptiveCoping	.000	.000	.001	.000	.000	.000	.000
HeadacheAndThirst	.015	.000	.001	.077	.000	.000	.000
lonely_no	.025	.000	.004	.000	.000	.000	.000
MLS_score	-.001	.000	.004	.000	.000	.000	.000
DASS_depression	-.005	.000	.029	.000	.000	.000	.000
DASS_Anxiety	-.005	.000	.022	.000	.000	.000	.000
DASS_Stress	-.007	.000	.028	.000	.000	.000	.000
COPE13	-.010	.000	.002	.098	.000	.000	.000
COPE6	-.005	.000	.001	.063	.000	.000	.000
COPE26	-.006	.000	.002	.077	.000	.000	.000
COPE16	-.005	.000	.001	.059	.000	.000	.000
AHS4_headache	.017	.000	.001	.051	.693	1.630	.000
AHS3_Tired	.035	.000	.002	.076	1.309	3.330	.000
AHS2_thirsty	.015	.000	.001	.052	.869	1.898	.000

Indirect Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	...	...	...	...	...	...	...
PsychDistress	...	.887	...	...	...	...	...
withResorp	.324	.375	.618	...	...	...	...
MaladaptiveCoping	.044	.307	.783	...	...	...	...
HeadacheAndThirst	.988	.220	.570	.461	...	...	...
lonely_no	.039	.301	.769	...	...	...	...
MLS_score	.039	.311	.775	...	...	...	...
DASS_depression	.047	.308	.769	...	...	...	...
DASS_Anxiety	.045	.311	.779	...	...	...	...
DASS_Stress	.044	.315	.783	...	...	...	...
COPE13	.000	.301	.777	.001	...	...	...
COPE6	.000	.294	.788	.001	...	...	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE26	.000	.303	.773	.001	...	...	...
COPE16	.000	.307	.783	.001	...	...	...
AHS4_headache	.982	.220	.556	.136	.046	.433	...
AHS3_Tired	.995	.231	.639	.152	.084	.485	...
AHS2_thirsty	.988	.220	.570	.152	.049	.452	...

Standardized Indirect Effects (Group number 1 - Default model)

Standardized Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	-.014	.000	.000	.000	.000	.000
withResorp	-.065	-.038	-.018	.000	.000	.000	.000
MaladaptiveCoping	-.408	-.215	-.258	.000	.000	.000	.000
HeadacheAndThirst	-.157	-.063	-.044	-7.410	.000	.000	.000
lonely_no	.005	-.021	-.124	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
MLS_score	-.259	-.129	-.150	.000	.000	.000	.000
DASS_depression	-.331	-.174	-.204	.000	.000	.000	.000
DASS_Anxiety	-.335	-.170	-.207	.000	.000	.000	.000
DASS_Stress	-.347	-.181	-.219	.000	.000	.000	.000
COPE13	-.350	-.141	-.162	.561	.000	.000	.000
COPE6	-.328	-.115	-.143	.448	.000	.000	.000
COPE26	-.292	-.116	-.131	.409	.000	.000	.000
COPE16	-.310	-.116	-.132	.383	.000	.000	.000
AHS4_headache	-.095	-.038	-.025	-.018	-.003	-5.904	.000
AHS3_Tired	-.131	-.055	-.039	-.057	-.018	-7.931	.000
AHS2_thirsty	-.097	-.037	-.023	-.018	-.001	-4.480	.000

Standardized Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.007	.000	.000	.000	.000	.000
withResorp	.015	.005	.041	.000	.000	.000	.000
MaladaptiveCoping	.006	.053	.297	.000	.000	.000	.000
HeadacheAndThirst	.215	.006	.101	.718	.000	.000	.000
lonely_no	.213	.099	.115	.000	.000	.000	.000
MLS_score	-.005	.030	.165	.000	.000	.000	.000
DASS_depression	-.004	.042	.235	.000	.000	.000	.000
DASS_Anxiety	-.001	.042	.239	.000	.000	.000	.000
DASS_Stress	-.007	.043	.247	.000	.000	.000	.000
COPE13	-.104	.032	.191	.783	.000	.000	.000
COPE6	-.082	.029	.183	.716	.000	.000	.000
COPE26	-.081	.027	.173	.689	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
COPE16	-.079	.027	.177	.692	.000	.000	.000
AHS4_headache	.120	.003	.072	.290	.195	.367	.000
AHS3_Tired	.216	.006	.082	.354	.310	.607	.000
AHS2_thirsty	.103	.003	.063	.267	.231	.357	.000

Standardized Indirect Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
incomePA_ChangePercent	...	...	...	...	...	...	...
PsychDistress	...	.871	...	...	...	...	...
withResorp	.343	.353	.600	...	...	...	...
MaladaptiveCoping	.054	.302	.792	...	...	...	...
HeadacheAndThirst	.999	.211	.589	.483	...	...	...
lonely_no	.038	.291	.771	...	...	...	...
MLS_score	.043	.282	.783	...	...	...	...
DASS_depression	.048	.302	.783	...	...	...	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	HeadacheAndThirst
DASS_Anxiety	.049	.303	.786	...	...	...	...
DASS_Stress	.046	.298	.785	...	...	...	...
COPE13	.000	.277	.785	.001	...	...	...
COPE6	.000	.302	.785	.002	...	...	...
COPE26	.000	.292	.777	.001	...	...	...
COPE16	.000	.287	.785	.002	...	...	...
AHS4_headache	.982	.213	.561	.147	.056	.421	...
AHS3_Tired	.997	.211	.627	.155	.085	.465	...
AHS2_thirsty	.988	.207	.561	.153	.053	.415	...

Bootstrap (Default model)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	43	114.598	93	.064	1.232
Saturated model	136	.000	0		
Independence model	16	858.506	120	.000	7.154

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	3389.913	.911	.870	.623
Saturated model	.000	1.000		
Independence model	16468.686	.426	.350	.376

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.867	.828	.972	.962	.971
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.775	.672	.752
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	21.598	.000	52.894
Saturated model	.000	.000	.000
Independence model	738.506	649.245	835.240

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.849	.160	.000	.392
Saturated model	.000	.000	.000	.000
Independence model	6.359	5.470	4.809	6.187

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.041	.000	.065	.700
Independence model	.214	.200	.227	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	200.598	212.988	325.843	368.843
Saturated model	272.000	311.186	668.121	804.121
Independence model	890.506	895.116	937.108	953.108

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	1.486	1.326	1.718	1.578
Saturated model	2.015	2.015	2.015	2.305
Independence model	6.596	5.935	7.313	6.630

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	138	151
Independence model	24	25

Execution time summary

Minimization: .092

Miscellaneous: .673

Bootstrap: 9.361

Total: 10.126

A4.2.6.5. Structural model for gastric and cardiovascular symptoms.

Variable counts (Group number 1)

Number of variables in your model: 40

Number of observed variables: 18

Number of unobserved variables: 22

Number of exogenous variables: 21

Number of endogenous variables: 19

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
age	18.000	66.000	1.078	4.997	.245	.568
priorIncome_PA	.000	192000.000	4.383	20.325	25.487	59.090
incomePA_ChangePercent	-100.000	200.000	.651	3.017	7.502	17.392
withResorp	.154	2.558	1.492	6.917	3.026	7.016
lonely_no	1.000	5.000	.057	.263	-1.257	-2.914
MLS_score	3.000	9.000	.345	1.599	-1.001	-2.321
DASS_depression	.000	40.000	.582	2.701	-.693	-1.607
DASS_Anxiety	2.000	34.000	1.058	4.904	.377	.874
DASS_Stress	.000	40.000	.418	1.937	-.794	-1.841
COPE13	1.000	4.000	.383	1.774	-1.118	-2.592
COPE6	1.000	4.000	1.495	6.931	1.949	4.519
COPE26	1.000	4.000	1.472	6.823	.930	2.157
COPE16	1.000	4.000	2.275	10.548	5.296	12.279
AHS9_heartRacing	.000	6.000	2.282	10.583	4.508	10.451
AHS8_nausea	.000	5.000	2.857	13.248	7.496	17.380
AHS7_stomachAche	.000	6.000	2.993	13.876	9.899	22.950
AHS6_appetiteLoss	.000	6.000	2.570	11.918	5.624	13.038
AHS5_dizzinessFaintness	.000	5.000	3.223	14.942	9.540	22.117
Multivariate					125.356	26.530

Models

Default model (Default model)

Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments:	171
Number of distinct parameters to be estimated:	47
Degrees of freedom (171 - 47):	124

Result (Default model)

Minimum was achieved

Chi-square = 172.977

Degrees of freedom = 124

Probability level = .002

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	.802	.422	
PsychDistress	<---	priorIncome_PA	.000	.000	-.588	.556	
PsychDistress	<---	incomePA_ChangePercent	-.044	.021	-2.146	.032	p1
PsychDistress	<---	age	-.143	.073	-1.971	.049	
MaladaptiveCoping	<---	PsychDistress	.043	.006	7.336	***	p2
withResorp	<---	PsychDistress	.002	.005	.457	.648	p4
MaladaptiveCoping	<---	age	-.002	.002	-1.152	.249	
GastricAndCardio	<---	MaladaptiveCoping	.699	.605	1.156	.248	p3

			Estimate	S.E.	C.R.	P	Label
GastricAndCardio	<---	withResorp	.178	.123	1.447	.148	p5
GastricAndCardio	<---	PsychDistress	-.019	.026	-.722	.470	
AHS5_dizzinessFaintness	<---	GastricAndCardio	1.000				
AHS6_appetiteLoss	<---	GastricAndCardio	1.515	.301	5.028	***	
AHS7_stomachAche	<---	GastricAndCardio	1.110	.239	4.648	***	
AHS8_nausea	<---	GastricAndCardio	1.493	.280	5.339	***	
AHS9_heartRacing	<---	GastricAndCardio	1.216	.275	4.427	***	
COPE16	<---	MaladaptiveCoping	1.000				
COPE26	<---	MaladaptiveCoping	1.376	.255	5.397	***	
COPE6	<---	MaladaptiveCoping	1.079	.144	7.482	***	
COPE13	<---	MaladaptiveCoping	1.816	.313	5.809	***	
DASS_Stress	<---	PsychDistress	1.000				
DASS_Anxiety	<---	PsychDistress	.731	.056	13.117	***	
DASS_depression	<---	PsychDistress	1.012	.076	13.380	***	
MLS_score	<---	PsychDistress	.131	.016	8.107	***	
lonely_no	<---	PsychDistress	-.073	.013	-5.772	***	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
incomePA_ChangePercent	<---	priorIncome_PA	.071
PsychDistress	<---	priorIncome_PA	-.055
PsychDistress	<---	incomePA_ChangePercent	-.190
PsychDistress	<---	age	-.187
MaladaptiveCoping	<---	PsychDistress	1.105
withResorp	<---	PsychDistress	.042
MaladaptiveCoping	<---	age	-.079
GastricAndCardio	<---	MaladaptiveCoping	.440
GastricAndCardio	<---	withResorp	.144
GastricAndCardio	<---	PsychDistress	-.306
AHS5_dizzinessFaintness	<---	GastricAndCardio	.555
AHS6_appetiteLoss	<---	GastricAndCardio	.654
AHS7_stomachAche	<---	GastricAndCardio	.572
AHS8_nausea	<---	GastricAndCardio	.766
AHS9_heartRacing	<---	GastricAndCardio	.532
COPE16	<---	MaladaptiveCoping	.524
COPE26	<---	MaladaptiveCoping	.535
COPE6	<---	MaladaptiveCoping	.535
COPE13	<---	MaladaptiveCoping	.599
DASS_Stress	<---	PsychDistress	.902
DASS_Anxiety	<---	PsychDistress	.844
DASS_depression	<---	PsychDistress	.853
MLS_score	<---	PsychDistress	.634
lonely_no	<---	PsychDistress	-.483

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
incomePA_ChangePercent	.005

	Estimate
PsychDistress	.084
withResorp	.002
MaladaptiveCoping	1.265
GastricAndCardio	.008
lonely_no	.234
MLS_score	.401
DASS_depression	.728
DASS_Anxiety	.712
DASS_Stress	.813
COPE13	.359
COPE6	.286
COPE26	.286
COPE16	.275
AHS9_heartRacing	.283
AHS8_nausea	.586
AHS7_stomachAche	.328
AHS6_appetiteLoss	.427
AHS5_dizzinessFaintness	.309

User-defined estimands: (Group number 1 - Default model)

Income_Distress_Coping_Gastric	-.001
Income_Distress_BAC_Gastric	.000
Distress_Coping_Gastric	.030
Distress_BAC_Gastric	.000

Total Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.143	.000	-.044	.000	.000	.000	.000
withResorp	.000	.000	.000	.002	.000	.000	.000
MaladaptiveCoping	-.009	.000	-.002	.043	.000	.000	.000
GastricAndCardio	-.003	.000	-.001	.012	.178	.699	.000
lonely_no	.010	.000	.003	-.073	.000	.000	.000
MLS_score	-.019	.000	-.006	.131	.000	.000	.000
DASS_depression	-.145	.000	-.045	1.012	.000	.000	.000
DASS_Anxiety	-.105	.000	-.032	.731	.000	.000	.000
DASS_Stress	-.143	.000	-.044	1.000	.000	.000	.000
COPE13	-.016	.000	-.003	.078	.000	1.816	.000
COPE6	-.009	.000	-.002	.047	.000	1.079	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE26	-.012	.000	-.003	.059	.000	1.376	.000
COPE16	-.009	.000	-.002	.043	.000	1.000	.000
AHS9_heartRacing	-.004	.000	-.001	.014	.217	.850	1.216
AHS8_nausea	-.005	.000	-.001	.017	.266	1.044	1.493
AHS7_stomachAche	-.004	.000	-.001	.013	.198	.776	1.110
AHS6_appetiteLoss	-.005	.000	-.001	.018	.270	1.059	1.515
AHS5_dizzinessFaintness	-.003	.000	-.001	.012	.178	.699	1.000

Standardized Total Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.071	.000	.000	.000	.000	.000
PsychDistress	-.187	-.069	-.190	.000	.000	.000	.000
withResorp	-.008	-.003	-.008	.042	.000	.000	.000
MaladaptiveCoping	-.286	-.076	-.211	1.105	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
GastricAndCardio	-.070	-.013	-.036	.187	.144	.440	.000
lonely_no	.090	.033	.092	-.483	.000	.000	.000
MLS_score	-.118	-.044	-.121	.634	.000	.000	.000
DASS_depression	-.159	-.059	-.162	.853	.000	.000	.000
DASS_Anxiety	-.158	-.058	-.161	.844	.000	.000	.000
DASS_Stress	-.169	-.062	-.172	.902	.000	.000	.000
COPE13	-.171	-.046	-.126	.662	.000	.599	.000
COPE6	-.153	-.041	-.113	.591	.000	.535	.000
COPE26	-.153	-.041	-.113	.591	.000	.535	.000
COPE16	-.150	-.040	-.110	.579	.000	.524	.000
AHS9_heartRacing	-.037	-.007	-.019	.099	.077	.234	.532
AHS8_nausea	-.053	-.010	-.027	.143	.111	.337	.766

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS7_stomachAche	-.040	-.007	-.020	.107	.083	.252	.572
AHS6_appetiteLoss	-.046	-.008	-.023	.122	.094	.288	.654
AHS5_dizzinessFaintness	-.039	-.007	-.020	.104	.080	.244	.555

Direct Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.143	.000	-.044	.000	.000	.000	.000
withResorp	.000	.000	.000	.002	.000	.000	.000
MaladaptiveCoping	-.002	.000	.000	.043	.000	.000	.000
GastricAndCardio	.000	.000	.000	-.019	.178	.699	.000
lonely_no	.000	.000	.000	-.073	.000	.000	.000
MLS_score	.000	.000	.000	.131	.000	.000	.000
DASS_depression	.000	.000	.000	1.012	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.731	.000	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE13	.000	.000	.000	.000	.000	1.816	.000
COPE6	.000	.000	.000	.000	.000	1.079	.000
COPE26	.000	.000	.000	.000	.000	1.376	.000
COPE16	.000	.000	.000	.000	.000	1.000	.000
AHS9_heartRacing	.000	.000	.000	.000	.000	.000	1.216
AHS8_nausea	.000	.000	.000	.000	.000	.000	1.493
AHS7_stomachAche	.000	.000	.000	.000	.000	.000	1.110
AHS6_appetiteLoss	.000	.000	.000	.000	.000	.000	1.515
AHS5_dizzinessFaintness	.000	.000	.000	.000	.000	.000	1.000

Standardized Direct Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.071	.000	.000	.000	.000	.000
PsychDistress	-.187	-.055	-.190	.000	.000	.000	.000
withResorp	.000	.000	.000	.042	.000	.000	.000
MaladaptiveCoping	-.079	.000	.000	1.105	.000	.000	.000
GastricAndCardio	.000	.000	.000	-.306	.144	.440	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
lonely_no	.000	.000	.000	-.483	.000	.000	.000
MLS_score	.000	.000	.000	.634	.000	.000	.000
DASS_depression	.000	.000	.000	.853	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.844	.000	.000	.000
DASS_Stress	.000	.000	.000	.902	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.599	.000
COPE6	.000	.000	.000	.000	.000	.535	.000
COPE26	.000	.000	.000	.000	.000	.535	.000
COPE16	.000	.000	.000	.000	.000	.524	.000
AHS9_heartRacing	.000	.000	.000	.000	.000	.000	.532
AHS8_nausea	.000	.000	.000	.000	.000	.000	.766
AHS7_stomachAche	.000	.000	.000	.000	.000	.000	.572
AHS6_appetiteLoss	.000	.000	.000	.000	.000	.000	.654
AHS5_dizzinessFaintness	.000	.000	.000	.000	.000	.000	.555

Indirect Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	.000	.000	.000	.000	.000	.000	.000
MaladaptiveCoping	-.006	.000	-.002	.000	.000	.000	.000
GastricAndCardio	-.003	.000	-.001	.031	.000	.000	.000
lonely_no	.010	.000	.003	.000	.000	.000	.000
MLS_score	-.019	.000	-.006	.000	.000	.000	.000
DASS_depression	-.145	.000	-.045	.000	.000	.000	.000
DASS_Anxiety	-.105	.000	-.032	.000	.000	.000	.000
DASS_Stress	-.143	.000	-.044	.000	.000	.000	.000
COPE13	-.016	.000	-.003	.078	.000	.000	.000
COPE6	-.009	.000	-.002	.047	.000	.000	.000
COPE26	-.012	.000	-.003	.059	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE16	-.009	.000	-.002	.043	.000	.000	.000
AHS9_heartRacing	-.004	.000	-.001	.014	.217	.850	.000
AHS8_nausea	-.005	.000	-.001	.017	.266	1.044	.000
AHS7_stomachAche	-.004	.000	-.001	.013	.198	.776	.000
AHS6_appetiteLoss	-.005	.000	-.001	.018	.270	1.059	.000
AHS5_dizzinessFaintness	-.003	.000	-.001	.012	.178	.699	.000

Standardized Indirect Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	-.013	.000	.000	.000	.000	.000
withResorp	-.008	-.003	-.008	.000	.000	.000	.000
MaladaptiveCoping	-.207	-.076	-.211	.000	.000	.000	.000
GastricAndCardio	-.070	-.013	-.036	.493	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
lonely_no	.090	.033	.092	.000	.000	.000	.000
MLS_score	-.118	-.044	-.121	.000	.000	.000	.000
DASS_depression	-.159	-.059	-.162	.000	.000	.000	.000
DASS_Anxiety	-.158	-.058	-.161	.000	.000	.000	.000
DASS_Stress	-.169	-.062	-.172	.000	.000	.000	.000
COPE13	-.171	-.046	-.126	.662	.000	.000	.000
COPE6	-.153	-.041	-.113	.591	.000	.000	.000
COPE26	-.153	-.041	-.113	.591	.000	.000	.000
COPE16	-.150	-.040	-.110	.579	.000	.000	.000
AHS9_heartRacing	-.037	-.007	-.019	.099	.077	.234	.000
AHS8_nausea	-.053	-.010	-.027	.143	.111	.337	.000
AHS7_stomachAche	-.040	-.007	-.020	.107	.083	.252	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS6_appetiteLoss	-.046	-.008	-.023	.122	.094	.288	.000
AHS5_dizzinessFaintness	-.039	-.007	-.020	.104	.080	.244	.000

Regression Weights: (Group number 1 - Default model)

			M.I.	Par Change
lonely_no	<---	age	4.416	.018
DASS_depression	<---	withResorp	5.803	2.789
DASS_Stress	<---	withResorp	5.735	-2.453
COPE13	<---	AHS6_appetiteLoss	5.131	.119
COPE26	<---	AHS9_heartRacing	4.216	-.100
COPE26	<---	AHS6_appetiteLoss	5.439	-.112
AHS9_heartRacing	<---	PsychDistress	6.586	.030
AHS9_heartRacing	<---	MaladaptiveCoping	8.122	.739
AHS9_heartRacing	<---	DASS_depression	5.907	.023
AHS9_heartRacing	<---	DASS_Anxiety	5.032	.029
AHS9_heartRacing	<---	DASS_Stress	8.115	.029
AHS8_nausea	<---	age	4.779	.014
AHS8_nausea	<---	PsychDistress	5.499	-.020
AHS8_nausea	<---	MaladaptiveCoping	4.937	-.429
AHS8_nausea	<---	DASS_depression	5.783	-.017
AHS8_nausea	<---	DASS_Stress	5.446	-.017
AHS8_nausea	<---	COPE13	8.755	-.207
AHS6_appetiteLoss	<---	withResorp	8.365	.605
AHS6_appetiteLoss	<---	COPE26	4.023	-.210

Bootstrap (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	.000	.000	.000
PsychDistress	<---	priorIncome_PA	.000	.000	.000	.000	.000
PsychDistress	<---	incomePA_ChangePercent	.023	.000	-.043	.002	.001
PsychDistress	<---	age	.075	.001	-.136	.007	.002
MaladaptiveCoping	<---	PsychDistress	.009	.000	.043	.000	.000
withResorp	<---	PsychDistress	.004	.000	.002	.000	.000
MaladaptiveCoping	<---	age	.002	.000	-.002	.000	.000
GastricAndCardio	<---	MaladaptiveCoping	4.194	.066	1.051	.352	.094
GastricAndCardio	<---	withResorp	.146	.002	.181	.003	.003
GastricAndCardio	<---	PsychDistress	.173	.003	-.032	-.013	.004
AHS5_dizzinessFaintness	<---	GastricAndCardio	.000	.000	1.000	.000	.000
AHS6_appetiteLoss	<---	GastricAndCardio	7.389	.117	2.014	.500	.165
AHS7_stomachAche	<---	GastricAndCardio	1.019	.016	1.219	.108	.023
AHS8_nausea	<---	GastricAndCardio	4.491	.071	2.077	.585	.100
AHS9_heartRacing	<---	GastricAndCardio	1.394	.022	1.472	.256	.031

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
COPE16	<---	MaladaptiveCoping	.000	.000	1.000	.000	.000
COPE26	<---	MaladaptiveCoping	.358	.006	1.434	.059	.008
COPE6	<---	MaladaptiveCoping	.179	.003	1.108	.030	.004
COPE13	<---	MaladaptiveCoping	.427	.007	1.906	.090	.010
DASS_Stress	<---	PsychDistress	.000	.000	1.000	.000	.000
DASS_Anxiety	<---	PsychDistress	.059	.001	.733	.001	.001
DASS_depression	<---	PsychDistress	.078	.001	1.010	-.002	.002
MLS_score	<---	PsychDistress	.017	.000	.131	.000	.000
lonely_no	<---	PsychDistress	.012	.000	-.072	.001	.000

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	<---	priorIncome_PA	.052	.001	.077	.006	.001
PsychDistress	<---	priorIncome_PA	.079	.001	-.069	-.013	.002
PsychDistress	<---	incomePA_ChangePercent	.097	.002	-.182	.008	.002
PsychDistress	<---	age	.100	.002	-.178	.008	.002
MaladaptiveCoping	<---	PsychDistress	.114	.002	1.108	.003	.003
withResorp	<---	PsychDistress	.085	.001	.044	.002	.002

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
MaladaptiveCoping	<---	age	.083	.001	-.081	-.002	.002
GastricAndCardio	<---	MaladaptiveCoping	2.306	.036	.611	.171	.052
GastricAndCardio	<---	withResorp	.101	.002	.141	-.003	.002
GastricAndCardio	<---	PsychDistress	2.309	.037	-.482	-.176	.052
AHS5_dizzinessFaintness	<---	GastricAndCardio	.144	.002	.544	-.011	.003
AHS6_appetiteLoss	<---	GastricAndCardio	.131	.002	.638	-.016	.003
AHS7_stomachAche	<---	GastricAndCardio	.143	.002	.532	-.041	.003
AHS8_nausea	<---	GastricAndCardio	.138	.002	.775	.009	.003
AHS9_heartRacing	<---	GastricAndCardio	.161	.003	.535	.004	.004
COPE16	<---	MaladaptiveCoping	.078	.001	.523	-.001	.002
COPE26	<---	MaladaptiveCoping	.070	.001	.533	-.001	.002
COPE6	<---	MaladaptiveCoping	.076	.001	.538	.003	.002
COPE13	<---	MaladaptiveCoping	.083	.001	.603	.004	.002
DASS_Stress	<---	PsychDistress	.029	.000	.903	.001	.001
DASS_Anxiety	<---	PsychDistress	.031	.000	.846	.003	.001
DASS_depression	<---	PsychDistress	.035	.001	.852	-.001	.001
MLS_score	<---	PsychDistress	.064	.001	.631	-.002	.001

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
lonely_no	<---	PsychDistress	.080	.001	-.480	.003	.002

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	.009	.000	.009	.004	.000
PsychDistress	.051	.001	.106	.021	.001
withResorp	.014	.000	.009	.007	.000
MaladaptiveCoping	.253	.004	1.286	.020	.006
GastricAndCardio	.502	.008	-.038	-.047	.011
lonely_no	.076	.001	.237	.004	.002
MLS_score	.080	.001	.403	.001	.002
DASS_depression	.059	.001	.728	.000	.001
DASS_Anxiety	.052	.001	.717	.005	.001
DASS_Stress	.052	.001	.816	.003	.001
COPE13	.099	.002	.371	.012	.002
COPE6	.081	.001	.295	.009	.002
COPE26	.075	.001	.289	.003	.002
COPE16	.080	.001	.280	.005	.002
AHS9_heartRacing	.209	.003	.312	.030	.005
AHS8_nausea	.229	.004	.620	.033	.005
AHS7_stomachAche	.145	.002	.303	-.024	.003
AHS6_appetiteLoss	.180	.003	.424	-.003	.004
AHS5_dizzinessFaintness	.147	.002	.317	.009	.003

User-defined estimands: (Group number 1 - Default model)

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
Income_Distress_Coping_Gastric	.009	.000	-.002	-.001	.000
Income_Distress_BAC_Gastric	.000	.000	.000	.000	.000
Distress_Coping_Gastric	.174	.003	.044	.014	.004
Distress_BAC_Gastric	.001	.000	.000	.000	.000

Total Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.075	.000	.023	.000	.000	.000	.000
withResorp	.001	.000	.000	.004	.000	.000	.000
MaladaptiveCoping	.004	.000	.001	.009	.000	.000	.000
GastricAndCardio	.004	.000	.001	.011	.146	4.194	.000
lonely_no	.006	.000	.002	.012	.000	.000	.000
MLS_score	.011	.000	.003	.017	.000	.000	.000
DASS_depression	.078	.000	.024	.078	.000	.000	.000
DASS_Anxiety	.056	.000	.018	.059	.000	.000	.000
DASS_Stress	.075	.000	.023	.000	.000	.000	.000
COPE13	.007	.000	.002	.009	.000	.427	.000
COPE6	.004	.000	.001	.008	.000	.179	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE26	.005	.000	.001	.010	.000	.358	.000
COPE16	.004	.000	.001	.009	.000	.000	.000
AHS9_heartRacing	.005	.000	.001	.014	.185	4.314	1.394
AHS8_nausea	.006	.000	.001	.013	.168	6.352	4.491
AHS7_stomachAche	.004	.000	.001	.011	.110	3.667	1.019
AHS6_appetiteLoss	.006	.000	.001	.013	.203	5.466	7.389
AHS5_dizzinessFaintness	.004	.000	.001	.011	.146	4.194	.000

Standardized Total Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.052	.000	.000	.000	.000	.000
PsychDistress	.100	.080	.097	.000	.000	.000	.000
withResorp	.018	.011	.019	.085	.000	.000	.000
MaladaptiveCoping	.110	.091	.111	.114	.000	.000	.000
GastricAndCardio	.078	.021	.033	.138	.101	2.306	.000
lonely_no	.053	.040	.050	.080	.000	.000	.000
MLS_score	.066	.051	.061	.064	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
DASS_depression	.086	.069	.083	.035	.000	.000	.000
DASS_Anxiety	.084	.068	.083	.031	.000	.000	.000
DASS_Stress	.089	.073	.087	.029	.000	.000	.000
COPE13	.071	.053	.065	.059	.000	.083	.000
COPE6	.066	.048	.059	.070	.000	.076	.000
COPE26	.058	.049	.061	.070	.000	.070	.000
COPE16	.063	.046	.060	.075	.000	.078	.000
AHS9_heartRacing	.044	.014	.021	.092	.062	1.190	.161
AHS8_nausea	.061	.016	.025	.103	.069	1.926	.138
AHS7_stomachAche	.044	.012	.019	.082	.044	1.282	.143
AHS6_appetiteLoss	.050	.013	.021	.089	.071	1.474	.131
AHS5_dizzinessFaintness	.044	.013	.020	.087	.061	1.410	.144

Direct Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.075	.000	.023	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
withResorp	.000	.000	.000	.004	.000	.000	.000
MaladaptiveCoping	.002	.000	.000	.009	.000	.000	.000
GastricAndCardio	.000	.000	.000	.173	.146	4.194	.000
lonely_no	.000	.000	.000	.012	.000	.000	.000
MLS_score	.000	.000	.000	.017	.000	.000	.000
DASS_depression	.000	.000	.000	.078	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.059	.000	.000	.000
DASS_Stress	.000	.000	.000	.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.427	.000
COPE6	.000	.000	.000	.000	.000	.179	.000
COPE26	.000	.000	.000	.000	.000	.358	.000
COPE16	.000	.000	.000	.000	.000	.000	.000
AHS9_heartRacing	.000	.000	.000	.000	.000	.000	1.394
AHS8_nausea	.000	.000	.000	.000	.000	.000	4.491
AHS7_stomachAche	.000	.000	.000	.000	.000	.000	1.019
AHS6_appetiteLoss	.000	.000	.000	.000	.000	.000	7.389
AHS5_dizzinessFaintness	.000	.000	.000	.000	.000	.000	.000

Standardized Direct Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.052	.000	.000	.000	.000	.000
PsychDistress	.100	.079	.097	.000	.000	.000	.000
withResorp	.000	.000	.000	.085	.000	.000	.000
MaladaptiveCoping	.083	.000	.000	.114	.000	.000	.000
GastricAndCardio	.000	.000	.000	2.309	.101	2.306	.000
lonely_no	.000	.000	.000	.080	.000	.000	.000
MLS_score	.000	.000	.000	.064	.000	.000	.000
DASS_depression	.000	.000	.000	.035	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.031	.000	.000	.000
DASS_Stress	.000	.000	.000	.029	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.083	.000
COPE6	.000	.000	.000	.000	.000	.076	.000
COPE26	.000	.000	.000	.000	.000	.070	.000
COPE16	.000	.000	.000	.000	.000	.078	.000
AHS9_heartRacing	.000	.000	.000	.000	.000	.000	.161
AHS8_nausea	.000	.000	.000	.000	.000	.000	.138

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS7_stomachAche	.000	.000	.000	.000	.000	.000	.143
AHS6_appetiteLoss	.000	.000	.000	.000	.000	.000	.131
AHS5_dizzinessFaintness	.000	.000	.000	.000	.000	.000	.144

Indirect Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	.001	.000	.000	.000	.000	.000	.000
MaladaptiveCoping	.004	.000	.001	.000	.000	.000	.000
GastricAndCardio	.004	.000	.001	.174	.000	.000	.000
lonely_no	.006	.000	.002	.000	.000	.000	.000
MLS_score	.011	.000	.003	.000	.000	.000	.000
DASS_depression	.078	.000	.024	.000	.000	.000	.000
DASS_Anxiety	.056	.000	.018	.000	.000	.000	.000
DASS_Stress	.075	.000	.023	.000	.000	.000	.000
COPE13	.007	.000	.002	.009	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE6	.004	.000	.001	.008	.000	.000	.000
COPE26	.005	.000	.001	.010	.000	.000	.000
COPE16	.004	.000	.001	.009	.000	.000	.000
AHS9_heartRacing	.005	.000	.001	.014	.185	4.314	.000
AHS8_nausea	.006	.000	.001	.013	.168	6.352	.000
AHS7_stomachAche	.004	.000	.001	.011	.110	3.667	.000
AHS6_appetiteLoss	.006	.000	.001	.013	.203	5.466	.000
AHS5_dizzinessFaintness	.004	.000	.001	.011	.146	4.194	.000

Standardized Indirect Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.012	.000	.000	.000	.000	.000
withResorp	.018	.011	.019	.000	.000	.000	.000
MaladaptiveCoping	.110	.091	.111	.000	.000	.000	.000
GastricAndCardio	.078	.021	.033	2.318	.000	.000	.000
lonely_no	.053	.040	.050	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
MLS_score	.066	.051	.061	.000	.000	.000	.000
DASS_depression	.086	.069	.083	.000	.000	.000	.000
DASS_Anxiety	.084	.068	.083	.000	.000	.000	.000
DASS_Stress	.089	.073	.087	.000	.000	.000	.000
COPE13	.071	.053	.065	.059	.000	.000	.000
COPE6	.066	.048	.059	.070	.000	.000	.000
COPE26	.058	.049	.061	.070	.000	.000	.000
COPE16	.063	.046	.060	.075	.000	.000	.000
AHS9_heartRacing	.044	.014	.021	.092	.062	1.190	.000
AHS8_nausea	.061	.016	.025	.103	.069	1.926	.000
AHS7_stomachAche	.044	.012	.019	.082	.044	1.282	.000
AHS6_appetiteLoss	.050	.013	.021	.089	.071	1.474	.000
AHS5_dizzinessFaintness	.044	.013	.020	.087	.061	1.410	.000

Bootstrap Confidence (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			Estimate	Lower	Upper	P
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	.000	.165
PsychDistress	<---	priorIncome_PA	.000	.000	.000	.526
PsychDistress	<---	incomePA_ChangePercent	-.044	-.090	.002	.056
PsychDistress	<---	age	-.143	-.284	.003	.054
MaladaptiveCoping	<---	PsychDistress	.043	.029	.063	.000
withResorp	<---	PsychDistress	.002	-.006	.011	.549
MaladaptiveCoping	<---	age	-.002	-.008	.002	.279
GastricAndCardio	<---	MaladaptiveCoping	.699	-.913	18.364	.198
GastricAndCardio	<---	withResorp	.178	-.006	.620	.060
GastricAndCardio	<---	PsychDistress	-.019	-.894	.039	.276
AHS5_dizzinessFaintness	<---	GastricAndCardio	1.000	1.000	1.000	...
AHS6_appetiteLoss	<---	GastricAndCardio	1.515	.724	5.446	.001
AHS7_stomachAche	<---	GastricAndCardio	1.110	.435	3.612	.001
AHS8_nausea	<---	GastricAndCardio	1.493	.573	5.210	.001
AHS9_heartRacing	<---	GastricAndCardio	1.216	.501	4.214	.002

Parameter			Estimate	Lower	Upper	P
COPE16	<---	MaladaptiveCoping	1.000	1.000	1.000	...
COPE26	<---	MaladaptiveCoping	1.376	.836	2.185	.001
COPE6	<---	MaladaptiveCoping	1.079	.805	1.493	.001
COPE13	<---	MaladaptiveCoping	1.816	1.157	2.716	.002
DASS_Stress	<---	PsychDistress	1.000	1.000	1.000	...
DASS_Anxiety	<---	PsychDistress	.731	.619	.850	.001
DASS_depression	<---	PsychDistress	1.012	.867	1.169	.001
MLS_score	<---	PsychDistress	.131	.096	.162	.001
lonely_no	<---	PsychDistress	-.073	-.097	-.048	.001

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			Estimate	Lower	Upper	P
incomePA_ChangePercent	<---	priorIncome_PA	.071	-.042	.168	.206
PsychDistress	<---	priorIncome_PA	-.055	-.213	.098	.539
PsychDistress	<---	incomePA_ChangePercent	-.190	-.361	.011	.060
PsychDistress	<---	age	-.187	-.383	.004	.054
MaladaptiveCoping	<---	PsychDistress	1.105	.893	1.357	.001

Parameter			Estimate	Lower	Upper	P
withResorp	<---	PsychDistress	.042	-.108	.231	.556
MaladaptiveCoping	<---	age	-.079	-.255	.068	.325
GastricAndCardio	<---	MaladaptiveCoping	.440	-.650	10.978	.192
GastricAndCardio	<---	withResorp	.144	-.012	.414	.065
GastricAndCardio	<---	PsychDistress	-.306	-9.469	.841	.348
AHS5_dizzinessFaintness	<---	GastricAndCardio	.555	.194	.787	.001
AHS6_appetiteLoss	<---	GastricAndCardio	.654	.348	.852	.001
AHS7_stomachAche	<---	GastricAndCardio	.572	.291	.818	.000
AHS8_nausea	<---	GastricAndCardio	.766	.407	.962	.003
AHS9_heartRacing	<---	GastricAndCardio	.532	.201	.821	.002
COPE16	<---	MaladaptiveCoping	.524	.349	.661	.001
COPE26	<---	MaladaptiveCoping	.535	.396	.675	.001
COPE6	<---	MaladaptiveCoping	.535	.379	.672	.002
COPE13	<---	MaladaptiveCoping	.599	.423	.744	.002
DASS_Stress	<---	PsychDistress	.902	.836	.952	.002
DASS_Anxiety	<---	PsychDistress	.844	.772	.895	.002
DASS_depression	<---	PsychDistress	.853	.775	.912	.001

Parameter			Estimate	Lower	Upper	P
MLS_score	<---	PsychDistress	.634	.498	.745	.001
lonely_no	<---	PsychDistress	-.483	-.628	-.315	.001

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	Estimate	Lower	Upper	P
incomePA_ChangePercent	.005	.000	.028	.002
PsychDistress	.084	.011	.178	.007
withResorp	.002	.000	.026	.008
MaladaptiveCoping	1.265	.900	1.886	.001
GastricAndCardio	.008	-1.249	.203	.979
lonely_no	.234	.099	.394	.001
MLS_score	.401	.248	.556	.001
DASS_depression	.728	.600	.832	.001
DASS_Anxiety	.712	.596	.802	.002
DASS_Stress	.813	.698	.907	.002
COPE13	.359	.179	.553	.002
COPE6	.286	.143	.452	.002
COPE26	.286	.157	.456	.001
COPE16	.275	.122	.436	.001
AHS9_heartRacing	.283	.040	.674	.001
AHS8_nausea	.586	.165	.926	.003
AHS7_stomachAche	.328	.085	.669	.000
AHS6_appetiteLoss	.427	.121	.727	.001
AHS5_dizzinessFaintness	.309	.038	.620	.001

User-defined estimands: (Group number 1 - Default model)

Parameter	Estimate	Lower	Upper	P
Income_Distress_Coping_Gastric	-.001	-.094	.001	.132
Income_Distress_BAC_Gastric	.000	.000	.000	.241
Distress_Coping_Gastric	.030	-.030	.774	.193
Distress_BAC_Gastric	.000	-.001	.005	.287

Total Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.284	.000	-.090	.000	.000	.000	.000
withResorp	-.002	.000	-.001	-.006	.000	.000	.000
MaladaptiveCoping	-.017	.000	-.004	.029	.000	.000	.000
GastricAndCardio	-.016	.000	-.002	-.003	-.006	-.913	.000
lonely_no	.000	.000	.000	-.097	.000	.000	.000
MLS_score	-.042	.000	-.012	.096	.000	.000	.000
DASS_depression	-.306	.000	-.091	.867	.000	.000	.000
DASS_Anxiety	-.213	.000	-.068	.619	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
DASS_Stress	-.284	.000	-.090	1.000	.000	.000	.000
COPE13	-.028	.000	-.007	.063	.000	1.157	.000
COPE6	-.018	.000	-.005	.032	.000	.805	.000
COPE26	-.021	.000	-.006	.041	.000	.836	.000
COPE16	-.017	.000	-.004	.029	.000	1.000	.000
AHS9_heartRacing	-.019	.000	-.003	-.006	-.003	-1.092	.501
AHS8_nausea	-.016	.000	-.003	-.010	-.006	-1.628	.573
AHS7_stomachAche	-.020	.000	-.003	-.003	.035	-.591	.435
AHS6_appetiteLoss	-.023	.000	-.003	-.008	-.003	-1.220	.724
AHS5_dizzinessFaintness	-.016	.000	-.002	-.003	-.006	-.913	1.000

Total Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
PsychDistress	.003	.000	.002	.000	.000	.000	.000
withResorp	.001	.000	.000	.011	.000	.000	.000
MaladaptiveCoping	-.002	.000	.000	.063	.000	.000	.000
GastricAndCardio	.001	.000	.000	.037	.620	18.364	.000
lonely_no	.025	.000	.007	-.048	.000	.000	.000
MLS_score	.000	.000	.000	.162	.000	.000	.000
DASS_depression	.000	.000	.002	1.169	.000	.000	.000
DASS_Anxiety	.002	.000	.002	.850	.000	.000	.000
DASS_Stress	.003	.000	.002	1.000	.000	.000	.000
COPE13	-.003	.000	.000	.099	.000	2.716	.000
COPE6	-.002	.000	.000	.064	.000	1.493	.000
COPE26	-.003	.000	.000	.079	.000	2.185	.000
COPE16	-.002	.000	.000	.063	.000	1.000	.000
AHS9_heartRacing	.002	.000	.000	.045	.814	21.242	4.214
AHS8_nausea	.001	.000	.000	.040	.694	30.558	5.210

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS7_stomachAche	.000	.000	.000	.044	.486	29.244	3.612
AHS6_appetiteLoss	.001	.000	.000	.043	.960	38.312	5.446
AHS5_dizzinessFaintness	.001	.000	.000	.037	.620	18.364	1.000

Total Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	...	.165	...	...	...	...	...
PsychDistress	.054	.389	.056	...	...	...	...
withResorp	.369	.435	.441	.549	...	...	...
MaladaptiveCoping	.012	.392	.047	.000	...	...	...
GastricAndCardio	.114	.300	.138	.207	.060	.198	...
lonely_no	.041	.365	.045	.001	...	...	...
MLS_score	.051	.398	.047	.001	...	...	...
DASS_depression	.050	.398	.056	.001	...	...	...
DASS_Anxiety	.054	.391	.059	.001	...	...	...
DASS_Stress	.054	.389	.056	...	...	...	...
COPE13	.020	.396	.049	.001	...	.002	...
COPE6	.016	.374	.049	.001	...	.001	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE26	.013	.388	.046	.001	...	.001	...
COPE16	.012	.392	.047	.000	...	...	...
AHS9_heartRacing	.128	.315	.140	.211	.053	.210	.002
AHS8_nausea	.068	.284	.100	.145	.053	.197	.001
AHS7_stomachAche	.070	.244	.071	.102	.023	.146	.001
AHS6_appetiteLoss	.068	.267	.102	.148	.052	.161	.001
AHS5_dizzinessFaintness	.114	.300	.138	.207	.060	.198	...

Standardized Total Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	-.042	.000	.000	.000	.000	.000
PsychDistress	-.383	-.230	-.361	.000	.000	.000	.000
withResorp	-.064	-.041	-.069	-.108	.000	.000	.000
MaladaptiveCoping	-.483	-.266	-.427	.893	.000	.000	.000
GastricAndCardio	-.250	-.078	-.126	-.128	-.012	-.650	.000
lonely_no	.003	-.037	.004	-.628	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
MLS_score	-.258	-.148	-.237	.498	.000	.000	.000
DASS_depression	-.335	-.197	-.314	.775	.000	.000	.000
DASS_Anxiety	-.323	-.193	-.309	.772	.000	.000	.000
DASS_Stress	-.339	-.209	-.328	.836	.000	.000	.000
COPE13	-.305	-.156	-.250	.547	.000	.423	.000
COPE6	-.285	-.136	-.223	.449	.000	.379	.000
COPE26	-.260	-.143	-.239	.438	.000	.396	.000
COPE16	-.278	-.135	-.228	.413	.000	.349	.000
AHS9_heartRacing	-.166	-.054	-.083	-.042	-.002	-.295	.201
AHS8_nausea	-.160	-.056	-.092	-.104	-.012	-.468	.407
AHS7_stomachAche	-.165	-.045	-.081	-.037	.009	-.192	.291
AHS6_appetiteLoss	-.194	-.050	-.088	-.065	-.004	-.279	.348

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS5_dizzinessFaintness	-.160	-.048	-.080	-.032	-.004	-.284	.194

Standardized Total Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.168	.000	.000	.000	.000	.000
PsychDistress	.004	.080	.011	.000	.000	.000	.000
withResorp	.014	.008	.014	.231	.000	.000	.000
MaladaptiveCoping	-.063	.088	.002	1.357	.000	.000	.000
GastricAndCardio	.031	.013	.011	.412	.414	10.978	.000
lonely_no	.217	.117	.203	-.315	.000	.000	.000
MLS_score	.005	.050	.003	.745	.000	.000	.000
DASS_depression	.000	.068	.009	.912	.000	.000	.000
DASS_Anxiety	.004	.070	.011	.895	.000	.000	.000
DASS_Stress	.004	.073	.010	.952	.000	.000	.000
COPE13	-.034	.053	.004	.772	.000	.744	.000
COPE6	-.026	.049	.002	.717	.000	.672	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE26	-.038	.043	.002	.712	.000	.675	.000
COPE16	-.028	.046	.004	.709	.000	.661	.000
AHS9_heartRacing	.019	.006	.005	.293	.268	6.327	.821
AHS8_nausea	.021	.010	.007	.302	.270	10.960	.962
AHS7_stomachAche	.007	.005	.002	.290	.177	9.780	.818
AHS6_appetiteLoss	.009	.007	.005	.289	.332	11.474	.852
AHS5_dizzinessFaintness	.016	.005	.003	.282	.259	7.412	.787

Standardized Total Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	...	.206	...	...	...	...	...
PsychDistress	.054	.405	.060	...	...	...	...
withResorp	.376	.432	.420	.556	...	...	...
MaladaptiveCoping	.018	.409	.051	.001	...	...	...
GastricAndCardio	.108	.298	.134	.244	.065	.192	...
lonely_no	.042	.370	.042	.001	...	...	...
MLS_score	.058	.400	.053	.001	...	...	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
DASS_depression	.050	.405	.059	.001	...	...	...
DASS_Anxiety	.056	.426	.063	.002	...	...	...
DASS_Stress	.055	.408	.060	.002	...	...	...
COPE13	.020	.400	.055	.001	...	.002	...
COPE6	.020	.400	.052	.001	...	.002	...
COPE26	.014	.402	.053	.001	...	.001	...
COPE16	.018	.391	.055	.001	...	.001	...
AHS9_heartRacing	.136	.295	.150	.238	.056	.203	.002
AHS8_nausea	.094	.287	.111	.201	.068	.180	.003
AHS7_stomachAche	.078	.231	.082	.133	.032	.143	.000
AHS6_appetiteLoss	.079	.267	.104	.193	.058	.153	.001
AHS5_dizzinessFaintness	.125	.285	.141	.236	.063	.185	.001

Direct Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	-.284	.000	-.090	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
withResorp	.000	.000	.000	-.006	.000	.000	.000
MaladaptiveCoping	-.008	.000	.000	.029	.000	.000	.000
GastricAndCardio	.000	.000	.000	-.894	-.006	-.913	.000
lonely_no	.000	.000	.000	-.097	.000	.000	.000
MLS_score	.000	.000	.000	.096	.000	.000	.000
DASS_depression	.000	.000	.000	.867	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.619	.000	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	1.157	.000
COPE6	.000	.000	.000	.000	.000	.805	.000
COPE26	.000	.000	.000	.000	.000	.836	.000
COPE16	.000	.000	.000	.000	.000	1.000	.000
AHS9_heartRacing	.000	.000	.000	.000	.000	.000	.501
AHS8_nausea	.000	.000	.000	.000	.000	.000	.573
AHS7_stomachAche	.000	.000	.000	.000	.000	.000	.435
AHS6_appetiteLoss	.000	.000	.000	.000	.000	.000	.724

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS5_dizzinessFaintness	.000	.000	.000	.000	.000	.000	1.000

Direct Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.003	.000	.002	.000	.000	.000	.000
withResorp	.000	.000	.000	.011	.000	.000	.000
MaladaptiveCoping	.002	.000	.000	.063	.000	.000	.000
GastricAndCardio	.000	.000	.000	.039	.620	18.364	.000
lonely_no	.000	.000	.000	-.048	.000	.000	.000
MLS_score	.000	.000	.000	.162	.000	.000	.000
DASS_depression	.000	.000	.000	1.169	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.850	.000	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	2.716	.000
COPE6	.000	.000	.000	.000	.000	1.493	.000
COPE26	.000	.000	.000	.000	.000	2.185	.000
COPE16	.000	.000	.000	.000	.000	1.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS9_heartRacing	.000	.000	.000	.000	.000	.000	4.214
AHS8_nausea	.000	.000	.000	.000	.000	.000	5.210
AHS7_stomachAche	.000	.000	.000	.000	.000	.000	3.612
AHS6_appetiteLoss	.000	.000	.000	.000	.000	.000	5.446
AHS5_dizzinessFaintness	.000	.000	.000	.000	.000	.000	1.000

Direct Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	...	.165	...	...	...	...	...
PsychDistress	.054	.526	.056	...	...	...	...
withResorp	...	...	...	.549	...	...	...
MaladaptiveCoping	.279	...	...	.000	...	...	...
GastricAndCardio	...	...	...	.276	.060	.198	...
lonely_no	...	...	...	.001	...	...	...
MLS_score	...	...	...	.001	...	...	...
DASS_depression	...	...	...	.001	...	...	...
DASS_Anxiety	...	...	...	.001	...	...	...
DASS_Stress	...	...	...	...	...	...	...
COPE13	...	...	...	...	...	.002	...
COPE6	...	...	...	...	...	.001	...
COPE26	...	...	...	...	...	.001	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE16	…	…	…	…	…	…	…
AHS9_heartRacing	…	…	…	…	…	…	.002
AHS8_nausea	…	…	…	…	…	…	.001
AHS7_stomachAche	…	…	…	…	…	…	.001
AHS6_appetiteLoss	…	…	…	…	…	…	.001
AHS5_dizzinessFaintness	…	…	…	…	…	…	…

Standardized Direct Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	-.042	.000	.000	.000	.000	.000
PsychDistress	-.383	-.213	-.361	.000	.000	.000	.000
withResorp	.000	.000	.000	-.108	.000	.000	.000
MaladaptiveCoping	-.255	.000	.000	.893	.000	.000	.000
GastricAndCardio	.000	.000	.000	-9.469	-.012	-.650	.000
lonely_no	.000	.000	.000	-.628	.000	.000	.000
MLS_score	.000	.000	.000	.498	.000	.000	.000
DASS_depression	.000	.000	.000	.775	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
DASS_Anxiety	.000	.000	.000	.772	.000	.000	.000
DASS_Stress	.000	.000	.000	.836	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.423	.000
COPE6	.000	.000	.000	.000	.000	.379	.000
COPE26	.000	.000	.000	.000	.000	.396	.000
COPE16	.000	.000	.000	.000	.000	.349	.000
AHS9_heartRacing	.000	.000	.000	.000	.000	.000	.201
AHS8_nausea	.000	.000	.000	.000	.000	.000	.407
AHS7_stomachAche	.000	.000	.000	.000	.000	.000	.291
AHS6_appetiteLoss	.000	.000	.000	.000	.000	.000	.348
AHS5_dizzinessFaintness	.000	.000	.000	.000	.000	.000	.194

Standardized Direct Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.168	.000	.000	.000	.000	.000
PsychDistress	.004	.098	.011	.000	.000	.000	.000
withResorp	.000	.000	.000	.231	.000	.000	.000
MaladaptiveCoping	.068	.000	.000	1.357	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
GastricAndCardio	.000	.000	.000	.841	.414	10.978	.000
lonely_no	.000	.000	.000	-.315	.000	.000	.000
MLS_score	.000	.000	.000	.745	.000	.000	.000
DASS_depression	.000	.000	.000	.912	.000	.000	.000
DASS_Anxiety	.000	.000	.000	.895	.000	.000	.000
DASS_Stress	.000	.000	.000	.952	.000	.000	.000
COPE13	.000	.000	.000	.000	.000	.744	.000
COPE6	.000	.000	.000	.000	.000	.672	.000
COPE26	.000	.000	.000	.000	.000	.675	.000
COPE16	.000	.000	.000	.000	.000	.661	.000
AHS9_heartRacing	.000	.000	.000	.000	.000	.000	.821
AHS8_nausea	.000	.000	.000	.000	.000	.000	.962
AHS7_stomachAche	.000	.000	.000	.000	.000	.000	.818
AHS6_appetiteLoss	.000	.000	.000	.000	.000	.000	.852
AHS5_dizzinessFaintness	.000	.000	.000	.000	.000	.000	.787

Standardized Direct Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	...	.206	...	...	...	...	...
PsychDistress	.054	.539	.060	...	...	...	...
withResorp	...	...	...	.556	...	...	...
MaladaptiveCoping	.325	...	...	.001	...	...	...
GastricAndCardio	...	...	...	.348	.065	.192	...
lonely_no	...	...	...	.001	...	...	...
MLS_score	...	...	...	.001	...	...	...
DASS_depression	...	...	...	.001	...	...	...
DASS_Anxiety	...	...	...	.002	...	...	...
DASS_Stress	...	...	...	.002	...	...	...
COPE13	...	...	...	...	...	.002	...
COPE6	...	...	...	...	...	.002	...
COPE26	...	...	...	...	...	.001	...
COPE16	...	...	...	...	...	.001	...
AHS9_heartRacing	...	...	...	...	...	...	.002
AHS8_nausea	...	...	...	...	...	...	.003
AHS7_stomachAche	...	...	...	...	...	...	.000
AHS6_appetiteLoss	...	...	...	...	...	...	.001
AHS5_dizzinessFaintness	...	...	...	...	...	...	.001

Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	-.002	.000	-.001	.000	.000	.000	.000
MaladaptiveCoping	-.016	.000	-.004	.000	.000	.000	.000
GastricAndCardio	-.016	.000	-.002	-.029	.000	.000	.000
lonely_no	.000	.000	.000	.000	.000	.000	.000
MLS_score	-.042	.000	-.012	.000	.000	.000	.000
DASS_depression	-.306	.000	-.091	.000	.000	.000	.000
DASS_Anxiety	-.213	.000	-.068	.000	.000	.000	.000
DASS_Stress	-.284	.000	-.090	.000	.000	.000	.000
COPE13	-.028	.000	-.007	.063	.000	.000	.000
COPE6	-.018	.000	-.005	.032	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE26	-.021	.000	-.006	.041	.000	.000	.000
COPE16	-.017	.000	-.004	.029	.000	.000	.000
AHS9_heartRacing	-.019	.000	-.003	-.006	-.003	-1.092	.000
AHS8_nausea	-.016	.000	-.003	-.010	-.006	-1.628	.000
AHS7_stomachAche	-.020	.000	-.003	-.003	.035	-.591	.000
AHS6_appetiteLoss	-.023	.000	-.003	-.008	-.003	-1.220	.000
AHS5_dizzinessFaintness	-.016	.000	-.002	-.003	-.006	-.913	.000

Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000	.000
withResorp	.001	.000	.000	.000	.000	.000	.000
MaladaptiveCoping	.000	.000	.000	.000	.000	.000	.000
GastricAndCardio	.001	.000	.000	.778	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
lonely_no	.025	.000	.007	.000	.000	.000	.000
MLS_score	.000	.000	.000	.000	.000	.000	.000
DASS_depression	.000	.000	.002	.000	.000	.000	.000
DASS_Anxiety	.002	.000	.002	.000	.000	.000	.000
DASS_Stress	.003	.000	.002	.000	.000	.000	.000
COPE13	-.003	.000	.000	.099	.000	.000	.000
COPE6	-.002	.000	.000	.064	.000	.000	.000
COPE26	-.003	.000	.000	.079	.000	.000	.000
COPE16	-.002	.000	.000	.063	.000	.000	.000
AHS9_heartRacing	.002	.000	.000	.045	.814	21.242	.000
AHS8_nausea	.001	.000	.000	.040	.694	30.558	.000
AHS7_stomachAche	.000	.000	.000	.044	.486	29.244	.000
AHS6_appetiteLoss	.001	.000	.000	.043	.960	38.312	.000
AHS5_dizzinessFaintness	.001	.000	.000	.037	.620	18.364	.000

Indirect Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	...	...	...	...	...	...	...
PsychDistress	...	.095	...	...	...	...	...
withResorp	.369	.435	.441	...	...	...	...
MaladaptiveCoping	.037	.392	.047	...	...	...	...
GastricAndCardio	.114	.300	.138	.185	...	...	...
lonely_no	.041	.365	.045	...	...	...	...
MLS_score	.051	.398	.047	...	...	...	...
DASS_depression	.050	.398	.056	...	...	...	...
DASS_Anxiety	.054	.391	.059	...	...	...	...
DASS_Stress	.054	.389	.056	...	...	...	...
COPE13	.020	.396	.049	.001	...	...	...
COPE6	.016	.374	.049	.001	...	...	...
COPE26	.013	.388	.046	.001	...	...	...
COPE16	.012	.392	.047	.000	...	...	...
AHS9_heartRacing	.128	.315	.140	.211	.053	.210	...
AHS8_nausea	.068	.284	.100	.145	.053	.197	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS7_stomachAche	.070	.244	.071	.102	.023	.146	...
AHS6_appetiteLoss	.068	.267	.102	.148	.052	.161	...
AHS5_dizzinessFaintness	.114	.300	.138	.207	.060	.198	...

Standardized Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000
PsychDistress	.000	-.049	.000	.000	.000	.000	.000
withResorp	-.064	-.041	-.069	.000	.000	.000	.000
MaladaptiveCoping	-.422	-.266	-.427	.000	.000	.000	.000
GastricAndCardio	-.250	-.078	-.126	-.595	.000	.000	.000
lonely_no	.003	-.037	.004	.000	.000	.000	.000
MLS_score	-.258	-.148	-.237	.000	.000	.000	.000
DASS_depression	-.335	-.197	-.314	.000	.000	.000	.000
DASS_Anxiety	-.323	-.193	-.309	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
DASS_Stress	-.339	-.209	-.328	.000	.000	.000	.000
COPE13	-.305	-.156	-.250	.547	.000	.000	.000
COPE6	-.285	-.136	-.223	.449	.000	.000	.000
COPE26	-.260	-.143	-.239	.438	.000	.000	.000
COPE16	-.278	-.135	-.228	.413	.000	.000	.000
AHS9_heartRacing	-.166	-.054	-.083	-.042	-.002	-.295	.000
AHS8_nausea	-.160	-.056	-.092	-.104	-.012	-.468	.000
AHS7_stomachAche	-.165	-.045	-.081	-.037	.009	-.192	.000
AHS6_appetiteLoss	-.194	-.050	-.088	-.065	-.004	-.279	.000
AHS5_dizzinessFaintness	-.160	-.048	-.080	-.032	-.004	-.284	.000

Standardized Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
PsychDistress	.000	.002	.000	.000	.000	.000	.000
withResorp	.014	.008	.014	.000	.000	.000	.000
MaladaptiveCoping	.005	.088	.002	.000	.000	.000	.000
GastricAndCardio	.031	.013	.011	10.872	.000	.000	.000
lonely_no	.217	.117	.203	.000	.000	.000	.000
MLS_score	.005	.050	.003	.000	.000	.000	.000
DASS_depression	.000	.068	.009	.000	.000	.000	.000
DASS_Anxiety	.004	.070	.011	.000	.000	.000	.000
DASS_Stress	.004	.073	.010	.000	.000	.000	.000
COPE13	-.034	.053	.004	.772	.000	.000	.000
COPE6	-.026	.049	.002	.717	.000	.000	.000
COPE26	-.038	.043	.002	.712	.000	.000	.000
COPE16	-.028	.046	.004	.709	.000	.000	.000
AHS9_heartRacing	.019	.006	.005	.293	.268	6.327	.000
AHS8_nausea	.021	.010	.007	.302	.270	10.960	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
AHS7_stomachAche	.007	.005	.002	.290	.177	9.780	.000
AHS6_appetiteLoss	.009	.007	.005	.289	.332	11.474	.000
AHS5_dizzinessFaintness	.016	.005	.003	.282	.259	7.412	.000

Standardized Indirect Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
incomePA_ChangePercent	...	...	...	...	...	...	...
PsychDistress	...	.085	...	...	...	...	...
withResorp	.376	.432	.420	...	...	...	...
MaladaptiveCoping	.055	.409	.051	...	...	...	...
GastricAndCardio	.108	.298	.134	.190	...	...	...
lonely_no	.042	.370	.042	...	...	...	...
MLS_score	.058	.400	.053	...	...	...	...
DASS_depression	.050	.405	.059	...	...	...	...
DASS_Anxiety	.056	.426	.063	...	...	...	...
DASS_Stress	.055	.408	.060	...	...	...	...
COPE13	.020	.400	.055	.001	...	...	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping	GastricAndCardio
COPE6	.020	.400	.052	.001	...	...	...
COPE26	.014	.402	.053	.001	...	...	...
COPE16	.018	.391	.055	.001	...	...	...
AHS9_heartRacing	.136	.295	.150	.238	.056	.203	...
AHS8_nausea	.094	.287	.111	.201	.068	.180	...
AHS7_stomachAche	.078	.231	.082	.133	.032	.143	...
AHS6_appetiteLoss	.079	.267	.104	.193	.058	.153	...
AHS5_dizzinessFaintness	.125	.285	.141	.236	.063	.185	...

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	47	172.977	124	.002	1.395
Saturated model	171	.000	0		
Independence model	18	957.636	153	.000	6.259

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	882.870	.871	.823	.632
Saturated model	.000	1.000		
Independence model	9330.091	.416	.348	.373

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.819	.777	.941	.925	.939
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.810	.664	.761
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	48.977	18.288	87.706
Saturated model	.000	.000	.000
Independence model	804.636	710.689	906.066

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	1.351	.383	.143	.685
Saturated model	.000	.000	.000	.000
Independence model	7.482	6.286	5.552	7.079

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.056	.034	.074	.311
Independence model	.203	.190	.215	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	266.977	283.363	401.389	448.389
Saturated model	342.000	401.615	831.028	1002.028
Independence model	993.636	999.911	1045.112	1063.112

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	2.086	1.846	2.388	2.214
Saturated model	2.672	2.672	2.672	3.138
Independence model	7.763	7.029	8.555	7.812

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	112	122
Independence model	25	27

Execution time summary

Minimization: .029

Miscellaneous: .614

Bootstrap: 19.427

Total: 20.070

A4.2.6.6. Structural model for 1-item hangover severity.

Analysis Summary

Sample size = 129

Number of variables in your model: 30

Number of observed variables: 14

Number of unobserved variables: 16

Number of exogenous variables: 16

Number of endogenous variables: 14

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
Age	18.000	66.000	1.078	4.997	.245	.568
priorIncome_PA	.000	192000.000	4.383	20.325	25.487	59.090
incomePA_ChangePercent	-100.000	200.000	.651	3.017	7.502	17.392
withResorp	.154	2.558	1.492	6.917	3.026	7.016
AHS_hangover	.000	7.000	1.991	9.230	3.198	7.414
lonely_no	1.000	5.000	.057	.263	-1.257	-2.914
MLS_score	3.000	9.000	.345	1.599	-1.001	-2.321
DASS_depression	.000	40.000	.582	2.701	-.693	-1.607
DASS_Anxiety	2.000	34.000	1.058	4.904	.377	.874
DASS_Stress	.000	40.000	.418	1.937	-.794	-1.841
COPE13	1.000	4.000	.383	1.774	-1.118	-2.592
COPE6	1.000	4.000	1.495	6.931	1.949	4.519
COPE26	1.000	4.000	1.472	6.823	.930	2.157
COPE16	1.000	4.000	2.275	10.548	5.296	12.279
Multivariate					66.655	17.884

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 105

Number of distinct parameters to be estimated: 38

Degrees of freedom (105 - 38): 67

Result (Default model)

Minimum was achieved

Chi-square = 84.390

Degrees of freedom = 67

Probability level = .074

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	.802	.422	
PsychDistress	<---	priorIncome_PA	.000	.000	-.618	.536	
PsychDistress	<---	incomePA_ChangePercent	-.044	.021	-2.094	.036	p1
PsychDistress	<---	age	-.138	.073	-1.890	.059	
MaladaptiveCoping	<---	PsychDistress	.041	.006	7.128	***	p2
withResorp	<---	PsychDistress	.002	.005	.438	.661	p4
MaladaptiveCoping	<---	age	-.004	.002	-2.056	.040	
COPE16	<---	MaladaptiveCoping	1.000				
COPE26	<---	MaladaptiveCoping	1.385	.257	5.396	***	
COPE6	<---	MaladaptiveCoping	1.117	.151	7.410	***	
COPE13	<---	MaladaptiveCoping	1.871	.316	5.911	***	
DASS_Stress	<---	PsychDistress	1.000				
DASS_Anxiety	<---	PsychDistress	.722	.056	12.978	***	

			Estimate	S.E.	C.R.	P	Label
DASS_depression	<---	PsychDistress	1.014	.074	13.614	***	
MLS_score	<---	PsychDistress	.130	.016	8.076	***	
lonely_no	<---	PsychDistress	-.072	.013	-5.726	***	
AHS_hangover	<---	PsychDistress	.174	.127	1.368	.171	
AHS_hangover	<---	withResorp	.797	.270	2.949	.003	p5
AHS_hangover	<---	MaladaptiveCoping	-4.426	3.031	-1.460	.144	p3

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
incomePA_ChangePercent	<---	priorIncome_PA	.071
PsychDistress	<---	priorIncome_PA	-.058
PsychDistress	<---	incomePA_ChangePercent	-.186
PsychDistress	<---	age	-.179
MaladaptiveCoping	<---	PsychDistress	1.022
withResorp	<---	PsychDistress	.040
MaladaptiveCoping	<---	age	-.138
COPE16	<---	MaladaptiveCoping	.543
COPE26	<---	MaladaptiveCoping	.558
COPE6	<---	MaladaptiveCoping	.574
COPE13	<---	MaladaptiveCoping	.640
DASS_Stress	<---	PsychDistress	.906
DASS_Anxiety	<---	PsychDistress	.837
DASS_depression	<---	PsychDistress	.859
MLS_score	<---	PsychDistress	.632

			Estimate
lonely_no	<---	PsychDistress	-.480
AHS_hangover	<---	PsychDistress	1.073
AHS_hangover	<---	withResorp	.246
AHS_hangover	<---	MaladaptiveCoping	-1.099

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
incomePA_ChangePercent	.005
PsychDistress	.080
withResorp	.002
MaladaptiveCoping	1.120
AHS_hangover	-.058
lonely_no	.230
MLS_score	.399
DASS_depression	.737
DASS_Anxiety	.701
DASS_Stress	.822
COPE13	.409
COPE6	.330
COPE26	.312
COPE16	.295

User-defined estimands: (Group number 1 - Default model)

Income_Distress_Coping_hangover	.008
Income_Distress_BAC_hangover	.000
Distress_Coping_hangover	-.182
Distress_BAC_hangover	.002

Total Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	-.138	.000	-.044	.000	.000	.000
withResorp	.000	.000	.000	.002	.000	.000
MaladaptiveCoping	-.010	.000	-.002	.041	.000	.000
AHS_hangover	.020	.000	.000	-.006	.797	-4.426
lonely_no	.010	.000	.003	-.072	.000	.000
MLS_score	-.018	.000	-.006	.130	.000	.000
DASS_depression	-.140	.000	-.044	1.014	.000	.000
DASS_Anxiety	-.100	.000	-.031	.722	.000	.000
DASS_Stress	-.138	.000	-.044	1.000	.000	.000
COPE13	-.019	.000	-.003	.077	.000	1.871
COPE6	-.011	.000	-.002	.046	.000	1.117
COPE26	-.014	.000	-.002	.057	.000	1.385

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE16	-.010	.000	-.002	.041	.000	1.000

Standardized Total Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.071	.000	.000	.000	.000
PsychDistress	-.179	-.071	-.186	.000	.000	.000
withResorp	-.007	-.003	-.007	.040	.000	.000
MaladaptiveCoping	-.321	-.073	-.190	1.022	.000	.000
AHS_hangover	.159	.003	.007	-.040	.246	-1.099
lonely_no	.086	.034	.089	-.480	.000	.000
MLS_score	-.113	-.045	-.118	.632	.000	.000
DASS_depression	-.154	-.061	-.160	.859	.000	.000
DASS_Anxiety	-.150	-.060	-.156	.837	.000	.000
DASS_Stress	-.162	-.065	-.169	.906	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE13	-.205	-.047	-.122	.654	.000	.640
COPE6	-.184	-.042	-.109	.587	.000	.574
COPE26	-.179	-.041	-.106	.570	.000	.558
COPE16	-.174	-.040	-.103	.555	.000	.543

Direct Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	-.138	.000	-.044	.000	.000	.000
withResorp	.000	.000	.000	.002	.000	.000
MaladaptiveCoping	-.004	.000	.000	.041	.000	.000
AHS_hangover	.000	.000	.000	.174	.797	-4.426
lonely_no	.000	.000	.000	-.072	.000	.000
MLS_score	.000	.000	.000	.130	.000	.000
DASS_depression	.000	.000	.000	1.014	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
DASS_Anxiety	.000	.000	.000	.722	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000
COPE13	.000	.000	.000	.000	.000	1.871
COPE6	.000	.000	.000	.000	.000	1.117
COPE26	.000	.000	.000	.000	.000	1.385
COPE16	.000	.000	.000	.000	.000	1.000

Standardized Direct Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.071	.000	.000	.000	.000
PsychDistress	-.179	-.058	-.186	.000	.000	.000
withResorp	.000	.000	.000	.040	.000	.000
MaladaptiveCoping	-.138	.000	.000	1.022	.000	.000
AHS_hangover	.000	.000	.000	1.073	.246	-1.099
lonely_no	.000	.000	.000	-.480	.000	.000
MLS_score	.000	.000	.000	.632	.000	.000
DASS_depression	.000	.000	.000	.859	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
DASS_Anxiety	.000	.000	.000	.837	.000	.000
DASS_Stress	.000	.000	.000	.906	.000	.000
COPE13	.000	.000	.000	.000	.000	.640
COPE6	.000	.000	.000	.000	.000	.574
COPE26	.000	.000	.000	.000	.000	.558
COPE16	.000	.000	.000	.000	.000	.543

Indirect Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000
withResorp	.000	.000	.000	.000	.000	.000
MaladaptiveCoping	-.006	.000	-.002	.000	.000	.000
AHS_hangover	.020	.000	.000	-.181	.000	.000
lonely_no	.010	.000	.003	.000	.000	.000
MLS_score	-.018	.000	-.006	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
DASS_depression	-.140	.000	-.044	.000	.000	.000
DASS_Anxiety	-.100	.000	-.031	.000	.000	.000
DASS_Stress	-.138	.000	-.044	.000	.000	.000
COPE13	-.019	.000	-.003	.077	.000	.000
COPE6	-.011	.000	-.002	.046	.000	.000
COPE26	-.014	.000	-.002	.057	.000	.000
COPE16	-.010	.000	-.002	.041	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.000	-.013	.000	.000	.000	.000
withResorp	-.007	-.003	-.007	.000	.000	.000
MaladaptiveCoping	-.183	-.073	-.190	.000	.000	.000
AHS_hangover	.159	.003	.007	-1.113	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
lonely_no	.086	.034	.089	.000	.000	.000
MLS_score	-.113	-.045	-.118	.000	.000	.000
DASS_depression	-.154	-.061	-.160	.000	.000	.000
DASS_Anxiety	-.150	-.060	-.156	.000	.000	.000
DASS_Stress	-.162	-.065	-.169	.000	.000	.000
COPE13	-.205	-.047	-.122	.654	.000	.000
COPE6	-.184	-.042	-.109	.587	.000	.000
COPE26	-.179	-.041	-.106	.570	.000	.000
COPE16	-.174	-.040	-.103	.555	.000	.000

Regression Weights: (Group number 1 - Default model)

			M.I.	Par Change
lonely_no	<---	age	4.595	.019
DASS_depression	<---	withResorp	6.230	2.860
DASS_Stress	<---	withResorp	5.973	-2.489

Bootstrap (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	.000	.000	.000
PsychDistress	<---	priorIncome_PA	.000	.000	.000	.000	.000
PsychDistress	<---	incomePA_ChangePercent	.023	.000	-.042	.001	.001
PsychDistress	<---	age	.076	.001	-.130	.008	.002
MaladaptiveCoping	<---	PsychDistress	.008	.000	.041	.000	.000
withResorp	<---	PsychDistress	.004	.000	.002	.000	.000
MaladaptiveCoping	<---	age	.002	.000	-.004	.001	.000
COPE16	<---	MaladaptiveCoping	.000	.000	1.000	.000	.000
COPE26	<---	MaladaptiveCoping	.350	.006	1.447	.061	.008
COPE6	<---	MaladaptiveCoping	.179	.003	1.134	.017	.004
COPE13	<---	MaladaptiveCoping	.414	.007	1.947	.076	.009
DASS_Stress	<---	PsychDistress	.000	.000	1.000	.000	.000
DASS_Anxiety	<---	PsychDistress	.058	.001	.725	.003	.001
DASS_depression	<---	PsychDistress	.080	.001	1.013	-.001	.002
MLS_score	<---	PsychDistress	.017	.000	.130	.000	.000

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
lonely_no	<---	PsychDistress	.012	.000	-.071	.000	.000
AHS_hangover	<---	PsychDistress	.788	.012	.303	.129	.018
AHS_hangover	<---	withResorp	.345	.005	.815	.018	.008
AHS_hangover	<---	MaladaptiveCoping	19.909	.315	-7.879	-3.454	.445

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	<---	priorIncome_PA	.052	.001	.078	.007	.001
PsychDistress	<---	priorIncome_PA	.081	.001	-.072	-.014	.002
PsychDistress	<---	incomePA_ChangePercent	.096	.002	-.179	.007	.002
PsychDistress	<---	age	.100	.002	-.170	.009	.002
MaladaptiveCoping	<---	PsychDistress	.096	.002	1.055	.034	.002
withResorp	<---	PsychDistress	.086	.001	.043	.003	.002
MaladaptiveCoping	<---	age	.070	.001	-.127	.011	.002
COPE16	<---	MaladaptiveCoping	.075	.001	.532	-.011	.002
COPE26	<---	MaladaptiveCoping	.066	.001	.547	-.011	.001
COPE6	<---	MaladaptiveCoping	.070	.001	.560	-.015	.002
COPE13	<---	MaladaptiveCoping	.074	.001	.626	-.014	.002

Parameter			SE	SE-SE	Mean	Bias	SE-Bias
DASS_Stress	<---	PsychDistress	.028	.000	.906	.000	.001
DASS_Anxiety	<---	PsychDistress	.032	.001	.840	.003	.001
DASS_depression	<---	PsychDistress	.035	.001	.857	-.001	.001
MLS_score	<---	PsychDistress	.064	.001	.629	-.003	.001
lonely_no	<---	PsychDistress	.079	.001	-.478	.001	.002
AHS_hangover	<---	PsychDistress	4.542	.072	1.803	.730	.102
AHS_hangover	<---	withResorp	.108	.002	.252	.007	.002
AHS_hangover	<---	MaladaptiveCoping	4.539	.072	-1.832	-.733	.102

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
incomePA_ChangePercent	.009	.000	.009	.004	.000
PsychDistress	.050	.001	.102	.022	.001
withResorp	.014	.000	.009	.008	.000
MaladaptiveCoping	.221	.004	1.193	.073	.005
AHS_hangover	.443	.007	-.079	-.021	.010
lonely_no	.075	.001	.235	.005	.002
MLS_score	.079	.001	.400	.001	.002
DASS_depression	.060	.001	.736	-.001	.001
DASS_Anxiety	.053	.001	.707	.006	.001
DASS_Stress	.051	.001	.822	.001	.001
COPE13	.091	.001	.398	-.012	.002

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
COPE6	.078	.001	.318	-.012	.002
COPE26	.072	.001	.304	-.008	.002
COPE16	.079	.001	.289	-.006	.002

User-defined estimands: (Group number 1 - Default model)

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
Income_Distress_Coping_hangover	.036	.001	.013	.005	.001
Income_Distress_BAC_hangover	.000	.000	.000	.000	.000
Distress_Coping_hangover	.786	.012	-.310	-.128	.018
Distress_BAC_hangover	.004	.000	.002	.000	.000

Total Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.076	.000	.023	.000	.000	.000
withResorp	.001	.000	.000	.004	.000	.000
MaladaptiveCoping	.004	.000	.001	.008	.000	.000
AHS_hangover	.015	.000	.001	.015	.345	19.909
lonely_no	.006	.000	.002	.012	.000	.000
MLS_score	.011	.000	.003	.017	.000	.000
DASS_depression	.079	.000	.024	.080	.000	.000
DASS_Anxiety	.056	.000	.017	.058	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
DASS_Stress	.076	.000	.023	.000	.000	.000
COPE13	.006	.000	.002	.009	.000	.414
COPE6	.004	.000	.001	.008	.000	.179
COPE26	.004	.000	.001	.009	.000	.350
COPE16	.004	.000	.001	.008	.000	.000

Standardized Total Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.052	.000	.000	.000	.000
PsychDistress	.100	.083	.096	.000	.000	.000
withResorp	.017	.011	.019	.086	.000	.000
MaladaptiveCoping	.101	.089	.104	.096	.000	.000
AHS_hangover	.113	.011	.019	.093	.108	4.539
lonely_no	.053	.040	.049	.079	.000	.000
MLS_score	.066	.052	.060	.064	.000	.000
DASS_depression	.087	.071	.083	.035	.000	.000
DASS_Anxiety	.084	.070	.082	.032	.000	.000
DASS_Stress	.090	.075	.087	.028	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE13	.066	.055	.064	.057	.000	.074
COPE6	.063	.049	.058	.063	.000	.070
COPE26	.054	.049	.059	.067	.000	.066
COPE16	.059	.046	.057	.070	.000	.075

Direct Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.076	.000	.023	.000	.000	.000
withResorp	.000	.000	.000	.004	.000	.000
MaladaptiveCoping	.002	.000	.000	.008	.000	.000
AHS_hangover	.000	.000	.000	.788	.345	19.909
lonely_no	.000	.000	.000	.012	.000	.000
MLS_score	.000	.000	.000	.017	.000	.000
DASS_depression	.000	.000	.000	.080	.000	.000
DASS_Anxiety	.000	.000	.000	.058	.000	.000
DASS_Stress	.000	.000	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE13	.000	.000	.000	.000	.000	.414
COPE6	.000	.000	.000	.000	.000	.179
COPE26	.000	.000	.000	.000	.000	.350
COPE16	.000	.000	.000	.000	.000	.000

Standardized Direct Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.052	.000	.000	.000	.000
PsychDistress	.100	.081	.096	.000	.000	.000
withResorp	.000	.000	.000	.086	.000	.000
MaladaptiveCoping	.070	.000	.000	.096	.000	.000
AHS_hangover	.000	.000	.000	4.542	.108	4.539
lonely_no	.000	.000	.000	.079	.000	.000
MLS_score	.000	.000	.000	.064	.000	.000
DASS_depression	.000	.000	.000	.035	.000	.000
DASS_Anxiety	.000	.000	.000	.032	.000	.000
DASS_Stress	.000	.000	.000	.028	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE13	.000	.000	.000	.000	.000	.074
COPE6	.000	.000	.000	.000	.000	.070
COPE26	.000	.000	.000	.000	.000	.066
COPE16	.000	.000	.000	.000	.000	.075

Indirect Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000
withResorp	.001	.000	.000	.000	.000	.000
MaladaptiveCoping	.004	.000	.001	.000	.000	.000
AHS_hangover	.015	.000	.001	.786	.000	.000
lonely_no	.006	.000	.002	.000	.000	.000
MLS_score	.011	.000	.003	.000	.000	.000
DASS_depression	.079	.000	.024	.000	.000	.000
DASS_Anxiety	.056	.000	.017	.000	.000	.000
DASS_Stress	.076	.000	.023	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE13	.006	.000	.002	.009	.000	.000
COPE6	.004	.000	.001	.008	.000	.000
COPE26	.004	.000	.001	.009	.000	.000
COPE16	.004	.000	.001	.008	.000	.000

Standardized Indirect Effects - Standard Errors (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.012	.000	.000	.000	.000
withResorp	.017	.011	.019	.000	.000	.000
MaladaptiveCoping	.106	.089	.104	.000	.000	.000
AHS_hangover	.113	.011	.019	4.529	.000	.000
lonely_no	.053	.040	.049	.000	.000	.000
MLS_score	.066	.052	.060	.000	.000	.000
DASS_depression	.087	.071	.083	.000	.000	.000
DASS_Anxiety	.084	.070	.082	.000	.000	.000
DASS_Stress	.090	.075	.087	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE13	.066	.055	.064	.057	.000	.000
COPE6	.063	.049	.058	.063	.000	.000
COPE26	.054	.049	.059	.067	.000	.000
COPE16	.059	.046	.057	.070	.000	.000

Bootstrap Confidence (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

Parameter			Estimate	Lower	Upper	P
incomePA_ChangePercent	<---	priorIncome_PA	.000	.000	.000	.165
PsychDistress	<---	priorIncome_PA	.000	.000	.000	.485
PsychDistress	<---	incomePA_ChangePercent	-.044	-.088	.003	.059
PsychDistress	<---	age	-.138	-.283	.008	.065
MaladaptiveCoping	<---	PsychDistress	.041	.028	.059	.001
withResorp	<---	PsychDistress	.002	-.006	.011	.560
MaladaptiveCoping	<---	age	-.004	-.010	-.001	.010
COPE16	<---	MaladaptiveCoping	1.000	1.000	1.000	...
COPE26	<---	MaladaptiveCoping	1.385	.843	2.157	.002
COPE6	<---	MaladaptiveCoping	1.117	.845	1.553	.001

Parameter			Estimate	Lower	Upper	P
COPE13	<---	MaladaptiveCoping	1.871	1.240	2.782	.002
DASS_Stress	<---	PsychDistress	1.000	1.000	1.000	...
DASS_Anxiety	<---	PsychDistress	.722	.611	.839	.001
DASS_depression	<---	PsychDistress	1.014	.858	1.175	.001
MLS_score	<---	PsychDistress	.130	.097	.162	.001
lonely_no	<---	PsychDistress	-.072	-.095	-.048	.001
AHS_hangover	<---	PsychDistress	.174	.005	2.520	.037
AHS_hangover	<---	withResorp	.797	.160	1.498	.011
AHS_hangover	<---	MaladaptiveCoping	-4.426	-55.888	-.258	.028

Standardized Regression Weights: (Group number 1 - Default model)

Parameter			Estimate	Lower	Upper	P
incomePA_ChangePercent	<---	priorIncome_PA	.071	-.046	.164	.212
PsychDistress	<---	priorIncome_PA	-.058	-.229	.085	.488
PsychDistress	<---	incomePA_ChangePercent	-.186	-.357	.017	.065
PsychDistress	<---	age	-.179	-.377	.011	.066
MaladaptiveCoping	<---	PsychDistress	1.022	.942	1.299	.001
withResorp	<---	PsychDistress	.040	-.114	.231	.589

Parameter			Estimate	Lower	Upper	P
MaladaptiveCoping	<---	age	-.138	-.308	-.028	.015
COPE16	<---	MaladaptiveCoping	.543	.392	.685	.000
COPE26	<---	MaladaptiveCoping	.558	.435	.690	.000
COPE6	<---	MaladaptiveCoping	.574	.444	.717	.000
COPE13	<---	MaladaptiveCoping	.640	.493	.775	.000
DASS_Stress	<---	PsychDistress	.906	.845	.956	.001
DASS_Anxiety	<---	PsychDistress	.837	.763	.890	.003
DASS_depression	<---	PsychDistress	.859	.775	.919	.001
MLS_score	<---	PsychDistress	.632	.495	.744	.001
lonely_no	<---	PsychDistress	-.480	-.623	-.310	.001
AHS_hangover	<---	PsychDistress	1.073	.031	14.654	.038
AHS_hangover	<---	withResorp	.246	.044	.458	.013
AHS_hangover	<---	MaladaptiveCoping	-1.099	-14.081	-.073	.024

Squared Multiple Correlations: (Group number 1 - Default model)

Parameter	Estimate	Lower	Upper	P
incomePA_ChangePercent	.005	.000	.027	.003
PsychDistress	.080	.010	.171	.007
withResorp	.002	.000	.023	.011
MaladaptiveCoping	1.120	.995	1.762	.001
AHS_hangover	-.058	-2.729	.120	.440
lonely_no	.230	.096	.388	.001
MLS_score	.399	.245	.554	.001
DASS_depression	.737	.600	.844	.001
DASS_Anxiety	.701	.582	.791	.003
DASS_Stress	.822	.713	.913	.001
COPE13	.409	.243	.601	.000
COPE6	.330	.197	.514	.000
COPE26	.312	.190	.476	.000
COPE16	.295	.154	.469	.000

User-defined estimands: (Group number 1 - Default model)

Parameter	Estimate	Lower	Upper	P
Income_Distress_Coping_hangover	.008	.000	.155	.033
Income_Distress_BAC_hangover	.000	-.001	.000	.351
Distress_Coping_hangover	-.182	-2.506	-.015	.022
Distress_BAC_hangover	.002	-.004	.011	.462

Total Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	-.283	.000	-.088	.000	.000	.000
withResorp	-.002	.000	-.001	-.006	.000	.000
MaladaptiveCoping	-.019	.000	-.004	.028	.000	.000
AHS_hangover	.000	.000	-.001	-.036	.160	-55.888
lonely_no	.000	.000	.000	-.095	.000	.000
MLS_score	-.041	.000	-.012	.097	.000	.000
DASS_depression	-.299	.000	-.090	.858	.000	.000
DASS_Anxiety	-.210	.000	-.066	.611	.000	.000
DASS_Stress	-.283	.000	-.088	1.000	.000	.000
COPE13	-.032	.000	-.007	.062	.000	1.240
COPE6	-.022	.000	-.004	.032	.000	.845

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE26	-.023	.000	-.006	.039	.000	.843
COPE16	-.019	.000	-.004	.028	.000	1.000

Total Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.008	.000	.003	.000	.000	.000
withResorp	.001	.000	.000	.011	.000	.000
MaladaptiveCoping	-.004	.000	.000	.059	.000	.000
AHS_hangover	.057	.000	.002	.021	1.498	-.258
lonely_no	.024	.000	.007	-.048	.000	.000
MLS_score	.001	.000	.000	.162	.000	.000
DASS_depression	.006	.000	.003	1.175	.000	.000
DASS_Anxiety	.005	.000	.003	.839	.000	.000
DASS_Stress	.008	.000	.003	1.000	.000	.000
COPE13	-.008	.000	.000	.096	.000	2.782

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE6	-.005	.000	.000	.063	.000	1.553
COPE26	-.007	.000	.000	.076	.000	2.157
COPE16	-.004	.000	.000	.059	.000	1.000

Total Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	...	.165	...	...	...	...
PsychDistress	.065	.378	.059	...	...	...
withResorp	.361	.446	.458	.560	...	...
MaladaptiveCoping	.001	.367	.054	.001	...	...
AHS_hangover	.049	.466	.452	.639	.011	.028
lonely_no	.052	.349	.050	.001	...	...
MLS_score	.062	.368	.049	.001	...	...
DASS_depression	.061	.366	.060	.001	...	...
DASS_Anxiety	.064	.372	.065	.001	...	...
DASS_Stress	.065	.378	.059	...	...	...
COPE13	.002	.359	.053	.001	...	.002

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE6	.002	.357	.052	.001	...	.001
COPE26	.001	.385	.058	.001	...	.002
COPE16	.001	.367	.054	.001	...	...

Standardized Total Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	-.046	.000	.000	.000	.000
PsychDistress	-.377	-.244	-.357	.000	.000	.000
withResorp	-.063	-.043	-.067	-.114	.000	.000
MaladaptiveCoping	-.515	-.265	-.384	.942	.000	.000
AHS_hangover	-.001	-.010	-.022	-.218	.044	-14.081
lonely_no	-.001	-.034	.001	-.623	.000	.000
MLS_score	-.254	-.155	-.229	.495	.000	.000
DASS_depression	-.328	-.210	-.312	.775	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
DASS_Anxiety	-.314	-.204	-.302	.763	.000	.000
DASS_Stress	-.331	-.221	-.323	.845	.000	.000
COPE13	-.341	-.161	-.241	.545	.000	.493
COPE6	-.332	-.145	-.216	.460	.000	.444
COPE26	-.286	-.148	-.222	.424	.000	.435
COPE16	-.303	-.138	-.213	.399	.000	.392

Standardized Total Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.164	.000	.000	.000	.000
PsychDistress	.011	.076	.017	.000	.000	.000
withResorp	.014	.008	.014	.231	.000	.000
MaladaptiveCoping	-.128	.079	.022	1.299	.000	.000
AHS_hangover	.414	.039	.055	.135	.458	-.073
lonely_no	.211	.124	.193	-.310	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
MLS_score	.006	.047	.004	.744	.000	.000
DASS_depression	.007	.065	.011	.919	.000	.000
DASS_Anxiety	.010	.065	.014	.890	.000	.000
DASS_Stress	.011	.071	.013	.956	.000	.000
COPE13	-.087	.050	.011	.760	.000	.775
COPE6	-.073	.044	.005	.703	.000	.717
COPE26	-.084	.040	.008	.686	.000	.690
COPE16	-.072	.041	.010	.680	.000	.685

Standardized Total Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	...	.212	...	...	...	...
PsychDistress	.066	.387	.065	...	...	...
withResorp	.378	.438	.451	.589	...	...
MaladaptiveCoping	.004	.404	.074	.001	...	...
AHS_hangover	.052	.455	.426	.634	.013	.024

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
lonely_no	.053	.351	.048	.001	...	...
MLS_score	.066	.377	.056	.001	...	...
DASS_depression	.063	.385	.062	.001	...	...
DASS_Anxiety	.069	.403	.066	.003	...	...
DASS_Stress	.069	.397	.063	.001	...	...
COPE13	.002	.393	.066	.001	...	.000
COPE6	.002	.377	.059	.001	...	.000
COPE26	.002	.396	.065	.002	...	.000
COPE16	.002	.386	.066	.002	...	.000

Direct Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	-.283	.000	-.088	.000	.000	.000
withResorp	.000	.000	.000	-.006	.000	.000
MaladaptiveCoping	-.010	.000	.000	.028	.000	.000
AHS_hangover	.000	.000	.000	.005	.160	-55.888

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
lonely_no	.000	.000	.000	-.095	.000	.000
MLS_score	.000	.000	.000	.097	.000	.000
DASS_depression	.000	.000	.000	.858	.000	.000
DASS_Anxiety	.000	.000	.000	.611	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000
COPE13	.000	.000	.000	.000	.000	1.240
COPE6	.000	.000	.000	.000	.000	.845
COPE26	.000	.000	.000	.000	.000	.843
COPE16	.000	.000	.000	.000	.000	1.000

Direct Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.008	.000	.003	.000	.000	.000
withResorp	.000	.000	.000	.011	.000	.000
MaladaptiveCoping	-.001	.000	.000	.059	.000	.000
AHS_hangover	.000	.000	.000	2.520	1.498	-.258
lonely_no	.000	.000	.000	-.048	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
MLS_score	.000	.000	.000	.162	.000	.000
DASS_depression	.000	.000	.000	1.175	.000	.000
DASS_Anxiety	.000	.000	.000	.839	.000	.000
DASS_Stress	.000	.000	.000	1.000	.000	.000
COPE13	.000	.000	.000	.000	.000	2.782
COPE6	.000	.000	.000	.000	.000	1.553
COPE26	.000	.000	.000	.000	.000	2.157
COPE16	.000	.000	.000	.000	.000	1.000

Direct Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	...	.165	...	...	...	...
PsychDistress	.065	.485	.059	...	...	...
withResorp	...	...	...	.560	...	...
MaladaptiveCoping	.010	...	...	.001	...	...
AHS_hangover	...	...	...	.037	.011	.028
lonely_no	...	...	...	.001	...	...
MLS_score	...	...	...	.001	...	...
DASS_depression	...	...	...	.001	...	...
DASS_Anxiety	...	...	...	.001	...	...

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
DASS_Stress	…	…	…	…	…	…
COPE13	…	…	…	…	…	.002
COPE6	…	…	…	…	…	.001
COPE26	…	…	…	…	…	.002
COPE16	…	…	…	…	…	…

Standardized Direct Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	-.046	.000	.000	.000	.000
PsychDistress	-.377	-.229	-.357	.000	.000	.000
withResorp	.000	.000	.000	-.114	.000	.000
MaladaptiveCoping	-.308	.000	.000	.942	.000	.000
AHS_hangover	.000	.000	.000	.031	.044	-14.081
lonely_no	.000	.000	.000	-.623	.000	.000
MLS_score	.000	.000	.000	.495	.000	.000
DASS_depression	.000	.000	.000	.775	.000	.000
DASS_Anxiety	.000	.000	.000	.763	.000	.000
DASS_Stress	.000	.000	.000	.845	.000	.000
COPE13	.000	.000	.000	.000	.000	.493

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE6	.000	.000	.000	.000	.000	.444
COPE26	.000	.000	.000	.000	.000	.435
COPE16	.000	.000	.000	.000	.000	.392

Standardized Direct Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.164	.000	.000	.000	.000
PsychDistress	.011	.085	.017	.000	.000	.000
withResorp	.000	.000	.000	.231	.000	.000
MaladaptiveCoping	-.028	.000	.000	1.299	.000	.000
AHS_hangover	.000	.000	.000	14.654	.458	-.073
lonely_no	.000	.000	.000	-.310	.000	.000
MLS_score	.000	.000	.000	.744	.000	.000
DASS_depression	.000	.000	.000	.919	.000	.000
DASS_Anxiety	.000	.000	.000	.890	.000	.000
DASS_Stress	.000	.000	.000	.956	.000	.000
COPE13	.000	.000	.000	.000	.000	.775
COPE6	.000	.000	.000	.000	.000	.717

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE26	.000	.000	.000	.000	.000	.690
COPE16	.000	.000	.000	.000	.000	.685

Standardized Direct Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	...	.212	...	...	...	...
PsychDistress	.066	.488	.065	...	...	...
withResorp	...	...	...	.589	...	...
MaladaptiveCoping	.015	...	...	.001	...	...
AHS_hangover	...	...	...	.038	.013	.024
lonely_no	...	...	...	.001	...	...
MLS_score	...	...	...	.001	...	...
DASS_depression	...	...	...	.001	...	...
DASS_Anxiety	...	...	...	.003	...	...
DASS_Stress	...	...	...	.001	...	...
COPE13	...	...	...	...	...	.000
COPE6	...	...	...	...	...	.000
COPE26	...	...	...	...	...	.000
COPE16	...	...	...	...	...	.000

Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
PsychDistress	.000	.000	.000	.000	.000	.000
withResorp	-.002	.000	-.001	.000	.000	.000
MaladaptiveCoping	-.014	.000	-.004	.000	.000	.000
AHS_hangover	.000	.000	-.001	-2.505	.000	.000
lonely_no	.000	.000	.000	.000	.000	.000
MLS_score	-.041	.000	-.012	.000	.000	.000
DASS_depression	-.299	.000	-.090	.000	.000	.000
DASS_Anxiety	-.210	.000	-.066	.000	.000	.000
DASS_Stress	-.283	.000	-.088	.000	.000	.000
COPE13	-.032	.000	-.007	.062	.000	.000
COPE6	-.022	.000	-.004	.032	.000	.000
COPE26	-.023	.000	-.006	.039	.000	.000
COPE16	-.019	.000	-.004	.028	.000	.000

Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.000	.000	.000	.000	.000
withResorp	.001	.000	.000	.000	.000	.000
MaladaptiveCoping	.000	.000	.000	.000	.000	.000
AHS_hangover	.057	.000	.002	-.012	.000	.000
lonely_no	.024	.000	.007	.000	.000	.000
MLS_score	.001	.000	.000	.000	.000	.000
DASS_depression	.006	.000	.003	.000	.000	.000
DASS_Anxiety	.005	.000	.003	.000	.000	.000
DASS_Stress	.008	.000	.003	.000	.000	.000
COPE13	-.008	.000	.000	.096	.000	.000
COPE6	-.005	.000	.000	.063	.000	.000
COPE26	-.007	.000	.000	.076	.000	.000
COPE16	-.004	.000	.000	.059	.000	.000

Indirect Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	...	...	...	...	...	...
PsychDistress	...	.101	...	...	...	...
withResorp	.361	.446	.458	...	...	...
MaladaptiveCoping	.051	.367	.054	...	...	...
AHS_hangover	.049	.466	.452	.025	...	...
lonely_no	.052	.349	.050	...	...	...
MLS_score	.062	.368	.049	...	...	...
DASS_depression	.061	.366	.060	...	...	...
DASS_Anxiety	.064	.372	.065	...	...	...
DASS_Stress	.065	.378	.059	...	...	...
COPE13	.002	.359	.053	.001	...	...
COPE6	.002	.357	.052	.001	...	...
COPE26	.001	.385	.058	.001	...	...
COPE16	.001	.367	.054	.001	...	...

Standardized Indirect Effects - Lower Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.000	-.047	.000	.000	.000	.000
withResorp	-.063	-.043	-.067	.000	.000	.000
MaladaptiveCoping	-.400	-.265	-.384	.000	.000	.000
AHS_hangover	-.001	-.010	-.022	-14.756	.000	.000
lonely_no	-.001	-.034	.001	.000	.000	.000
MLS_score	-.254	-.155	-.229	.000	.000	.000
DASS_depression	-.328	-.210	-.312	.000	.000	.000
DASS_Anxiety	-.314	-.204	-.302	.000	.000	.000
DASS_Stress	-.331	-.221	-.323	.000	.000	.000
COPE13	-.341	-.161	-.241	.545	.000	.000
COPE6	-.332	-.145	-.216	.460	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE26	-.286	-.148	-.222	.424	.000	.000
COPE16	-.303	-.138	-.213	.399	.000	.000

Standardized Indirect Effects - Upper Bounds (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	.000	.000	.000	.000	.000	.000
PsychDistress	.000	.003	.000	.000	.000	.000
withResorp	.014	.008	.014	.000	.000	.000
MaladaptiveCoping	.019	.079	.022	.000	.000	.000
AHS_hangover	.414	.039	.055	-.086	.000	.000
lonely_no	.211	.124	.193	.000	.000	.000
MLS_score	.006	.047	.004	.000	.000	.000
DASS_depression	.007	.065	.011	.000	.000	.000
DASS_Anxiety	.010	.065	.014	.000	.000	.000
DASS_Stress	.011	.071	.013	.000	.000	.000
COPE13	-.087	.050	.011	.760	.000	.000

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
COPE6	-.073	.044	.005	.703	.000	.000
COPE26	-.084	.040	.008	.686	.000	.000
COPE16	-.072	.041	.010	.680	.000	.000

Standardized Indirect Effects - Two Tailed Significance (BC) (Group number 1 - Default model)

	age	priorIncome_PA	incomePA_ChangePercent	PsychDistress	withResorp	MaladaptiveCoping
incomePA_ChangePercent	...	...	...	...	...	...
PsychDistress	...	.087	...	...	...	...
withResorp	.378	.438	.451	...	...	...
MaladaptiveCoping	.077	.404	.074	...	...	...
AHS_hangover	.052	.455	.426	.025	...	...
lonely_no	.053	.351	.048	...	...	...
MLS_score	.066	.377	.056	...	...	...
DASS_depression	.063	.385	.062	...	...	...
DASS_Anxiety	.069	.403	.066	...	...	...
DASS_Stress	.069	.397	.063	...	...	...
COPE13	.002	.393	.066	.001	...	...

	age	priorIncome_PA	incomePercentPA_Change	PsychDistress	withRelorp	MaladaptiveCoping
COPE6	.002	.377	.059	.001	...	...
COPE26	.002	.396	.065	.002	...	...
COPE16	.002	.386	.066	.002	...	...

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	38	84.390	67	.074	1.260
Saturated model	105	.000	0		
Independence model	14	743.793	91	.000	8.174

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	925.915	.914	.866	.583
Saturated model	.000	1.000		
Independence model	11901.375	.405	.314	.351

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.887	.846	.974	.964	.973
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.736	.653	.717
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	17.390	.000	45.002
Saturated model	.000	.000	.000
Independence model	652.793	569.558	743.495

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.659	.136	.000	.352
Saturated model	.000	.000	.000	.000
Independence model	5.811	5.100	4.450	5.809

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.045	.000	.072	.588
Independence model	.237	.221	.253	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	160.390	170.478	269.063	307.063
Saturated model	210.000	237.876	510.280	615.280
Independence model	771.793	775.510	811.831	825.831

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	1.253	1.117	1.469	1.332
Saturated model	1.641	1.641	1.641	1.858
Independence model	6.030	5.379	6.738	6.059

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	133	147
Independence model	20	22

Execution time summary

Minimization:	.040
Miscellaneous:	.376
Bootstrap:	8.665
Total:	9.081

A4.3. Statistical outputs for chapter 5.

A4.3.1. Descriptive statistics – sample characteristics.

Descriptive Statistics - sample characteristics

Descriptive Statistics

	Age	Gender	Finished_Drinks
Valid	26	26	26
Missing	0	0	0
Mean	24.731		
Std. Deviation	6.995		
Minimum	18.000		
Maximum	40.000		

Frequency Tables

Frequencies for Gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
M	11	42.308	42.308	42.308
NB	4	15.385	15.385	57.692
F	11	42.308	42.308	100.000
Missing	0	0.000		
Total	26	100.000		

Note. Age has more than 10 distinct values and is omitted.

Frequencies for Finished_Drinks

Finished_Drinks	Frequency	Percent	Valid Percent	Cumulative Percent
Y	22	84.615	84.615	84.615
N	3	11.538	11.538	96.154
N	1	3.846	3.846	100.000

Frequencies for Finished_Drinks

Finished_Drinks	Frequency	Percent	Valid Percent	Cumulative Percent
Missing	0	0.000		
Total	26	100.000		

A4.3.2. Descriptive statistics – questionnaires.

Descriptive Statistics - Questionnaires

Descriptive Statistics

	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Pre_BSRI	26	0	341.077	207.673	24.000	778.000
Post_BSRI	26	0	371.846	216.291	61.000	753.000
Pre_ERQ_CR	26	0	4.276	1.126	1.333	6.500
Pre_ERQ_ES	26	0	4.115	1.006	1.250	5.750
Post_ERQ_CR	26	0	4.333	1.110	2.167	6.667
Post_ERQ_ES	26	0	4.135	1.123	1.250	6.500
Pre_Symptom_Hangover	26	0	0.154	0.464	0.000	2.000
Pre_Symptom_Headache-Thirst	26	0	2.590	1.533	0.333	6.667
Pre_Symptom_Gastric-Cardio	26	0	0.600	0.748	0.000	2.800
Pre_Symptom_Total	26	0	27.538	18.584	2.000	78.000
Post_Symptom_Hangover	26	0	3.769	2.957	0.000	9.000
Post_Symptom_Headache-Thirst	26	0	5.141	2.119	1.333	9.333
Post_Symptom_Gastric-Cardio	26	0	2.223	1.709	0.000	6.200
Post_Symptom_Total	26	0	69.769	37.207	18.000	166.000

A4.3.3. Descriptive statistics – delta scores.

Descriptive Statistics - Difference scores

Descriptive Statistics

	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Symptom_1-item_Difference	26	0	3.615	3.047	-1.000	9.000
Symptom_Headache-thirst_Difference	26	0	2.551	2.496	-2.333	6.667
Symptom_Gastric-cardio_Difference	25	1	1.448	1.374	-0.600	4.800
Symptom_Total_Difference	26	0	42.231	34.597	-3.000	121.000
Diff_BSRI	22	4	22.091	109.336	-246.000	234.000
Diff_ERQ_CR	21	5	0.143	0.402	-0.667	1.000
Diff_ERQ_ES	22	4	0.023	0.400	-0.750	0.750
Diff_Recall_Pos	26	0	-0.192	1.470	-3.000	3.000
Diff_Recall_Neu	26	0	-0.385	2.021	-7.000	3.000
Diff_Recall_Neg	26	0	-0.385	1.444	-5.000	2.000
Diff_Stroop_ACC_Pos	14	12	-0.036	0.113	-0.350	0.100
Diff_Stroop_ACC_Neu	14	12	-0.003	0.081	-0.147	0.105
Diff_Stroop_ACC_Neg	14	12	-0.008	0.061	-0.108	0.105
Diff_Stroop_RT_Pos	14	12	87.239	223.559	-234.500	608.796
Diff_Stroop_RT_Neu	14	12	45.786	198.856	-167.690	584.458
Diff_Stroop_RT_Neg	14	12	19.722	174.408	-284.637	442.272
Diff_Moe_ACC_RC-DC	24	2	-0.022	0.061	-0.217	0.137

Descriptive Statistics

	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Diff_Moe_ACC_RC-DR	24	2	1.709×10^{-5}	0.053	-0.132	0.092
Diff_Moe_ACC_RR-DC	24	2	-0.008	0.052	-0.142	0.079
Diff_Moe_ACC_RR-DR	24	2	-0.012	0.072	-0.250	0.071
Diff_Moe_ACC_RRi-DC	24	2	0.001	0.030	-0.057	0.081
Diff_Moe_ACC_RRi-DR	24	2	-0.022	0.050	-0.158	0.030
Diff_Moe_RT_RC-DC	24	2	-12.060	324.869	-589.625	834.172
Diff_Moe_RT_RC-DR	24	2	-67.354	307.704	-499.825	743.944
Diff_Moe_RT_RR-DC	24	2	-61.187	280.003	-497.658	507.562
Diff_Moe_RT_RR-DR	24	2	-26.368	274.025	-434.329	622.664
Diff_Moe_RT_RRi-DC	24	2	-1.124	230.904	-403.565	549.102
Diff_Moe_RT_RRi-DR	24	2	-57.833	195.304	-349.035	328.209

A4.3.4. Emotional free recall statistics.

A4.3.4.1. Descriptive statistics for emotional free recall.

Descriptive Statistics - Free recall

Descriptive Statistics

	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Pre_Recall_Pos	26	0	0.654	1.093	0.000	3.000
Pre_Recall_Neu	26	0	1.115	1.681	0.000	7.000
Pre_Recall_Neg	26	0	0.962	1.248	0.000	5.000
Post_Recall_Pos	26	0	0.462	0.761	0.000	3.000
Post_Recall_Neu	26	0	0.731	1.151	0.000	4.000
Post_Recall_Neg	26	0	0.577	0.809	0.000	2.000

A4.3.4.2. Repeated measures ANOVA for emotional free recall.

Repeated Measures ANOVA - Free recall

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2	η^2_p
Hungover	None	4.006	1.000	4.006	2.357	0.137	0.029	0.086
Residuals	None	42.494	25.000	1.700				
Emotion	None	3.500	2.000	1.750	3.144	0.052	0.025	0.112
	Greenhouse-Geisser	3.500	1.857	1.885	3.144	0.056	0.025	0.112
Residuals	None	27.833	50.000	0.557				
	Greenhouse-Geisser	27.833	46.420	0.600				
Hungover ✻ Emotion	None	0.321 [a]	2.000 [a]	0.160 [a]	0.130[a]	0.878[a]	0.002	0.005
	Greenhouse-Geisser	0.321	1.403	0.228	0.130	0.804	0.002	0.005
Residuals	None	61.679	50.000	1.234				
	Greenhouse-Geisser	61.679	35.072	1.759				

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated ($p < .05$).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	71.417	25	2.857		

Note. Type III Sum of Squares

Descriptives

Descriptives

Hungover	Emotion	N	Mean	SD	SE	Coefficient of variation
Hangover	Pos	26	0.462	0.761	0.149	1.648
	Neu	26	0.731	1.151	0.226	1.575
	Neg	26	0.577	0.809	0.159	1.402
Sober	Pos	26	0.654	1.093	0.214	1.672
	Neu	26	1.115	1.681	0.330	1.507
	Neg	26	0.962	1.248	0.245	1.298

Assumption Checks

Test of Sphericity

	Mauchly's W	Approx. X^2	df	p-value	Greenhouse-Geisser ε	Huynh-Feldt ε	Lower Bound ε
Emotion	0.923	1.926	2	0.382	0.928	1.000	0.500
Hungover ✻ Emotion	0.574	13.308	2	0.001	0.701	0.730	0.500

Contrast Tables

Custom Contrast - Hungover ✻ Emotion

Comparison	Estimate	SE	df	t	p
1	0.385	0.283	25.000	1.358	0.187
2	-0.615	0.592	25.000	-1.039	0.309
3	-0.423	0.494	25.000	-0.857	0.399

Custom Contrast Coefficients - Hungover ✻ Emotion

Hungover	Emotion	Comparison 1	Comparison 2	Comparison 3
Hangover	Pos	0	0	1
Sober		0	1	0
Hangover	Neu	0	0	-2
Sober		0	-2	0
Hangover	Neg	-1	0	1
Sober		1	1	0

A4.3.4.3. Bayesian repeated measures ANOVA for emotional free recall.

Bayesian Repeated Measures ANOVA - Free recall

Model Comparison

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Null model (incl. subject and random slopes)	0.200	0.461	3.424	1.000	
Hungover	0.200	0.289	1.628	0.627	1.065
Emotion	0.200	0.148	0.696	0.321	1.138
Hungover + Emotion	0.200	0.089	0.393	0.194	1.180
Hungover + Emotion + Hungover ✻ Emotion	0.200	0.012	0.048	0.026	2.025

Note. All models include subject, and random slopes for all repeated measures factors.

Analysis of Effects

Effects	P(incl)	P(excl)	P(incl|data)	P(excl|data)	BF_{incl}
Hungover	0.600	0.400	0.391	0.609	0.427
Emotion	0.600	0.400	0.249	0.751	0.222
Hungover ✻ Emotion	0.200	0.800	0.012	0.988	0.048

Bayesian Paired Samples T-Test - contrasts for free recall

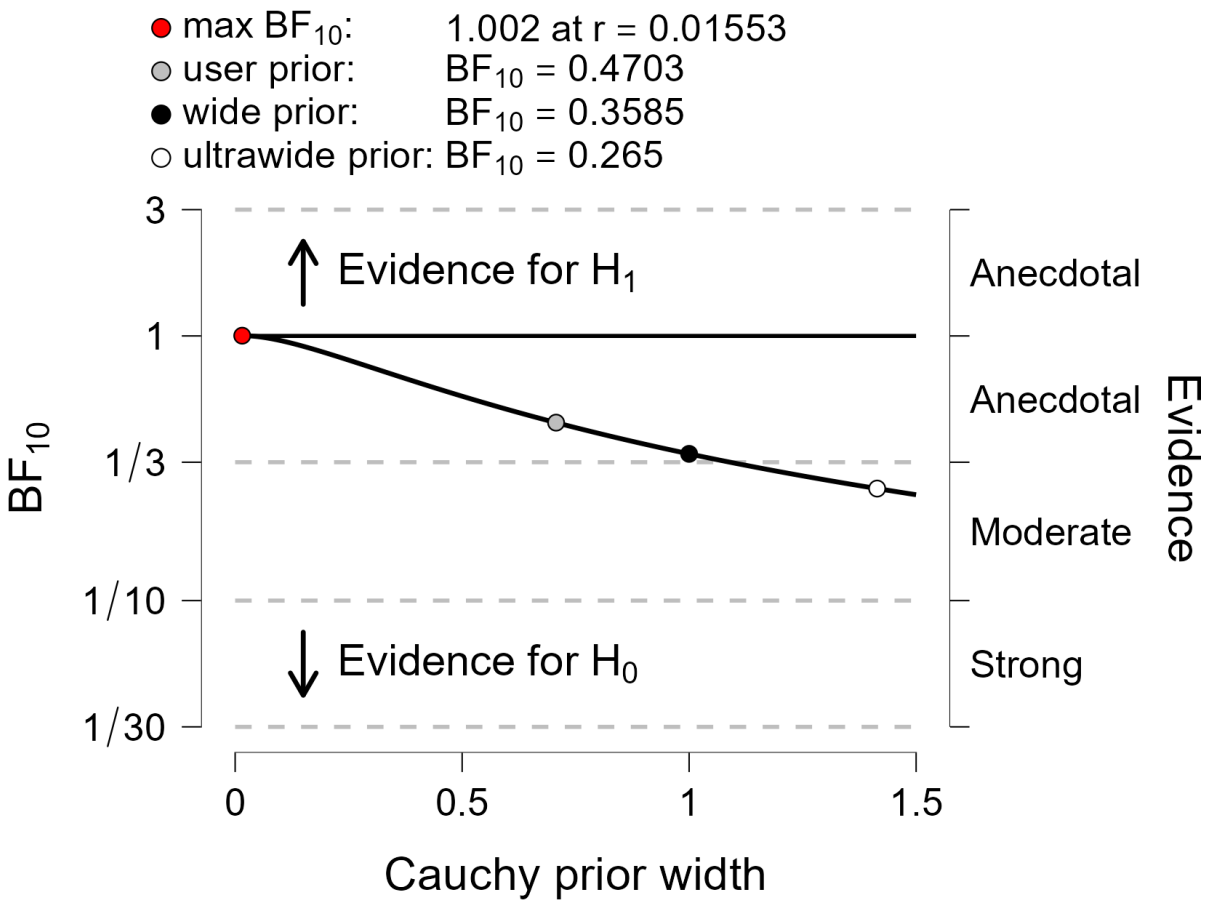
Bayesian Paired Samples T-Test

Measure 1		Measure 2	BF_{10}	error %
Pre_Recall_Neg	-	Post_Recall_Neg	0.470	0.027

Inferential Plots

Pre_Recall_Neg - Post_Recall_Neg

Bayes Factor Robustness Check


max BF10: 1.002 at r = 0.01553
user prior: BF10 = 0.4703
wide prior: BF10 = 0.3585
ultrawide prior: BF10 = 0.265
3
1
1/3
1/10
1/30
BF10
Evidence for H1
Evidence for H0
Anecdotal
Anecdotal
Moderate
Strong
Evidence
0
0.5
1
1.5
Cauchy prior width

A4.3.5. emotional Stroop statistics.

A4.3.5.1. Descriptive statistics for emotional Stroop.

A4.3.5.1.1. Reaction times.

Descriptive Statistics - Stroop RT

Descriptive Statistics

	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Pre_Stroop_RT_Neg	14	12	846.236	124.785	661.205	1041.080
Pre_Stroop_RT_Neu	14	12	804.564	74.739	688.705	909.316
Pre_Stroop_RT_Pos	14	12	807.138	106.681	624.010	983.826
Post_Stroop_RT_Neg	14	12	865.958	192.285	709.340	1446.778
Post_Stroop_RT_Neu	14	12	850.351	229.967	623.850	1470.226
Post_Stroop_RT_Pos	14	12	894.377	277.908	619.550	1592.622

A4.3.5.1.2. Accuracies.

Descriptive Statistics - Stroop Acc

Descriptive Statistics

	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Pre_Stroop_ACC_Neg	14	12	0.952	0.051	0.850	1.000
Pre_Stroop_ACC_Neu	14	12	0.959	0.046	0.895	1.000
Pre_Stroop_ACC_Pos	14	12	0.952	0.043	0.889	1.000
Post_Stroop_ACC_Neg	14	12	0.944	0.060	0.842	1.000
Post_Stroop_ACC_Neu	14	12	0.956	0.063	0.800	1.000
Post_Stroop_ACC_Pos	14	12	0.916	0.110	0.650	1.000

A4.3.5.2. Repeated measures ANOVA for emotional Stroop.

A4.3.5.2.1. Reaction times.

Repeated Measures ANOVA - Stroop RT

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	η^2	η^2_p
Hungover	None	54440.874	1.000	54440.874	1.180	0.297	0.055	0.083
Residuals	None	599893.093	13.000	46145.623				
Emotion	None	12988.552	2.000	6494.276	1.249	0.303	0.013	0.088
	Greenhouse-Geisser	12988.552	1.949	6664.044	1.249	0.303	0.013	0.088
Residuals	None	135167.997	26.000	5198.769				
	Greenhouse-Geisser	135167.997	25.338	5334.671				
Hungover ✻ Emotion	None	16231.234 [a]	2.000 [a]	8115.617 [a]	1.174 [a]	0.325 [a]	0.016	0.083
	Greenhouse-Geisser	16231.234	1.307	12418.260	1.174	0.311	0.016	0.083
Residuals	None	179721.380	26.000	6912.361				
	Greenhouse-Geisser	179721.380	16.992	10577.075				

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated ($p < .05$).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	$1.680 \times 10^{+6}$	13	129261.687		

Note. Type III Sum of Squares

Descriptives

Descriptives

Hungover	Emotion	N	Mean	SD	SE	Coefficient of variation
Sober	Pos	14	807.138	106.681	28.512	0.132
	Neu	14	804.564	74.739	19.975	0.093
	Neg	14	846.236	124.785	33.350	0.147
Hangover	Pos	14	894.377	277.908	74.274	0.311
	Neu	14	850.351	229.967	61.461	0.270
	Neg	14	865.958	192.285	51.390	0.222

Assumption Checks

Test of Sphericity

	Mauchly's W	Approx. X^2	df	p-value	Greenhouse-Geisser ε	Huynh-Feldt ε	Lower Bound ε
Emotion	0.974	0.318	2	0.853	0.975	1.000	0.500
Hungover ✻ Emotion	0.470	9.065	2	0.011	0.654	0.697	0.500

Contrast Tables

Custom Contrast - Hungover ✻ Emotion

Comparison	Estimate	SE	df	t	p
1	-19.722	46.613	13.000	-0.423	0.679
2	44.245	44.990	13.000	0.983	0.343
3	59.634	42.258	13.000	1.411	0.182

Custom Contrast Coefficients - Hungover ✻ Emotion

Hungover	Emotion	Comparison 1	Comparison 2	Comparison 3
Sober	Pos	0	1	0
Hangover		0	0	1
Sober	Neu	0	-2	0
Hangover		0	0	-2
Sober	Neg	1	1	0
Hangover		-1	0	1

Simple Main Effects

Simple Main Effects - Hungover

Level of Emotion	Sum of Squares	df	Mean Square	F	p
Pos	53274.650	1	53274.650	2.132	0.168
Neu	14674.756	1	14674.756	0.742	0.405
Neg	2722.701	1	2722.701	0.179	0.679

Note. Type III Sum of Squares

A4.3.5.2.2. Accuracies.

Repeated Measures ANOVA - Stroop Acc

Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2	η^2_p
Hungover	0.005	1	0.005	0.857	0.372	0.024	0.062
Residuals	0.080	13	0.006				
Emotion	0.008	2	0.004	1.915	0.167	0.035	0.128
Residuals	0.053	26	0.002				
Hungover ✻ Emotion	0.004	2	0.002	0.815	0.454	0.020	0.059
Residuals	0.070	26	0.003				

Note. Type III Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	0.138	13	0.011		

Note. Type III Sum of Squares

Descriptives

Descriptives

Hungover	Emotion	N	Mean	SD	SE	Coefficient of variation
Sober	Pos	14	0.952	0.043	0.011	0.045
	Neu	14	0.959	0.046	0.012	0.048
	Neg	14	0.952	0.051	0.014	0.053
Hangover	Pos	14	0.916	0.110	0.030	0.121
	Neu	14	0.956	0.063	0.017	0.066
	Neg	14	0.944	0.060	0.016	0.063

Assumption Checks

Test of Sphericity

	Mauchly's W	Approx. X^2	df	p-value	Greenhouse-Geisser ε	Huynh-Feldt ε	Lower Bound ε
Emotion	0.802	2.650	2	0.266	0.835	0.943	0.500
Hungover ✻ Emotion	0.996	0.047	2	0.977	0.996	1.000	0.500

Contrast Tables

Custom Contrast - Hungover ✻ Emotion

Comparison	Estimate	SE	df	t	p
1	-0.008	0.016	13.000	-0.489	0.633
2	-0.011	0.015	13.000	-0.743	0.471
3	-0.007	0.018	13.000	-0.391	0.702
4	-0.014	0.034	13.000	-0.413	0.686
5	-0.051	0.026	13.000	-1.993	0.068

Custom Contrast Coefficients - Hungover ✻ Emotion

Hungover	Emotion	Comparison 1	Comparison 2	Comparison 3	Comparison 4	Comparison 5
Sober	Pos	0	0	0	1	0
Hangover		0	0	0	0	1
Sober	Neu	0	0	-1	-2	0
Hangover		0	-1	0	0	-2
Sober	Neg	-1	0	1	1	0
Hangover		1	1	0	0	1

Simple Main Effects

Simple Main Effects - Hungover

Level of Emotion	Sum of Squares	df	Mean Square	F	p
Pos	0.009	1	0.009	1.424	0.254
Neu	8.113×10^{-5}	1	8.113×10^{-5}	0.025	0.878
Neg	4.386×10^{-4}	1	4.386×10^{-4}	0.239	0.633

Note. Type III Sum of Squares

A4.3.5.3. Bayesian repeater measures ANOVA for emotional Stroop.

A4.3.5.3.1. Reaction times.

Bayesian Repeated Measures ANOVA - Stroop RT

Model Comparison

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Null model (incl. subject and random slopes)	0.200	0.449	3.261	1.000	
Hungover	0.200	0.318	1.864	0.708	1.662
Emotion	0.200	0.113	0.507	0.251	0.810
Hungover + Emotion	0.200	0.080	0.347	0.178	1.925
Hungover + Emotion + Hungover ✻ Emotion	0.200	0.041	0.169	0.091	3.292

Note. All models include subject, and random slopes for all repeated measures factors.

Analysis of Effects

Effects	P(incl)	P(excl)	P(incl|data)	P(excl|data)	BF_{incl}
Hungover	0.600	0.400	0.438	0.562	0.520
Emotion	0.600	0.400	0.233	0.767	0.203
Hungover ✻ Emotion	0.200	0.800	0.041	0.959	0.169

Bayesian Paired Samples T-Test - contrasts for emotional Stroop task

Bayesian Paired Samples T-Test

Measure 1		Measure 2	BF_{10}	error %
Pre_Stroop_RT_Neg	-	Post_Stroop_RT_Neg	0.292	0.010

A4.3.5.3.2. Accuracies

Bayesian Repeated Measures ANOVA - Stroop Acc

Model Comparison

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Null model (incl. subject and random slopes)	0.200	0.475	3.621	1.000	
Hungover	0.200	0.234	1.222	0.492	0.882
Emotion	0.200	0.172	0.834	0.363	0.937
Hungover + Emotion	0.200	0.085	0.373	0.179	1.995
Hungover + Emotion + Hungover ✻ Emotion	0.200	0.033	0.137	0.070	4.700

Note. All models include subject, and random slopes for all repeated measures factors.

Analysis of Effects

Effects	P(incl)	P(excl)	P(incl|data)	P(excl|data)	BF_{incl}
Hungover	0.600	0.400	0.352	0.648	0.363
Emotion	0.600	0.400	0.291	0.709	0.274
Hungover ✻ Emotion	0.200	0.800	0.033	0.967	0.137

Bayesian Paired Samples T-Test - contrasts for emotional Stroop task

Bayesian Paired Samples T-Test

Measure 1		Measure 2	BF_{10}	error %
Pre_Stroop_ACC_Neg	-	Post_Stroop_ACC_Neg	0.300	0.010

A4.3.6. Moeller task statistics.

A4.3.6.1. Descriptive statistics for Moeller task.

A4.3.6.1.1. Reaction times.

Descriptive Statistics - Moeller RT

Descriptive Statistics

	Valid	Missing	Mean	Std. Deviation	Shapiro-Wilk	P-value of Shapiro-Wilk	Minimum	Maximum
Pre_Moe_RT_RC-DC	24	2	1319.376	344.854	0.958	0.395	731.136	1989.057
Pre_Moe_RT_RC-DR	24	2	1321.206	351.282	0.973	0.740	742.271	2044.535
Pre_Moe_RT_RR-DC	24	2	1211.505	312.953	0.957	0.375	688.229	1733.455
Pre_Moe_RT_RR-DR	24	2	1179.538	305.125	0.955	0.351	638.177	1967.820
Pre_Moe_RT_RRi-DC	24	2	1035.236	258.947	0.965	0.538	594.168	1501.741
Pre_Moe_RT_RRi-DR	24	2	1037.371	301.312	0.939	0.158	593.277	1865.315
Post_Moe_RT_RC-DC	24	2	1307.315	430.285	0.927	0.083	702.556	2181.153
Post_Moe_RT_RC-DR	24	2	1253.852	389.168	0.905	0.027	705.357	1963.769
Post_Moe_RT_RR-DC	24	2	1150.317	353.155	0.957	0.388	623.910	1996.926
Post_Moe_RT_RR-DR	24	2	1153.169	350.286	0.907	0.030	688.221	1826.420
Post_Moe_RT_RRi-DC	24	2	1034.112	288.263	0.949	0.256	580.856	1559.869
Post_Moe_RT_RRi-DR	24	2	979.538	288.132	0.925	0.077	579.577	1516.280

A4.3.6.1.2. Accuracies.

Descriptive Statistics - Moeller Acc

Descriptive Statistics

	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Pre_Moe_ACC_RC-DC	24	2	0.962	0.050	0.818	1.000
Pre_Moe_ACC_RC-DR	24	2	0.950	0.046	0.838	1.000
Pre_Moe_ACC_RR-DC	24	2	0.973	0.027	0.921	1.000
Pre_Moe_ACC_RR-DR	24	2	0.972	0.029	0.917	1.000
Pre_Moe_ACC_RRi-DC	24	2	0.981	0.025	0.917	1.000
Pre_Moe_ACC_RRi-DR	24	2	0.989	0.019	0.944	1.000
Post_Moe_ACC_RC-DC	24	2	0.939	0.075	0.677	1.000
Post_Moe_ACC_RC-DR	24	2	0.950	0.057	0.763	1.000
Post_Moe_ACC_RR-DC	24	2	0.966	0.054	0.781	1.000
Post_Moe_ACC_RR-DR	24	2	0.960	0.063	0.750	1.000
Post_Moe_ACC_RRi-DC	24	2	0.982	0.025	0.917	1.000
Post_Moe_ACC_RRi-DR	24	2	0.967	0.055	0.813	1.000

A4.3.6.2. repeated measures ANOVA for Moeller task.

A4.3.6.2.1. Reaction times.

Repeated Measures ANOVA - Moeller RT

Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2	η^2_p
Hungover	102086.678	1	102086.678	0.548	0.467	0.010	0.023
Residuals	$4.282\times10^{+6}$	23	186192.205				
Response	$3.743\times10^{+6}$	2	$1.872\times10^{+6}$	101.026	< .001	0.359	0.815
Residuals	852185.548	46	18525.773				
Distractor	35478.222	1	35478.222	5.701	0.026	0.003	0.199
Residuals	143131.921	23	6223.127				
Hungover ✻ Response	2605.283	2	1302.641	0.145	0.865	2.502×10^{-4}	0.006
Residuals	412043.106	46	8957.459				
Hungover ✻ Distractor	11914.777	1	11914.777	2.220	0.150	0.001	0.088
Residuals	123451.929	23	5367.475				
Response ✻ Distractor	2103.528	2	1051.764	0.131	0.877	2.020×10^{-4}	0.006
Residuals	368704.307	46	8015.311				
Hungover ✻ Response ✻ Distractor	32999.450	2	16499.725	2.517	0.092	0.003	0.099
Residuals	301577.083	46	6556.024				

Note. Type III Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	$2.437\times10^{+7}$	23	$1.059\times10^{+6}$		

Note. Type III Sum of Squares

Descriptives

Descriptives

Hungover	Response	Distractor	N	Mean	SD	SE	Coefficient of variation
Sober	RC	DC	24	1319.376	344.854	70.393	0.261
		DR	24	1321.206	351.282	71.705	0.266
	RR	DC	24	1211.505	312.953	63.881	0.258
		DR	24	1179.538	305.125	62.283	0.259
	RRi	DC	24	1035.236	258.947	52.857	0.250
		DR	24	1037.371	301.312	61.505	0.290
Hangover	RC	DC	24	1307.315	430.285	87.832	0.329
		DR	24	1253.852	389.168	79.439	0.310
	RR	DC	24	1150.317	353.155	72.087	0.307
		DR	24	1153.169	350.286	71.502	0.304
	RRi	DC	24	1034.112	288.263	58.841	0.279
		DR	24	979.538	288.132	58.815	0.294

Assumption Checks

Test of Sphericity

	Mauchly's W	Approx. X^2	df	p-value	Greenhouse-Geisser ε	Huynh-Feldt ε	Lower Bound ε
Response	0.923	1.761	2	0.415	0.929	1.000	0.500

Test of Sphericity

	Mauchly's W	Approx. X^2	df	p-value	Greenhouse-Geisser ε	Huynh-Feldt ε	Lower Bound ε
Hungover ✻ Response	0.807	4.715	2	0.095	0.838	0.897	0.500
Response ✻ Distractor	0.950	1.135	2	0.567	0.952	1.000	0.500
Hungover ✻ Response ✻ Distractor	0.827	4.185	2	0.123	0.852	0.914	0.500

Contrast Tables

Simple Contrast - Response

Comparison	Estimate	SE	df	t	p
RR - RC	-126.805	18.695	23	-6.783	< .001
RRi - RC	-278.872	22.166	23	-12.581	< .001

Note. Results are averaged over the levels of: Distractor, Hungover

Simple Contrast - Distractor

Comparison	Estimate	SE	df	t	p
DR - DC	-22.198	9.297	23	-2.388	0.026

Note. Results are averaged over the levels of: Response, Hungover

Custom Contrast - Hungover ✻ Distractor

Comparison	Estimate	SE	df	t	p
1	-9.334	13.497	23.000	-0.692	0.496
2	-35.062	11.823	23.000	-2.966	0.007

Custom Contrast - Hungover ✻ Distractor

Comparison	Estimate	SE	df	t	p

Note. Results are averaged over the levels of: Response

Custom Contrast Coefficients - Hungover ✻ Distractor

Hungover	Distractor	Comparison 1	Comparison 2
Sober	DC	-1	0
Hangover		0	-1
Sober	DR	1	0
Hangover		0	1

Custom Contrast - Hungover ✻ Response ✻ Distractor

Comparison	Estimate	SE	df	t	p
1	-1.830	22.433	23.000	-0.082	0.936
2	53.464	25.235	23.000	2.119	0.045
3	31.967	21.067	23.000	1.517	0.143
4	-2.852	16.837	23.000	-0.169	0.867
5	-2.135	28.524	23.000	-0.075	0.941
6	54.574	26.711	23.000	2.043	0.053

Custom Contrast Coefficients - Hungover ✻ Response ✻ Distractor

Hungover	Response	Distractor	Comparison 1	Comparison 2	Comparison 3	Comparison 4	Comparison 5	Comparison 6
Sober	RC	DC	1	0	0	0	0	0

Custom Contrast Coefficients - Hungover ✻ Response ✻ Distractor

Hungover	Response	Distractor	Comparison 1	Comparison 2	Comparison 3	Comparison 4	Comparison 5	Comparison 6
Hangover			0	1	0	0	0	0
Sober	RR		0	0	1	0	0	0
Hangover			0	0	0	1	0	0
Sober	RRi		0	0	0	0	1	0
Hangover			0	0	0	0	0	1
Sober	RC	DR	-1	0	0	0	0	0
Hangover			0	-1	0	0	0	0
Sober	RR		0	0	-1	0	0	0
Hangover			0	0	0	-1	0	0
Sober	RRi		0	0	0	0	-1	0
Hangover			0	0	0	0	0	-1

Simple Main Effects

Simple Main Effects - Hungover

Level of Response	Level of Distractor	Sum of Squares	df	Mean Square	F	p
RC	DC	1745.421	1	1745.421	0.033	0.857
	DR	54438.790	1	54438.790	1.150	0.295

Simple Main Effects - Hungover

Level of Response	Level of Distractor	Sum of Squares	df	Mean Square	F	p
RR	DC	44926.812	1	44926.812	1.146	0.295
	DR	8343.560	1	8343.560	0.222	0.642
RRi	DC	15.162	1	15.162	5.687×10^{-4}	0.981
	DR	40136.443	1	40136.443	2.104	0.160

Note. Type III Sum of Squares

A4.3.6.2.2. Accuracies.

Repeated Measures ANOVA - Moeller Acc

Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2	η^2_p
Hungover	0.008	1	0.008	2.536	0.125	0.021	0.099
Residuals	0.073	23	0.003				
Response	0.042	2	0.021	11.806	< .001	0.106	0.339
Residuals	0.081	46	0.002				
Distractor	5.093×10^{-4}	1	5.093×10^{-4}	0.723	0.404	0.001	0.030
Residuals	0.016	23	7.045×10^{-4}				
Hungover ✻ Response	1.678×10^{-5}	2	8.390×10^{-6}	0.005	0.995	4.246×10^{-5}	2.353×10^{-4}
Residuals	0.071	46	0.002				
Hungover ✻ Distractor	6.218×10^{-5}	1	6.218×10^{-5}	0.098	0.757	1.573×10^{-4}	0.004
Residuals	0.015	23	6.335×10^{-4}				
Response ✻ Distractor	1.541×10^{-4}	2	7.704×10^{-5}	0.100	0.905	3.899×10^{-4}	0.004
Residuals	0.035	46	7.683×10^{-4}				
Hungover ✻ Response ✻ Distractor	0.006	2	0.003	3.154	0.052	0.016	0.121
Residuals	0.046	46	0.001				

Note. Type III Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	0.274	23	0.012		

Note. Type III Sum of Squares

Descriptives

Descriptives

Hungover	Response	Distractor	N	Mean	SD	SE	Coefficient of variation
Sober	RC	DC	24	0.962	0.050	0.010	0.052
		DR	24	0.950	0.046	0.009	0.048
	RR	DC	24	0.973	0.027	0.005	0.027
		DR	24	0.972	0.029	0.006	0.030
	RRi	DC	24	0.981	0.025	0.005	0.025
		DR	24	0.989	0.019	0.004	0.020
Hangover	RC	DC	24	0.939	0.075	0.015	0.080
		DR	24	0.950	0.057	0.012	0.060
	RR	DC	24	0.966	0.054	0.011	0.056
		DR	24	0.960	0.063	0.013	0.065
	RRi	DC	24	0.982	0.025	0.005	0.026
		DR	24	0.967	0.055	0.011	0.057

Assumption Checks

Test of Sphericity

	Mauchly's W	Approx. X^2	df	p-value	Greenhouse-Geisser ε	Huynh-Feldt ε	Lower Bound ε
Response	0.935	1.473	2	0.479	0.939	1.000	0.500
Hungover ✻ Response	0.939	1.374	2	0.503	0.943	1.000	0.500
Response ✻ Distractor	0.932	1.557	2	0.459	0.936	1.000	0.500
Hungover ✻ Response ✻ Distractor	0.897	2.385	2	0.304	0.907	0.980	0.500

Contrast Tables

Custom Contrast - Hungover ✻ Response ✻ Distractor

Comparison	Estimate	SE	df	t	p
1	0.005	0.010	23.000	0.511	0.614
2	0.011	0.015	23.000	0.708	0.486

Custom Contrast Coefficients - Hungover ✳ Response ✳ Distractor

Hungover	Response	Distractor	Comparison 1	Comparison 2
Sober	RC	DC	1	0
Hangover			0	1
Sober	RR		1	0
Hangover			0	1
Sober	RRi		1	0
Hangover			0	1
Sober	RC	DR	-1	0
Hangover			0	-1
Sober	RR		-1	0
Hangover			0	-1
Sober	RRi		-1	0
Hangover			0	-1

Simple Main Effects

Simple Main Effects - Hungover

Level of Response	Level of Distractor	Sum of Squares	df	Mean Square	F	p
RC	DC	0.006	1	0.006	3.225	0.086
	DR	3.506×10^{-9}	1	3.506×10^{-9}	2.501×10^{-6}	0.999
RR	DC	6.942×10^{-4}	1	6.942×10^{-4}	0.505	0.485
	DR	0.002	1	0.002	0.723	0.404
RRi	DC	1.205×10^{-5}	1	1.205×10^{-5}	0.026	0.873
	DR	0.006	1	0.006	4.713	0.041

Note. Type III Sum of Squares

A4.3.6.3. Bayesian repeated measures ANOVA for Moeller task.

A4.3.6.3.1. Reaction times.

Bayesian Repeated Measures ANOVA - Moeller RT

Model Comparison

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Response	0.053	0.491	17.376	1.000	
Response + Distractor	0.053	0.399	11.963	0.813	2.847
Response + Distractor + Response ✻ Distractor	0.053	0.046	0.877	0.095	3.184
Hungover + Response + Distractor	0.053	0.044	0.824	0.089	95.696
Hungover + Response + Distractor + Response ✻ Distractor	0.053	0.018	0.327	0.036	100.023
Hungover + Response + Hungover ✻ Response	0.053	6.053×10^{-4}	0.011	0.001	91.527
Hungover + Response + Distractor + Hungover ✻ Distractor	0.053	4.949×10^{-4}	0.009	0.001	89.157
Hungover + Response + Distractor + Hungover ✻ Response + Response ✻ Distractor	0.053	1.550×10^{-4}	0.003	3.156×10^{-4}	99.679
Hungover + Response	0.053	1.094×10^{-4}	0.002	2.227×10^{-4}	90.481
Hungover + Response + Distractor +	0.053	7.138×10^{-5}	0.001	1.453×10^{-4}	76.891

Model Comparison

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Hungover ✻ Response + Hungover ✻ Distractor					

Note. All models include subject, and random slopes for all repeated measures factors.

Note. Showing the best 10 out of 19 models.

Analysis of Effects

Effects	P(incl)	P(excl)	P(incl|data)	P(excl|data)	BF_{incl}
Hungover	0.737	0.263	0.063	0.937	0.024
Response	0.737	0.263	1.000	1.110×10^{-16}	$3.217\times10^{+15}$
Distractor	0.737	0.263	0.508	0.492	0.369
Hungover ✻ Response	0.316	0.684	9.122×10^{-4}	0.999	0.002
Hungover ✻ Distractor	0.316	0.684	6.081×10^{-4}	0.999	0.001
Response ✻ Distractor	0.316	0.684	0.064	0.936	0.149
Hungover ✻ Response ✻ Distractor	0.053	0.947	3.523×10^{-6}	1.000	6.342×10^{-5}

Bayesian Paired Samples T-Test - Contrasts for Moeller task

Bayesian Paired Samples T-Test

Measure 1		Measure 2	BF_{10}	error %
Pre_Moe_RT_DC	-	Pre_Moe_RT_DR	0.267	0.025
Post_Moe_RT_DC	-	Post_Moe_RT_DR	6.600	1.297×10^{-7}
Post_Moe_RT_RC-DC	-	Post_Moe_RT_RC-DR	1.410	0.022
Post_Moe_RT_RR-DC	-	Post_Moe_RT_RR-DR	0.217	0.024
Post_Moe_RT_RRi-DC	-	Post_Moe_RT_RRi-DR	1.249	0.022

A4.3.6.3.2. Accuracies.

Bayesian Repeated Measures ANOVA - Moeller Acc

Model Comparison

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Response	0.053	0.431	13.638	1.000	
Hungover + Response	0.053	0.320	8.480	0.743	3.066
Response + Distractor	0.053	0.088	1.737	0.204	2.981
Hungover + Response + Distractor	0.053	0.068	1.317	0.158	4.208
Hungover + Response + Hungover ✻ Response	0.053	0.043	0.817	0.101	6.077
Hungover + Response + Distractor + Hungover ✻ Distractor	0.053	0.015	0.278	0.035	3.507
Hungover + Response + Distractor + Hungover ✻ Response	0.053	0.010	0.180	0.023	7.704
Response + Distractor + Response ✻ Distractor	0.053	0.009	0.156	0.020	2.783
Hungover + Response + Distractor + Response ✻ Distractor	0.053	0.007	0.119	0.015	3.228
Hungover + Response + Distractor + Hungover ✻ Response + Hungover ✻ Distractor	0.053	0.002	0.037	0.005	4.209

Note. All models include subject, and random slopes for all repeated measures factors.

Note. Showing the best 10 out of 19 models.

Analysis of Effects

Effects	P(incl)	P(excl)	P(incl|data)	P(excl|data)	BF_{incl}
Hungover	0.737	0.263	0.471	0.529	0.318
Response	0.737	0.263	0.997	0.003	126.313
Distractor	0.737	0.263	0.203	0.797	0.091
Hungover ✻ Response	0.316	0.684	0.058	0.942	0.133
Hungover ✻ Distractor	0.316	0.684	0.020	0.980	0.045
Response ✻ Distractor	0.316	0.684	0.019	0.981	0.042
Hungover ✻ Response ✻ Distractor	0.053	0.947	0.001	0.999	0.026

Bayesian Paired Samples T-Test - Contrasts for Moeller task

Bayesian Paired Samples T-Test

Measure 1		Measure 2	BF_{10}	error %
Pre_Moe_ACC_DC	-	Pre_Moe_ACC_DR	0.242	0.025
Post_Moe_ACC_DC	-	Post_Moe_ACC_DR	0.269	0.025

A4.3.7. Hangover severity comparisons.

A4.3.7.1. 1-item hangover severity.

A4.3.7.1.1. Repeated measures t-test.

Paired Samples T-Test - 1-item hangover

Paired Samples T-Test

Measure 1		Measure 2	t	df	p	Cohen's d	SE Cohen's d
Post_Symptom_Hangover	-	Pre_Symptom_Hangover	6.050	25	< .001	1.186	0.383

Note. For all tests, the alternative hypothesis specifies that Post_Symptom_Hangover is greater than Pre_Symptom_Hangover.

Note. Student's t-test.

Assumption Checks

Test of Normality (Shapiro-Wilk)

			W	p
Post_Symptom_Hangover	-	Pre_Symptom_Hangover	0.937	0.113

Note. Significant results suggest a deviation from normality.

A4.3.7.1.2. Bayesian repeated measures t-test.

Bayesian Paired Samples T-Test - 1-item hangover

Bayesian Paired Samples T-Test

Measure 1		Measure 2	BF_{+0}	error %
Post_Symptom_Hangover	-	Pre_Symptom_Hangover	15072.762	$\sim 9.727\times10^{-8}$

Note. For all tests, the alternative hypothesis specifies that Post_Symptom_Hangover is greater than Pre_Symptom_Hangover.

A4.3.7.2. Total hangover severity.

A4.3.7.2.1. Repeated measures t-test.

Paired Samples T-Test - Total Hangover

Paired Samples T-Test

Measure 1		Measure 2	t	df	p	Cohen's d	SE Cohen's d
Post_Symptom_Total	-	Pre_Symptom_Total	6.224	25	< .001	1.221	0.287

Note. For all tests, the alternative hypothesis specifies that Post_Symptom_Total is greater than Pre_Symptom_Total.

Note. Student's t-test.

Assumption Checks

Test of Normality (Shapiro-Wilk)

			W	p
Post_Symptom_Total	-	Pre_Symptom_Total	0.928	0.068

Note. Significant results suggest a deviation from normality.

A4.3.7.2.2. Bayesian repeated measures t-test.

Bayesian Paired Samples T-Test - Total Hangover

Bayesian Paired Samples T-Test

Measure 1		Measure 2	BF_{+0}	error %
Post_Symptom_Total	-	Pre_Symptom_Total	22538.864	~ 2.574×10^{-7}

Note. For all tests, the alternative hypothesis specifies that Post_Symptom_Total is greater than Pre_Symptom_Total.

A4.3.7.3. Headache and thirst symptom cluster severity.

A4.3.7.3.1. Repeated measures t-test.

Paired Samples T-Test - headache & thirst

Paired Samples T-Test

Measure 1		Measure 2	t	df	p	Cohen's d	SE Cohen's d
Post_Symptom_Headache-Thirst	-	Pre_Symptom_Headache-Thirst	5.212	25	< .001	1.022	0.326

Note. For all tests, the alternative hypothesis specifies that Post_Symptom_Headache-Thirst is greater than Pre_Symptom_Headache-Thirst.

Note. Student's t-test.

Assumption Checks

Test of Normality (Shapiro-Wilk)

			W	p
Post_Symptom_Headache-Thirst	-	Pre_Symptom_Headache-Thirst	0.971	0.639

Note. Significant results suggest a deviation from normality.

A4.3.7.3.2. Bayesian repeated measures t-test.

Bayesian Paired Samples T-Test - headache & thirst

Bayesian Paired Samples T-Test

Measure 1		Measure 2	BF_{+0}	error %
Post_Symptom_Headache-Thirst	-	Pre_Symptom_Headache-Thirst	2136.710	~ 4.175×10^{-6}

Note. For all tests, the alternative hypothesis specifies that Post_Symptom_Headache-Thirst is greater than Pre_Symptom_Headache-Thirst.

A4.3.7.4. Gastric and cardiovascular symptom cluster severity.

A4.3.7.4.1. Repeated measures t-test.

Paired Samples T-Test - gastric & cardio

Paired Samples T-Test

Measure 1		Measure 2	W	z	df	p	Rank-Biserial Correlation	SE Rank-Biserial Correlation
Post_Symptom_Gastric-Cardio	-	Pre_Symptom_Gastric-Cardio	270.000	4.015		< .001	0.957	0.234

Note. For all tests, the alternative hypothesis specifies that Post_Symptom_Gastric-Cardio is greater than Pre_Symptom_Gastric-Cardio.

Note. Wilcoxon signed-rank test.

Assumption Checks

Test of Normality (Shapiro-Wilk)

			W	p
Post_Symptom_Gastric-Cardio	-	Pre_Symptom_Gastric-Cardio	0.906	0.021

Note. Significant results suggest a deviation from normality.

A4.3.7.4.2. Bayesian repeated measures t-test.

Bayesian Paired Samples T-Test - gastric & cardio

Bayesian Wilcoxon Signed-Rank Test

Measure 1		Measure 2	BF_{+0}	W	Rhat
Post_Symptom_Gastric-Cardio	-	Pre_Symptom_Gastric-Cardio	26440.842	270.000	1.259

Note. For all tests, the alternative hypothesis specifies that Post_Symptom_Gastric-Cardio is greater than Pre_Symptom_Gastric-Cardio.

Note. Result based on data augmentation algorithm with 5 chains of 1000 iterations.

A4.3.8. Delta score correlations.

A4.3.8.1. Frequentist delta score correlations.

Spearman's Correlations

			Spearman's rho		p
Symptom_1-item_Difference	-	Symptom_Headache-thirst_Difference	0.609	***	< .001
Symptom_1-item_Difference	-	Symptom_Gastric-cardio_Difference	0.599	**	0.002
Symptom_1-item_Difference	-	Symptom_Total_Difference	0.789	***	< .001
Symptom_1-item_Difference	-	Diff_BSRI	0.156		0.489
Symptom_1-item_Difference	-	Diff_ERQ_CR	0.062		0.788
Symptom_1-item_Difference	-	Diff_ERQ_ES	-0.094		0.678
Symptom_1-item_Difference	-	Diff_Recall_Pos	-0.153		0.457
Symptom_1-item_Difference	-	Diff_Recall_Neu	-0.112		0.587
Symptom_1-item_Difference	-	Diff_Recall_Neg	-0.117		0.569
Symptom_1-item_Difference	-	Diff_Stroop_ACC_Pos	0.375		0.186
Symptom_1-item_Difference	-	Diff_Stroop_ACC_Neu	-0.118		0.688
Symptom_1-item_Difference	-	Diff_Stroop_ACC_Neg	0.545	*	0.044
Symptom_1-item_Difference	-	Diff_Stroop_RT_Pos	0.404		0.152
Symptom_1-item_Difference	-	Diff_Stroop_RT_Neu	0.420		0.135
Symptom_1-item_Difference	-	Diff_Stroop_RT_Neg	0.071		0.809
Symptom_1-item_Difference	-	Diff_Moe_ACC_RC-DC	-0.029		0.894
Symptom_1-item_Difference	-	Diff_Moe_ACC_RC-DR	-0.093		0.667
Symptom_1-item_Difference	-	Diff_Moe_ACC_RR-DC	0.248		0.242
Symptom_1-item_Difference	-	Diff_Moe_ACC_RR-DR	-0.035		0.872
Symptom_1-item_Difference	-	Diff_Moe_ACC_RRi-DC	0.085		0.693
Symptom_1-item_Difference	-	Diff_Moe_ACC_RRi-DR	0.161		0.452
Symptom_1-item_Difference	-	Diff_Moe_RT_RC-DC	0.294		0.163
Symptom_1-item_Difference	-	Diff_Moe_RT_RC-DR	0.113		0.601
Symptom_1-item_Difference	-	Diff_Moe_RT_RR-DC	0.172		0.423

Spearman's Correlations

			Spearman's rho		p
Symptom_1-item_Difference	-	Diff_Moe_RT_RR-DR	0.184		0.390
Symptom_1-item_Difference	-	Diff_Moe_RT_RRi-DC	0.257		0.225
Symptom_1-item_Difference	-	Diff_Moe_RT_RRi-DR	0.285		0.178
Symptom_Headache-thirst_Difference	-	Symptom_Gastric-cardio_Difference	0.247		0.234
Symptom_Headache-thirst_Difference	-	Symptom_Total_Difference	0.785	***	< .001
Symptom_Headache-thirst_Difference	-	Diff_BSRI	0.130		0.564
Symptom_Headache-thirst_Difference	-	Diff_ERQ_CR	-0.190		0.408
Symptom_Headache-thirst_Difference	-	Diff_ERQ_ES	-0.078		0.730
Symptom_Headache-thirst_Difference	-	Diff_Recall_Pos	-0.305		0.130
Symptom_Headache-thirst_Difference	-	Diff_Recall_Neu	0.018		0.929
Symptom_Headache-thirst_Difference	-	Diff_Recall_Neg	-0.140		0.495
Symptom_Headache-thirst_Difference	-	Diff_Stroop_ACC_Pos	0.163		0.577
Symptom_Headache-thirst_Difference	-	Diff_Stroop_ACC_Neu	-0.232		0.424
Symptom_Headache-thirst_Difference	-	Diff_Stroop_ACC_Neg	0.637	*	0.014
Symptom_Headache-thirst_Difference	-	Diff_Stroop_RT_Pos	0.309		0.283
Symptom_Headache-thirst_Difference	-	Diff_Stroop_RT_Neu	0.322		0.262
Symptom_Headache-thirst_Difference	-	Diff_Stroop_RT_Neg	-0.020		0.946
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RC-DC	0.273		0.196

Spearman's Correlations

			Spearman's rho		p
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RC-DR	-0.003		0.990
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RR-DC	0.195		0.362
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RR-DR	0.118		0.584
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RRi-DC	-0.060		0.780
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RRi-DR	0.176		0.412
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RC-DC	0.229		0.282
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RC-DR	0.192		0.369
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RR-DC	0.155		0.469
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RR-DR	0.289		0.171
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RRi-DC	0.281		0.184
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RRi-DR	0.378		0.068
Symptom_Gastric-cardio_Difference	-	Symptom_Total_Difference	0.603	**	0.001
Symptom_Gastric-cardio_Difference	-	Diff_BSRI	0.071		0.759
Symptom_Gastric-cardio_Difference	-	Diff_ERQ_CR	0.166		0.472
Symptom_Gastric-cardio_Difference	-	Diff_ERQ_ES	-0.264		0.235
Symptom_Gastric-cardio_Difference	-	Diff_Recall_Pos	0.008		0.970
Symptom_Gastric-cardio_Difference	-	Diff_Recall_Neu	0.083		0.692

Spearman's Correlations

			Spearman's rho		p
Symptom_Gastric-cardio_Difference	-	Diff_Recall_Neg	0.113		0.589
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_ACC_Pos	0.056		0.857
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_ACC_Neu	0.045		0.884
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_ACC_Neg	0.363		0.222
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_RT_Pos	0.461		0.113
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_RT_Neu	0.343		0.252
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_RT_Neg	-0.199		0.515
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RC-DC	-0.420	*	0.046
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RC-DR	-0.201		0.358
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RR-DC	0.088		0.690
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RR-DR	-0.176		0.421
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RRi-DC	0.095		0.666
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RRi-DR	0.031		0.888
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RC-DC	0.249		0.253
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RC-DR	0.200		0.361
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RR-DC	0.262		0.227
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RR-DR	0.227		0.298

Spearman's Correlations

			Spearman's rho		p
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RRi-DC	0.334		0.119
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RRi-DR	0.185		0.398
Symptom_Total_Difference	-	Diff_BSRI	0.383		0.078
Symptom_Total_Difference	-	Diff_ERQ_CR	-0.103		0.658
Symptom_Total_Difference	-	Diff_ERQ_ES	-0.097		0.667
Symptom_Total_Difference	-	Diff_Recall_Pos	-0.254		0.210
Symptom_Total_Difference	-	Diff_Recall_Neu	0.128		0.535
Symptom_Total_Difference	-	Diff_Recall_Neg	-0.086		0.678
Symptom_Total_Difference	-	Diff_Stroop_ACC_Pos	0.280		0.332
Symptom_Total_Difference	-	Diff_Stroop_ACC_Neu	0.062		0.832
Symptom_Total_Difference	-	Diff_Stroop_ACC_Neg	0.520		0.057
Symptom_Total_Difference	-	Diff_Stroop_RT_Pos	0.359		0.208
Symptom_Total_Difference	-	Diff_Stroop_RT_Neu	0.275		0.341
Symptom_Total_Difference	-	Diff_Stroop_RT_Neg	0.277		0.337
Symptom_Total_Difference	-	Diff_Moe_ACC_RC-DC	-0.021		0.923
Symptom_Total_Difference	-	Diff_Moe_ACC_RC-DR	-0.276		0.192
Symptom_Total_Difference	-	Diff_Moe_ACC_RR-DC	0.034		0.874
Symptom_Total_Difference	-	Diff_Moe_ACC_RR-DR	0.225		0.290
Symptom_Total_Difference	-	Diff_Moe_ACC_RRi-DC	-0.110		0.608
Symptom_Total_Difference	-	Diff_Moe_ACC_RRi-DR	0.046		0.832
Symptom_Total_Difference	-	Diff_Moe_RT_RC-DC	0.344		0.100
Symptom_Total_Difference	-	Diff_Moe_RT_RC-DR	0.335		0.110
Symptom_Total_Difference	-	Diff_Moe_RT_RR-DC	0.337		0.107
Symptom_Total_Difference	-	Diff_Moe_RT_RR-DR	0.377		0.069
Symptom_Total_Difference	-	Diff_Moe_RT_RRi-DC	0.440	*	0.031
Symptom_Total_Difference	-	Diff_Moe_RT_RRi-DR	0.551	**	0.005

Spearman's Correlations

			Spearman's rho	p
Diff_BSRI	-	Diff_ERQ_CR	-0.009	0.972
Diff_BSRI	-	Diff_ERQ_ES	-0.129	0.611
Diff_BSRI	-	Diff_Recall_Pos	-0.147	0.513
Diff_BSRI	-	Diff_Recall_Neu	0.248	0.265
Diff_BSRI	-	Diff_Recall_Neg	-0.105	0.643
Diff_BSRI	-	Diff_Stroop_ACC_Pos	0.446	0.146
Diff_BSRI	-	Diff_Stroop_ACC_Neu	0.418	0.176
Diff_BSRI	-	Diff_Stroop_ACC_Neg	-0.282	0.374
Diff_BSRI	-	Diff_Stroop_RT_Pos	-0.039	0.905
Diff_BSRI	-	Diff_Stroop_RT_Neu	0.004	0.991
Diff_BSRI	-	Diff_Stroop_RT_Neg	0.329	0.296
Diff_BSRI	-	Diff_Moe_ACC_RC-DC	-0.291	0.200
Diff_BSRI	-	Diff_Moe_ACC_RC-DR	-0.303	0.181
Diff_BSRI	-	Diff_Moe_ACC_RR-DC	0.008	0.973
Diff_BSRI	-	Diff_Moe_ACC_RR-DR	0.402	0.071
Diff_BSRI	-	Diff_Moe_ACC_RRi-DC	-0.421	0.057
Diff_BSRI	-	Diff_Moe_ACC_RRi-DR	-0.320	0.157
Diff_BSRI	-	Diff_Moe_RT_RC-DC	0.123	0.594
Diff_BSRI	-	Diff_Moe_RT_RC-DR	0.277	0.223
Diff_BSRI	-	Diff_Moe_RT_RR-DC	0.319	0.159
Diff_BSRI	-	Diff_Moe_RT_RR-DR	0.194	0.399
Diff_BSRI	-	Diff_Moe_RT_RRi-DC	0.386	0.084
Diff_BSRI	-	Diff_Moe_RT_RRi-DR	0.432	0.050
Diff_ERQ_CR	-	Diff_ERQ_ES	0.019	0.939
Diff_ERQ_CR	-	Diff_Recall_Pos	0.098	0.671
Diff_ERQ_CR	-	Diff_Recall_Neu	-0.221	0.336
Diff_ERQ_CR	-	Diff_Recall_Neg	-0.111	0.631

Spearman's Correlations

			Spearman's rho		p
Diff_ERQ_CR	-	Diff_Stroop_ACC_Pos	0.814	**	0.002
Diff_ERQ_CR	-	Diff_Stroop_ACC_Neu	0.385		0.243
Diff_ERQ_CR	-	Diff_Stroop_ACC_Neg	0.298		0.374
Diff_ERQ_CR	-	Diff_Stroop_RT_Pos	-0.032		0.924
Diff_ERQ_CR	-	Diff_Stroop_RT_Neu	0.214		0.528
Diff_ERQ_CR	-	Diff_Stroop_RT_Neg	-0.395		0.230
Diff_ERQ_CR	-	Diff_Moe_ACC_RC-DC	-0.181		0.459
Diff_ERQ_CR	-	Diff_Moe_ACC_RC-DR	-0.278		0.249
Diff_ERQ_CR	-	Diff_Moe_ACC_RR-DC	0.218		0.369
Diff_ERQ_CR	-	Diff_Moe_ACC_RR-DR	-0.062		0.802
Diff_ERQ_CR	-	Diff_Moe_ACC_RRi-DC	0.133		0.586
Diff_ERQ_CR	-	Diff_Moe_ACC_RRi-DR	0.393		0.096
Diff_ERQ_CR	-	Diff_Moe_RT_RC-DC	0.091		0.712
Diff_ERQ_CR	-	Diff_Moe_RT_RC-DR	0.134		0.584
Diff_ERQ_CR	-	Diff_Moe_RT_RR-DC	0.164		0.502
Diff_ERQ_CR	-	Diff_Moe_RT_RR-DR	0.225		0.353
Diff_ERQ_CR	-	Diff_Moe_RT_RRi-DC	0.247		0.308
Diff_ERQ_CR	-	Diff_Moe_RT_RRi-DR	-0.223		0.359
Diff_ERQ_ES	-	Diff_Recall_Pos	-0.042		0.854
Diff_ERQ_ES	-	Diff_Recall_Neu	0.451	*	0.035
Diff_ERQ_ES	-	Diff_Recall_Neg	0.282		0.203
Diff_ERQ_ES	-	Diff_Stroop_ACC_Pos	0.077		0.812
Diff_ERQ_ES	-	Diff_Stroop_ACC_Neu	-0.192		0.551
Diff_ERQ_ES	-	Diff_Stroop_ACC_Neg	-0.273		0.391
Diff_ERQ_ES	-	Diff_Stroop_RT_Pos	-0.248		0.437
Diff_ERQ_ES	-	Diff_Stroop_RT_Neu	-0.507		0.092
Diff_ERQ_ES	-	Diff_Stroop_RT_Neg	0.014		0.965

Spearman's Correlations

			Spearman's rho		p
Diff_ERQ_ES	-	Diff_Moe_ACC_RC-DC	-0.055		0.817
Diff_ERQ_ES	-	Diff_Moe_ACC_RC-DR	0.210		0.373
Diff_ERQ_ES	-	Diff_Moe_ACC_RR-DC	0.134		0.572
Diff_ERQ_ES	-	Diff_Moe_ACC_RR-DR	-0.010		0.966
Diff_ERQ_ES	-	Diff_Moe_ACC_RRi-DC	-0.148		0.535
Diff_ERQ_ES	-	Diff_Moe_ACC_RRi-DR	0.336		0.148
Diff_ERQ_ES	-	Diff_Moe_RT_RC-DC	-0.723	***	< .001
Diff_ERQ_ES	-	Diff_Moe_RT_RC-DR	-0.486	*	0.030
Diff_ERQ_ES	-	Diff_Moe_RT_RR-DC	-0.592	**	0.006
Diff_ERQ_ES	-	Diff_Moe_RT_RR-DR	-0.617	**	0.004
Diff_ERQ_ES	-	Diff_Moe_RT_RRi-DC	-0.568	**	0.009
Diff_ERQ_ES	-	Diff_Moe_RT_RRi-DR	-0.305		0.191
Diff_Recall_Pos	-	Diff_Recall_Neu	-0.094		0.649
Diff_Recall_Pos	-	Diff_Recall_Neg	0.414	*	0.036
Diff_Recall_Pos	-	Diff_Stroop_ACC_Pos	-0.027		0.926
Diff_Recall_Pos	-	Diff_Stroop_ACC_Neu	0.246		0.396
Diff_Recall_Pos	-	Diff_Stroop_ACC_Neg	-0.403		0.153
Diff_Recall_Pos	-	Diff_Stroop_RT_Pos	-0.250		0.388
Diff_Recall_Pos	-	Diff_Stroop_RT_Neu	0.009		0.974
Diff_Recall_Pos	-	Diff_Stroop_RT_Neg	-0.113		0.700
Diff_Recall_Pos	-	Diff_Moe_ACC_RC-DC	0.106		0.623
Diff_Recall_Pos	-	Diff_Moe_ACC_RC-DR	0.308		0.143
Diff_Recall_Pos	-	Diff_Moe_ACC_RR-DC	0.269		0.203
Diff_Recall_Pos	-	Diff_Moe_ACC_RR-DR	-0.006		0.978
Diff_Recall_Pos	-	Diff_Moe_ACC_RRi-DC	0.138		0.521
Diff_Recall_Pos	-	Diff_Moe_ACC_RRi-DR	0.046		0.833
Diff_Recall_Pos	-	Diff_Moe_RT_RC-DC	-0.061		0.776

Spearman's Correlations

			Spearman's rho		p
Diff_Recall_Pos	-	Diff_Moe_RT_RC-DR	-0.089		0.680
Diff_Recall_Pos	-	Diff_Moe_RT_RR-DC	-0.189		0.375
Diff_Recall_Pos	-	Diff_Moe_RT_RR-DR	-0.149		0.487
Diff_Recall_Pos	-	Diff_Moe_RT_RRi-DC	-0.162		0.451
Diff_Recall_Pos	-	Diff_Moe_RT_RRi-DR	-0.388		0.061
Diff_Recall_Neu	-	Diff_Recall_Neg	0.440	*	0.025
Diff_Recall_Neu	-	Diff_Stroop_ACC_Pos	-0.370		0.193
Diff_Recall_Neu	-	Diff_Stroop_ACC_Neu	-0.482		0.081
Diff_Recall_Neu	-	Diff_Stroop_ACC_Neg	-0.211		0.470
Diff_Recall_Neu	-	Diff_Stroop_RT_Pos	-0.241		0.406
Diff_Recall_Neu	-	Diff_Stroop_RT_Neu	-0.437		0.118
Diff_Recall_Neu	-	Diff_Stroop_RT_Neg	0.288		0.317
Diff_Recall_Neu	-	Diff_Moe_ACC_RC-DC	0.052		0.810
Diff_Recall_Neu	-	Diff_Moe_ACC_RC-DR	0.006		0.978
Diff_Recall_Neu	-	Diff_Moe_ACC_RR-DC	-0.143		0.507
Diff_Recall_Neu	-	Diff_Moe_ACC_RR-DR	0.105		0.625
Diff_Recall_Neu	-	Diff_Moe_ACC_RRi-DC	0.070		0.746
Diff_Recall_Neu	-	Diff_Moe_ACC_RRi-DR	-0.194		0.365
Diff_Recall_Neu	-	Diff_Moe_RT_RC-DC	-0.517	**	0.010
Diff_Recall_Neu	-	Diff_Moe_RT_RC-DR	-0.326		0.120
Diff_Recall_Neu	-	Diff_Moe_RT_RR-DC	-0.255		0.230
Diff_Recall_Neu	-	Diff_Moe_RT_RR-DR	-0.359		0.085
Diff_Recall_Neu	-	Diff_Moe_RT_RRi-DC	-0.399		0.053
Diff_Recall_Neu	-	Diff_Moe_RT_RRi-DR	0.023		0.914
Diff_Recall_Neg	-	Diff_Stroop_ACC_Pos	-0.269		0.353
Diff_Recall_Neg	-	Diff_Stroop_ACC_Neu	-0.338		0.237
Diff_Recall_Neg	-	Diff_Stroop_ACC_Neg	-0.249		0.391

Spearman's Correlations

			Spearman's rho		p
Diff_Recall_Neg	-	Diff_Stroop_RT_Pos	-0.591	*	0.026
Diff_Recall_Neg	-	Diff_Stroop_RT_Neu	-0.342		0.232
Diff_Recall_Neg	-	Diff_Stroop_RT_Neg	-0.229		0.432
Diff_Recall_Neg	-	Diff_Moe_ACC_RC-DC	-0.075		0.727
Diff_Recall_Neg	-	Diff_Moe_ACC_RC-DR	0.106		0.621
Diff_Recall_Neg	-	Diff_Moe_ACC_RR-DC	0.309		0.142
Diff_Recall_Neg	-	Diff_Moe_ACC_RR-DR	-0.236		0.267
Diff_Recall_Neg	-	Diff_Moe_ACC_RRi-DC	0.275		0.193
Diff_Recall_Neg	-	Diff_Moe_ACC_RRi-DR	0.149		0.486
Diff_Recall_Neg	-	Diff_Moe_RT_RC-DC	-0.638	***	< .001
Diff_Recall_Neg	-	Diff_Moe_RT_RC-DR	-0.514	*	0.010
Diff_Recall_Neg	-	Diff_Moe_RT_RR-DC	-0.676	***	< .001
Diff_Recall_Neg	-	Diff_Moe_RT_RR-DR	-0.544	**	0.006
Diff_Recall_Neg	-	Diff_Moe_RT_RRi-DC	-0.594	**	0.002
Diff_Recall_Neg	-	Diff_Moe_RT_RRi-DR	-0.597	**	0.002
Diff_Stroop_ACC_Pos	-	Diff_Stroop_ACC_Neu	0.385		0.174
Diff_Stroop_ACC_Pos	-	Diff_Stroop_ACC_Neg	0.361		0.204
Diff_Stroop_ACC_Pos	-	Diff_Stroop_RT_Pos	0.230		0.429
Diff_Stroop_ACC_Pos	-	Diff_Stroop_RT_Neu	0.228		0.433
Diff_Stroop_ACC_Pos	-	Diff_Stroop_RT_Neg	0.071		0.810
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RC-DC	-0.104		0.724
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RC-DR	-0.317		0.270
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RR-DC	0.362		0.203
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RR-DR	0.391		0.167
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RRi-DC	-0.438		0.117
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RRi-DR	0.451		0.106
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RC-DC	0.088		0.764

Spearman's Correlations

			Spearman's rho		p
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RC-DR	0.091		0.758
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RR-DC	0.177		0.545
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RR-DR	0.104		0.724
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RRi-DC	0.259		0.372
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RRi-DR	0.013		0.964
Diff_Stroop_ACC_Neu	-	Diff_Stroop_ACC_Neg	0.000		1.000
Diff_Stroop_ACC_Neu	-	Diff_Stroop_RT_Pos	0.038		0.898
Diff_Stroop_ACC_Neu	-	Diff_Stroop_RT_Neu	-0.098		0.739
Diff_Stroop_ACC_Neu	-	Diff_Stroop_RT_Neg	-0.042		0.886
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RC-DC	-0.113		0.699
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RC-DR	-0.217		0.456
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RR-DC	-0.049		0.867
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RR-DR	0.378		0.183
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RRi-DC	-0.526		0.053
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RRi-DR	-0.076		0.795
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RC-DC	0.630	*	0.016
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RC-DR	0.687	**	0.007
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RR-DC	0.627	*	0.016
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RR-DR	0.621	*	0.018
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RRi-DC	0.656	*	0.011
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RRi-DR	0.425		0.130
Diff_Stroop_ACC_Neg	-	Diff_Stroop_RT_Pos	0.495		0.072
Diff_Stroop_ACC_Neg	-	Diff_Stroop_RT_Neu	0.300		0.297
Diff_Stroop_ACC_Neg	-	Diff_Stroop_RT_Neg	-0.210		0.471
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RC-DC	0.237		0.414
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RC-DR	0.032		0.914
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RR-DC	0.157		0.593

Spearman's Correlations

			Spearman's rho		p
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RR-DR	0.029		0.920
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RRi-DC	0.084		0.774
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RRi-DR	0.437		0.118
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RC-DC	0.409		0.147
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RC-DR	0.273		0.345
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RR-DC	0.449		0.107
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RR-DR	0.409		0.147
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RRi-DC	0.413		0.142
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RRi-DR	0.345		0.226
Diff_Stroop_RT_Pos	-	Diff_Stroop_RT_Neu	0.802	***	< .001
Diff_Stroop_RT_Pos	-	Diff_Stroop_RT_Neg	0.213		0.464
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RC-DC	0.262		0.366
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RC-DR	-0.018		0.952
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RR-DC	-0.060		0.840
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RR-DR	0.329		0.251
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RRi-DC	0.244		0.400
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RRi-DR	0.182		0.533
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RC-DC	0.530		0.054
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RC-DR	0.477		0.087
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RR-DC	0.574	*	0.035
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RR-DR	0.468		0.094
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RRi-DC	0.613	*	0.022
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RRi-DR	0.437		0.120
Diff_Stroop_RT_Neu	-	Diff_Stroop_RT_Neg	0.187		0.522
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RC-DC	0.305		0.288
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RC-DR	-0.167		0.568
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RR-DC	0.289		0.316

Spearman's Correlations

			Spearman's rho		p
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RR-DR	0.272		0.348
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RRi-DC	0.528		0.052
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RRi-DR	0.313		0.276
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RC-DC	0.411		0.146
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RC-DR	0.402		0.155
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RR-DC	0.327		0.253
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RR-DR	0.424		0.132
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RRi-DC	0.459		0.101
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RRi-DR	0.055		0.856
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RC-DC	0.143		0.627
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RC-DR	-0.537	*	0.048
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RR-DC	-0.272		0.348
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RR-DR	0.620	*	0.018
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RRi-DC	-0.120		0.683
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RRi-DR	0.041		0.891
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RC-DC	-0.002		1.000
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RC-DR	-0.134		0.648
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RR-DC	0.143		0.627
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RR-DR	-0.081		0.785
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RRi-DC	-0.055		0.856
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RRi-DR	0.332		0.246
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RC-DR	0.277		0.190
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RR-DC	-0.089		0.678
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RR-DR	0.190		0.375
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RRi-DC	0.043		0.841
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RRi-DR	-0.048		0.825
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RC-DC	0.051		0.811

Spearman's Correlations

			Spearman's rho		p
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RC-DR	0.101		0.638
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RR-DC	0.055		0.797
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RR-DR	0.133		0.537
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RRi-DC	0.014		0.950
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RRi-DR	-0.097		0.653
Diff_Moe_ACC_RC-DR	-	Diff_Moe_ACC_RR-DC	0.283		0.180
Diff_Moe_ACC_RC-DR	-	Diff_Moe_ACC_RR-DR	-0.023		0.913
Diff_Moe_ACC_RC-DR	-	Diff_Moe_ACC_RRi-DC	0.109		0.612
Diff_Moe_ACC_RC-DR	-	Diff_Moe_ACC_RRi-DR	-0.013		0.951
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RC-DC	-0.197		0.357
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RC-DR	-0.082		0.704
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RR-DC	-0.221		0.299
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RR-DR	-0.190		0.374
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RRi-DC	-0.227		0.286
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RRi-DR	-0.191		0.371
Diff_Moe_ACC_RR-DC	-	Diff_Moe_ACC_RR-DR	0.119		0.579
Diff_Moe_ACC_RR-DC	-	Diff_Moe_ACC_RRi-DC	0.253		0.234
Diff_Moe_ACC_RR-DC	-	Diff_Moe_ACC_RRi-DR	0.581	**	0.003
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RC-DC	-0.197		0.357
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RC-DR	-0.077		0.721
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RR-DC	-0.223		0.296
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RR-DR	-0.134		0.531
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RRi-DC	-0.111		0.606
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RRi-DR	-0.440	*	0.031
Diff_Moe_ACC_RR-DR	-	Diff_Moe_ACC_RRi-DC	-0.108		0.615
Diff_Moe_ACC_RR-DR	-	Diff_Moe_ACC_RRi-DR	0.248		0.242
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RC-DC	0.223		0.295

Spearman's Correlations

			Spearman's rho		p
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RC-DR	0.387		0.062
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RR-DC	0.432	*	0.035
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RR-DR	0.374		0.072
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RRi-DC	0.239		0.260
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RRi-DR	0.245		0.249
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_ACC_RRi-DR	0.267		0.208
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RC-DC	-0.028		0.896
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RC-DR	0.021		0.923
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RR-DC	-0.135		0.529
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RR-DR	0.008		0.969
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RRi-DC	-0.149		0.487
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RRi-DR	-0.227		0.287
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RC-DC	-0.165		0.442
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RC-DR	-0.065		0.761
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RR-DC	-0.126		0.558
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RR-DR	-0.073		0.736
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RRi-DC	-0.148		0.490
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RRi-DR	-0.380		0.067
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RC-DR	0.786	***	< .001
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RR-DC	0.890	***	< .001
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RR-DR	0.883	***	< .001
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RRi-DC	0.825	***	< .001
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RRi-DR	0.651	***	< .001
Diff_Moe_RT_RC-DR	-	Diff_Moe_RT_RR-DC	0.843	***	< .001
Diff_Moe_RT_RC-DR	-	Diff_Moe_RT_RR-DR	0.892	***	< .001
Diff_Moe_RT_RC-DR	-	Diff_Moe_RT_RRi-DC	0.848	***	< .001
Diff_Moe_RT_RC-DR	-	Diff_Moe_RT_RRi-DR	0.573	**	0.004

Spearman's Correlations

			Spearman's rho		p
Diff_Moe_RT_RR-DC	-	Diff_Moe_RT_RR-DR	0.884	***	< .001
Diff_Moe_RT_RR-DC	-	Diff_Moe_RT_RRi-DC	0.872	***	< .001
Diff_Moe_RT_RR-DC	-	Diff_Moe_RT_RRi-DR	0.701	***	< .001
Diff_Moe_RT_RR-DR	-	Diff_Moe_RT_RRi-DC	0.850	***	< .001
Diff_Moe_RT_RR-DR	-	Diff_Moe_RT_RRi-DR	0.630	**	0.001
Diff_Moe_RT_RRi-DC	-	Diff_Moe_RT_RRi-DR	0.626	**	0.001

* p < .05, ** p < .01, *** p < .001

A4.3.8.2. Bayesian delta score correlations.

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Symptom_1-item_Difference	-	Symptom_Headache-thirst_Difference	0.482	73.522
Symptom_1-item_Difference	-	Symptom_Gastric-cardio_Difference	0.456	32.859
Symptom_1-item_Difference	-	Symptom_Total_Difference	0.632	4230.515
Symptom_1-item_Difference	-	Diff_BSRI	0.094	0.326
Symptom_1-item_Difference	-	Diff_ERQ_CR	0.053	0.294
Symptom_1-item_Difference	-	Diff_ERQ_ES	-0.083	0.314
Symptom_1-item_Difference	-	Diff_Recall_Pos	-0.155	0.453
Symptom_1-item_Difference	-	Diff_Recall_Neu	-0.074	0.288
Symptom_1-item_Difference	-	Diff_Recall_Neg	-0.090	0.307
Symptom_1-item_Difference	-	Diff_Stroop_ACC_Pos	0.282	0.838
Symptom_1-item_Difference	-	Diff_Stroop_ACC_Neu	-0.036	0.342
Symptom_1-item_Difference	-	Diff_Stroop_ACC_Neg	0.420	2.510
Symptom_1-item_Difference	-	Diff_Stroop_RT_Pos	0.343	1.291
Symptom_1-item_Difference	-	Diff_Stroop_RT_Neu	0.320	1.086
Symptom_1-item_Difference	-	Diff_Stroop_RT_Neg	0.023	0.339
Symptom_1-item_Difference	-	Diff_Moe_ACC_RC-DC	-0.015	0.263
Symptom_1-item_Difference	-	Diff_Moe_ACC_RC-DR	-0.065	0.288
Symptom_1-item_Difference	-	Diff_Moe_ACC_RR-DC	0.185	0.561
Symptom_1-item_Difference	-	Diff_Moe_ACC_RR-DR	-0.016	0.263
Symptom_1-item_Difference	-	Diff_Moe_ACC_RRi-DC	0.080	0.302
Symptom_1-item_Difference	-	Diff_Moe_ACC_RRi-DR	0.133	0.388
Symptom_1-item_Difference	-	Diff_Moe_RT_RC-DC	0.204	0.663
Symptom_1-item_Difference	-	Diff_Moe_RT_RC-DR	0.068	0.290
Symptom_1-item_Difference	-	Diff_Moe_RT_RR-DC	0.121	0.363
Symptom_1-item_Difference	-	Diff_Moe_RT_RR-DR	0.136	0.396

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Symptom_1-item_Difference	-	Diff_Moe_RT_RRi-DC	0.181	0.546
Symptom_1-item_Difference	-	Diff_Moe_RT_RRi-DR	0.219	0.765
Symptom_Headache-thirst_Difference	-	Symptom_Gastric-cardio_Difference	0.159	0.465
Symptom_Headache-thirst_Difference	-	Symptom_Total_Difference	0.624	3344.777
Symptom_Headache-thirst_Difference	-	Diff_BSRI	0.136	0.396
Symptom_Headache-thirst_Difference	-	Diff_ERQ_CR	-0.159	0.452
Symptom_Headache-thirst_Difference	-	Diff_ERQ_ES	-0.057	0.292
Symptom_Headache-thirst_Difference	-	Diff_Recall_Pos	-0.245	1.098
Symptom_Headache-thirst_Difference	-	Diff_Recall_Neu	0.010	0.253
Symptom_Headache-thirst_Difference	-	Diff_Recall_Neg	-0.105	0.330
Symptom_Headache-thirst_Difference	-	Diff_Stroop_ACC_Pos	0.103	0.381
Symptom_Headache-thirst_Difference	-	Diff_Stroop_ACC_Neu	-0.174	0.478
Symptom_Headache-thirst_Difference	-	Diff_Stroop_ACC_Neg	0.495	5.433
Symptom_Headache-thirst_Difference	-	Diff_Stroop_RT_Pos	0.179	0.486
Symptom_Headache-thirst_Difference	-	Diff_Stroop_RT_Neu	0.201	0.535
Symptom_Headache-thirst_Difference	-	Diff_Stroop_RT_Neg	0.000	0.337
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RC-DC	0.213	0.720
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RC-DR	0.019	0.264

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RR-DC	0.123	0.368
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RR-DR	0.098	0.325
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RRi-DC	-0.039	0.271
Symptom_Headache-thirst_Difference	-	Diff_Moe_ACC_RRi-DR	0.117	0.355
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RC-DC	0.158	0.457
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RC-DR	0.106	0.337
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RR-DC	0.106	0.337
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RR-DR	0.202	0.651
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RRi-DC	0.180	0.539
Symptom_Headache-thirst_Difference	-	Diff_Moe_RT_RRi-DR	0.268	1.301
Symptom_Gastric-cardio_Difference	-	Symptom_Total_Difference	0.463	38.719
Symptom_Gastric-cardio_Difference	-	Diff_BSRI	0.034	0.285
Symptom_Gastric-cardio_Difference	-	Diff_ERQ_CR	0.109	0.349
Symptom_Gastric-cardio_Difference	-	Diff_ERQ_ES	-0.179	0.522
Symptom_Gastric-cardio_Difference	-	Diff_Recall_Pos	0.008	0.257
Symptom_Gastric-cardio_Difference	-	Diff_Recall_Neu	0.067	0.285
Symptom_Gastric-cardio_Difference	-	Diff_Recall_Neg	0.111	0.343

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_ACC_Pos	0.068	0.366
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_ACC_Neu	0.055	0.360
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_ACC_Neg	0.210	0.551
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_RT_Pos	0.342	1.170
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_RT_Neu	0.263	0.715
Symptom_Gastric-cardio_Difference	-	Diff_Stroop_RT_Neg	-0.132	0.418
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RC-DC	-0.277	1.360
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RC-DR	-0.148	0.425
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RR-DC	0.058	0.287
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RR-DR	-0.117	0.358
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RRi-DC	0.069	0.295
Symptom_Gastric-cardio_Difference	-	Diff_Moe_ACC_RRi-DR	0.013	0.268
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RC-DC	0.187	0.560
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RC-DR	0.179	0.526
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RR-DC	0.195	0.598
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RR-DR	0.162	0.468
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RRi-DC	0.227	0.800

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Symptom_Gastric-cardio_Difference	-	Diff_Moe_RT_RRi-DR	0.114	0.352
Symptom_Total_Difference	-	Diff_BSRI	0.279	1.306
Symptom_Total_Difference	-	Diff_ERQ_CR	-0.071	0.307
Symptom_Total_Difference	-	Diff_ERQ_ES	-0.076	0.306
Symptom_Total_Difference	-	Diff_Recall_Pos	-0.187	0.597
Symptom_Total_Difference	-	Diff_Recall_Neu	0.071	0.285
Symptom_Total_Difference	-	Diff_Recall_Neg	-0.069	0.284
Symptom_Total_Difference	-	Diff_Stroop_ACC_Pos	0.216	0.575
Symptom_Total_Difference	-	Diff_Stroop_ACC_Neu	0.092	0.372
Symptom_Total_Difference	-	Diff_Stroop_ACC_Neg	0.394	1.972
Symptom_Total_Difference	-	Diff_Stroop_RT_Pos	0.265	0.753
Symptom_Total_Difference	-	Diff_Stroop_RT_Neu	0.199	0.530
Symptom_Total_Difference	-	Diff_Stroop_RT_Neg	0.199	0.530
Symptom_Total_Difference	-	Diff_Moe_ACC_RC-DC	0.000	0.262
Symptom_Total_Difference	-	Diff_Moe_ACC_RC-DR	-0.195	0.610
Symptom_Total_Difference	-	Diff_Moe_ACC_RR-DC	0.007	0.262
Symptom_Total_Difference	-	Diff_Moe_ACC_RR-DR	0.183	0.555
Symptom_Total_Difference	-	Diff_Moe_ACC_RRi-DC	-0.081	0.303
Symptom_Total_Difference	-	Diff_Moe_ACC_RRi-DR	0.048	0.276
Symptom_Total_Difference	-	Diff_Moe_RT_RC-DC	0.272	1.371
Symptom_Total_Difference	-	Diff_Moe_RT_RC-DR	0.250	1.063
Symptom_Total_Difference	-	Diff_Moe_RT_RR-DC	0.265	1.256
Symptom_Total_Difference	-	Diff_Moe_RT_RR-DR	0.279	1.499
Symptom_Total_Difference	-	Diff_Moe_RT_RRi-DC	0.309	2.193
Symptom_Total_Difference	-	Diff_Moe_RT_RRi-DR	0.417	12.727
Diff_BSRI	-	Diff_ERQ_CR	0.008	0.308
Diff_BSRI	-	Diff_ERQ_ES	-0.150	0.428

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_BSRI	-	Diff_Recall_Pos	-0.089	0.320
Diff_BSRI	-	Diff_Recall_Neu	0.170	0.488
Diff_BSRI	-	Diff_Recall_Neg	-0.053	0.289
Diff_BSRI	-	Diff_Stroop_ACC_Pos	0.381	1.390
Diff_BSRI	-	Diff_Stroop_ACC_Neu	0.323	0.952
Diff_BSRI	-	Diff_Stroop_ACC_Neg	-0.226	0.582
Diff_BSRI	-	Diff_Stroop_RT_Pos	-0.076	0.382
Diff_BSRI	-	Diff_Stroop_RT_Neu	0.076	0.382
Diff_BSRI	-	Diff_Stroop_RT_Neg	0.290	0.790
Diff_BSRI	-	Diff_Moe_ACC_RC-DC	-0.209	0.642
Diff_BSRI	-	Diff_Moe_ACC_RC-DR	-0.238	0.819
Diff_BSRI	-	Diff_Moe_ACC_RR-DC	-0.029	0.284
Diff_BSRI	-	Diff_Moe_ACC_RR-DR	0.294	1.447
Diff_BSRI	-	Diff_Moe_ACC_RRi-DC	-0.305	1.638
Diff_BSRI	-	Diff_Moe_ACC_RRi-DR	-0.227	0.746
Diff_BSRI	-	Diff_Moe_RT_RC-DC	0.077	0.312
Diff_BSRI	-	Diff_Moe_RT_RC-DR	0.191	0.560
Diff_BSRI	-	Diff_Moe_RT_RR-DC	0.287	1.338
Diff_BSRI	-	Diff_Moe_RT_RR-DR	0.144	0.413
Diff_BSRI	-	Diff_Moe_RT_RRi-DC	0.268	1.094
Diff_BSRI	-	Diff_Moe_RT_RRi-DR	0.287	1.338
Diff_ERQ_CR	-	Diff_ERQ_ES	0.023	0.303
Diff_ERQ_CR	-	Diff_Recall_Pos	0.067	0.304
Diff_ERQ_CR	-	Diff_Recall_Neu	-0.190	0.553
Diff_ERQ_CR	-	Diff_Recall_Neg	-0.079	0.314
Diff_ERQ_CR	-	Diff_Stroop_ACC_Pos	0.629	9.311
Diff_ERQ_CR	-	Diff_Stroop_ACC_Neu	0.309	0.827

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_ERQ_CR	-	Diff_Stroop_ACC_Neg	0.250	0.630
Diff_ERQ_CR	-	Diff_Stroop_RT_Pos	-0.078	0.396
Diff_ERQ_CR	-	Diff_Stroop_RT_Neu	0.117	0.421
Diff_ERQ_CR	-	Diff_Stroop_RT_Neg	-0.311	0.836
Diff_ERQ_CR	-	Diff_Moe_ACC_RC-DC	-0.170	0.476
Diff_ERQ_CR	-	Diff_Moe_ACC_RC-DR	-0.211	0.619
Diff_ERQ_CR	-	Diff_Moe_ACC_RR-DC	0.195	0.556
Diff_ERQ_CR	-	Diff_Moe_ACC_RR-DR	-0.039	0.300
Diff_ERQ_CR	-	Diff_Moe_ACC_RRi-DC	0.093	0.338
Diff_ERQ_CR	-	Diff_Moe_ACC_RRi-DR	0.346	2.179
Diff_ERQ_CR	-	Diff_Moe_RT_RC-DC	0.068	0.316
Diff_ERQ_CR	-	Diff_Moe_RT_RC-DR	0.105	0.352
Diff_ERQ_CR	-	Diff_Moe_RT_RR-DC	0.130	0.389
Diff_ERQ_CR	-	Diff_Moe_RT_RR-DR	0.167	0.468
Diff_ERQ_CR	-	Diff_Moe_RT_RRi-DC	0.155	0.438
Diff_ERQ_CR	-	Diff_Moe_RT_RRi-DR	-0.192	0.543
Diff_ERQ_ES	-	Diff_Recall_Pos	-0.037	0.281
Diff_ERQ_ES	-	Diff_Recall_Neu	0.365	4.002
Diff_ERQ_ES	-	Diff_Recall_Neg	0.202	0.621
Diff_ERQ_ES	-	Diff_Stroop_ACC_Pos	0.050	0.370
Diff_ERQ_ES	-	Diff_Stroop_ACC_Neu	-0.169	0.473
Diff_ERQ_ES	-	Diff_Stroop_ACC_Neg	-0.207	0.539
Diff_ERQ_ES	-	Diff_Stroop_RT_Pos	-0.176	0.483
Diff_ERQ_ES	-	Diff_Stroop_RT_Neu	-0.433	2.043
Diff_ERQ_ES	-	Diff_Stroop_RT_Neg	-0.016	0.363
Diff_ERQ_ES	-	Diff_Moe_ACC_RC-DC	-0.046	0.297
Diff_ERQ_ES	-	Diff_Moe_ACC_RC-DR	0.172	0.485

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_ERQ_ES	-	Diff_Moe_ACC_RR-DC	0.117	0.365
Diff_ERQ_ES	-	Diff_Moe_ACC_RR-DR	0.030	0.290
Diff_ERQ_ES	-	Diff_Moe_ACC_RRi-DC	-0.120	0.369
Diff_ERQ_ES	-	Diff_Moe_ACC_RRi-DR	0.253	0.901
Diff_ERQ_ES	-	Diff_Moe_RT_RC-DC	-0.540	51.575
Diff_ERQ_ES	-	Diff_Moe_RT_RC-DR	-0.369	3.285
Diff_ERQ_ES	-	Diff_Moe_RT_RR-DC	-0.483	18.420
Diff_ERQ_ES	-	Diff_Moe_RT_RR-DR	-0.494	22.432
Diff_ERQ_ES	-	Diff_Moe_RT_RRi-DC	-0.449	10.475
Diff_ERQ_ES	-	Diff_Moe_RT_RRi-DR	-0.199	0.581
Diff_Recall_Pos	-	Diff_Recall_Neu	-0.068	0.283
Diff_Recall_Pos	-	Diff_Recall_Neg	0.338	4.144
Diff_Recall_Pos	-	Diff_Stroop_ACC_Pos	0.000	0.337
Diff_Recall_Pos	-	Diff_Stroop_ACC_Neu	0.175	0.478
Diff_Recall_Pos	-	Diff_Stroop_ACC_Neg	-0.334	1.208
Diff_Recall_Pos	-	Diff_Stroop_RT_Pos	-0.181	0.490
Diff_Recall_Pos	-	Diff_Stroop_RT_Neu	0.026	0.340
Diff_Recall_Pos	-	Diff_Stroop_RT_Neg	-0.052	0.348
Diff_Recall_Pos	-	Diff_Moe_ACC_RC-DC	0.058	0.282
Diff_Recall_Pos	-	Diff_Moe_ACC_RC-DR	0.221	0.777
Diff_Recall_Pos	-	Diff_Moe_ACC_RR-DC	0.202	0.650
Diff_Recall_Pos	-	Diff_Moe_ACC_RR-DR	-0.017	0.263
Diff_Recall_Pos	-	Diff_Moe_ACC_RRi-DC	0.111	0.346
Diff_Recall_Pos	-	Diff_Moe_ACC_RRi-DR	0.031	0.268
Diff_Recall_Pos	-	Diff_Moe_RT_RC-DC	-0.048	0.276
Diff_Recall_Pos	-	Diff_Moe_RT_RC-DR	-0.073	0.295
Diff_Recall_Pos	-	Diff_Moe_RT_RR-DC	-0.129	0.380

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_Recall_Pos	-	Diff_Moe_RT_RR-DR	-0.121	0.364
Diff_Recall_Pos	-	Diff_Moe_RT_RRi-DC	-0.121	0.364
Diff_Recall_Pos	-	Diff_Moe_RT_RRi-DR	-0.283	1.562
Diff_Recall_Neu	-	Diff_Recall_Neg	0.345	4.652
Diff_Recall_Neu	-	Diff_Stroop_ACC_Pos	-0.283	0.839
Diff_Recall_Neu	-	Diff_Stroop_ACC_Neu	-0.410	2.291
Diff_Recall_Neu	-	Diff_Stroop_ACC_Neg	-0.232	0.625
Diff_Recall_Neu	-	Diff_Stroop_RT_Pos	-0.131	0.411
Diff_Recall_Neu	-	Diff_Stroop_RT_Neu	-0.299	0.933
Diff_Recall_Neu	-	Diff_Stroop_RT_Neg	0.251	0.692
Diff_Recall_Neu	-	Diff_Moe_ACC_RC-DC	0.040	0.272
Diff_Recall_Neu	-	Diff_Moe_ACC_RC-DR	-0.008	0.262
Diff_Recall_Neu	-	Diff_Moe_ACC_RR-DC	-0.093	0.318
Diff_Recall_Neu	-	Diff_Moe_ACC_RR-DR	0.074	0.296
Diff_Recall_Neu	-	Diff_Moe_ACC_RRi-DC	0.046	0.275
Diff_Recall_Neu	-	Diff_Moe_ACC_RRi-DR	-0.170	0.499
Diff_Recall_Neu	-	Diff_Moe_RT_RC-DC	-0.373	5.840
Diff_Recall_Neu	-	Diff_Moe_RT_RC-DR	-0.230	0.856
Diff_Recall_Neu	-	Diff_Moe_RT_RR-DC	-0.175	0.518
Diff_Recall_Neu	-	Diff_Moe_RT_RR-DR	-0.246	1.013
Diff_Recall_Neu	-	Diff_Moe_RT_RRi-DC	-0.286	1.622
Diff_Recall_Neu	-	Diff_Moe_RT_RRi-DR	0.008	0.262
Diff_Recall_Neg	-	Diff_Stroop_ACC_Pos	-0.173	0.475
Diff_Recall_Neg	-	Diff_Stroop_ACC_Neu	-0.163	0.456
Diff_Recall_Neg	-	Diff_Stroop_ACC_Neg	-0.182	0.492
Diff_Recall_Neg	-	Diff_Stroop_RT_Pos	-0.433	2.841
Diff_Recall_Neg	-	Diff_Stroop_RT_Neu	-0.216	0.576

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_Recall_Neg	-	Diff_Stroop_RT_Neg	-0.168	0.466
Diff_Recall_Neg	-	Diff_Moe_ACC_RC-DC	-0.033	0.268
Diff_Recall_Neg	-	Diff_Moe_ACC_RC-DR	0.090	0.314
Diff_Recall_Neg	-	Diff_Moe_ACC_RR-DC	0.220	0.769
Diff_Recall_Neg	-	Diff_Moe_ACC_RR-DR	-0.168	0.491
Diff_Recall_Neg	-	Diff_Moe_ACC_RRi-DC	0.212	0.712
Diff_Recall_Neg	-	Diff_Moe_ACC_RRi-DR	0.116	0.354
Diff_Recall_Neg	-	Diff_Moe_RT_RC-DC	-0.517	99.012
Diff_Recall_Neg	-	Diff_Moe_RT_RC-DR	-0.378	6.369
Diff_Recall_Neg	-	Diff_Moe_RT_RR-DC	-0.541	175.064
Diff_Recall_Neg	-	Diff_Moe_RT_RR-DR	-0.411	11.270
Diff_Recall_Neg	-	Diff_Moe_RT_RRi-DC	-0.460	28.930
Diff_Recall_Neg	-	Diff_Moe_RT_RRi-DR	-0.492	57.445
Diff_Stroop_ACC_Pos	-	Diff_Stroop_ACC_Neu	0.294	0.905
Diff_Stroop_ACC_Pos	-	Diff_Stroop_ACC_Neg	0.256	0.714
Diff_Stroop_ACC_Pos	-	Diff_Stroop_RT_Pos	0.181	0.490
Diff_Stroop_ACC_Pos	-	Diff_Stroop_RT_Neu	0.203	0.541
Diff_Stroop_ACC_Pos	-	Diff_Stroop_RT_Neg	0.023	0.339
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RC-DC	-0.090	0.370
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RC-DR	-0.239	0.646
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RR-DC	0.241	0.656
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RR-DR	0.287	0.865
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RRi-DC	-0.294	0.905
Diff_Stroop_ACC_Pos	-	Diff_Moe_ACC_RRi-DR	0.338	1.236
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RC-DC	0.068	0.356
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RC-DR	0.045	0.345
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RR-DC	0.113	0.390

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RR-DR	0.090	0.370
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RRi-DC	0.181	0.490
Diff_Stroop_ACC_Pos	-	Diff_Moe_RT_RRi-DR	-0.023	0.339
Diff_Stroop_ACC_Neu	-	Diff_Stroop_ACC_Neg	0.025	0.340
Diff_Stroop_ACC_Neu	-	Diff_Stroop_RT_Pos	0.000	0.337
Diff_Stroop_ACC_Neu	-	Diff_Stroop_RT_Neu	-0.046	0.345
Diff_Stroop_ACC_Neu	-	Diff_Stroop_RT_Neg	0.000	0.337
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RC-DC	0.000	0.337
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RC-DR	-0.150	0.435
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RR-DC	-0.047	0.346
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RR-DR	0.291	0.885
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RRi-DC	-0.405	2.177
Diff_Stroop_ACC_Neu	-	Diff_Moe_ACC_RRi-DR	-0.073	0.359
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RC-DC	0.412	2.322
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RC-DR	0.503	5.970
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RR-DC	0.389	1.887
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RR-DR	0.412	2.322
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RRi-DC	0.435	2.890
Diff_Stroop_ACC_Neu	-	Diff_Moe_RT_RRi-DR	0.297	0.925
Diff_Stroop_ACC_Neg	-	Diff_Stroop_RT_Pos	0.380	1.744
Diff_Stroop_ACC_Neg	-	Diff_Stroop_RT_Neu	0.237	0.642
Diff_Stroop_ACC_Neg	-	Diff_Stroop_RT_Neg	-0.190	0.509
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RC-DC	0.190	0.509
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RC-DR	0.012	0.338
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RR-DC	0.121	0.398
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RR-DR	0.036	0.342
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RRi-DC	0.086	0.367

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_Stroop_ACC_Neg	-	Diff_Moe_ACC_RRi-DR	0.380	1.743
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RC-DC	0.261	0.735
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RC-DR	0.190	0.509
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RR-DC	0.309	0.999
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RR-DR	0.261	0.735
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RRi-DC	0.285	0.851
Diff_Stroop_ACC_Neg	-	Diff_Moe_RT_RRi-DR	0.332	1.188
Diff_Stroop_RT_Pos	-	Diff_Stroop_RT_Neu	0.670	53.005
Diff_Stroop_RT_Pos	-	Diff_Stroop_RT_Neg	0.121	0.399
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RC-DC	0.165	0.460
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RC-DR	-0.022	0.339
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RR-DC	-0.067	0.355
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RR-DR	0.268	0.767
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RRi-DC	0.160	0.452
Diff_Stroop_RT_Pos	-	Diff_Moe_ACC_RRi-DR	0.164	0.459
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RC-DC	0.319	1.074
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RC-DR	0.319	1.074
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RR-DC	0.407	2.213
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RR-DR	0.341	1.266
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RRi-DC	0.429	2.724
Diff_Stroop_RT_Pos	-	Diff_Moe_RT_RRi-DR	0.319	1.074
Diff_Stroop_RT_Neu	-	Diff_Stroop_RT_Neg	0.143	0.426
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RC-DC	0.187	0.503
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RC-DR	-0.133	0.412
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RR-DC	0.223	0.597
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RR-DR	0.201	0.535
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RRi-DC	0.366	1.552

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_Stroop_RT_Neu	-	Diff_Moe_ACC_RRi-DR	0.211	0.561
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RC-DC	0.297	0.921
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RC-DR	0.297	0.921
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RR-DC	0.209	0.555
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RR-DR	0.319	1.074
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RRi-DC	0.319	1.074
Diff_Stroop_RT_Neu	-	Diff_Moe_RT_RRi-DR	-0.011	0.338
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RC-DC	0.121	0.399
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RC-DR	-0.376	1.683
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RR-DC	-0.179	0.486
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RR-DR	0.469	4.118
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RRi-DC	-0.069	0.356
Diff_Stroop_RT_Neg	-	Diff_Moe_ACC_RRi-DR	0.000	0.337
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RC-DC	0.011	0.338
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RC-DR	-0.077	0.361
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RR-DC	0.143	0.426
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RR-DR	-0.055	0.349
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RRi-DC	-0.055	0.349
Diff_Stroop_RT_Neg	-	Diff_Moe_RT_RRi-DR	0.231	0.620
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RC-DR	0.205	0.669
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RR-DC	-0.060	0.284
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RR-DR	0.156	0.450
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RRi-DC	-0.004	0.262
Diff_Moe_ACC_RC-DC	-	Diff_Moe_ACC_RRi-DR	-0.049	0.276
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RC-DC	0.048	0.276
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RC-DR	0.077	0.299
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RR-DC	0.033	0.268

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RR-DR	0.099	0.327
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RRi-DC	0.018	0.264
Diff_Moe_ACC_RC-DC	-	Diff_Moe_RT_RRi-DR	-0.063	0.286
Diff_Moe_ACC_RC-DR	-	Diff_Moe_ACC_RR-DC	0.220	0.773
Diff_Moe_ACC_RC-DR	-	Diff_Moe_ACC_RR-DR	-0.015	0.263
Diff_Moe_ACC_RC-DR	-	Diff_Moe_ACC_RRi-DC	0.089	0.313
Diff_Moe_ACC_RC-DR	-	Diff_Moe_ACC_RRi-DR	-0.056	0.281
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RC-DC	-0.117	0.356
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RC-DR	-0.029	0.267
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RR-DC	-0.147	0.423
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RR-DR	-0.117	0.356
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RRi-DC	-0.147	0.423
Diff_Moe_ACC_RC-DR	-	Diff_Moe_RT_RRi-DR	-0.125	0.370
Diff_Moe_ACC_RR-DC	-	Diff_Moe_ACC_RR-DR	0.042	0.272
Diff_Moe_ACC_RR-DC	-	Diff_Moe_ACC_RRi-DC	0.184	0.559
Diff_Moe_ACC_RR-DC	-	Diff_Moe_ACC_RRi-DR	0.438	18.661
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RC-DC	-0.125	0.372
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RC-DR	-0.089	0.312
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RR-DC	-0.177	0.528
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RR-DR	-0.096	0.322
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RRi-DC	-0.081	0.303
Diff_Moe_ACC_RR-DC	-	Diff_Moe_RT_RRi-DR	-0.325	2.758
Diff_Moe_ACC_RR-DR	-	Diff_Moe_ACC_RRi-DC	-0.079	0.301
Diff_Moe_ACC_RR-DR	-	Diff_Moe_ACC_RRi-DR	0.180	0.542
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RC-DC	0.179	0.537
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RC-DR	0.299	1.918
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RR-DC	0.351	4.085

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RR-DR	0.254	1.105
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RRi-DC	0.172	0.506
Diff_Moe_ACC_RR-DR	-	Diff_Moe_RT_RRi-DR	0.202	0.649
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_ACC_RRi-DR	0.186	0.566
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RC-DC	-0.019	0.264
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RC-DR	0.027	0.266
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RR-DC	-0.073	0.295
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RR-DR	0.027	0.266
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RRi-DC	-0.119	0.360
Diff_Moe_ACC_RRi-DC	-	Diff_Moe_RT_RRi-DR	-0.150	0.433
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RC-DC	-0.107	0.339
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RC-DR	-0.052	0.278
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RR-DC	-0.084	0.306
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RR-DR	-0.044	0.273
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RRi-DC	-0.068	0.290
Diff_Moe_ACC_RRi-DR	-	Diff_Moe_RT_RRi-DR	-0.274	1.408
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RC-DR	0.674	6055.330
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RR-DC	0.717	22554.325
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RR-DR	0.746	56455.271
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RRi-DC	0.659	3972.203
Diff_Moe_RT_RC-DC	-	Diff_Moe_RT_RRi-DR	0.522	111.484
Diff_Moe_RT_RC-DR	-	Diff_Moe_RT_RR-DC	0.667	4899.207
Diff_Moe_RT_RC-DR	-	Diff_Moe_RT_RR-DR	0.739	44748.601
Diff_Moe_RT_RC-DR	-	Diff_Moe_RT_RRi-DC	0.681	7500.034
Diff_Moe_RT_RC-DR	-	Diff_Moe_RT_RRi-DR	0.442	20.351
Diff_Moe_RT_RR-DC	-	Diff_Moe_RT_RR-DR	0.725	28283.707
Diff_Moe_RT_RR-DC	-	Diff_Moe_RT_RRi-DC	0.710	18022.186

Bayesian Kendall's Tau Correlations

			Kendall's tau B	BF_{10}
Diff_Moe_RT_RR-DC	-	Diff_Moe_RT_RRi-DR	0.529	131.901
Diff_Moe_RT_RR-DR	-	Diff_Moe_RT_RRi-DC	0.696	11578.073
Diff_Moe_RT_RR-DR	-	Diff_Moe_RT_RRi-DR	0.442	20.351
Diff_Moe_RT_RRi-DC	-	Diff_Moe_RT_RRi-DR	0.428	15.386