

**A revised cost-benefit analysis tool capable of
analysing the effects of vocational rehabilitation.**

Tamara Brown

School of Health Sciences

University of Salford

Submitted in partial fulfilment of the requirements of the degree of

Doctor of Philosophy

April 2018

Contents

I List of tables.....	v
II List of figures.....	vi
III Acknowledgements.....	viii
IV Declarations.....	viii
V Abbreviations.....	viii
Abstract.....	xi
1. Introduction.....	1
1.1 Background and Rationale.....	1
1.1.1 Current UK costs of ill-health within the workplace.....	1
1.1.2 Current UK sickness absence and presenteeism statistics.....	2
1.1.3 Overview of UK government policy and reforms within health and work between 2005-2017.....	4
1.1.4 Rationale for using Vocational Rehabilitation as an intervention to reduce sickness absence and presenteeism.....	10
1.1.5 Summary.....	13
1.2 Research aims and objectives.....	14
1.3 Overview of the thesis.....	16
1.4 Description of the two VR services (organisation 1 and 2) researched within this project.....	18
1.4.1 Organisation 1.....	18
1.4.2 Organisation 2.....	19
2. Literature review.....	22
2.1 Introduction.....	22
2.2 Current influences on the use of economic analyses within VR for the working population.....	22
2.2.1 Vocational Rehabilitation.....	22
2.2.1.1 Definition of VR.....	23
2.2.1.2 VR practitioners.....	26
2.2.1.3 Aims of VR.....	27
2.2.1.4 VR approach.....	27
2.2.1.5. Differences between VR and Occupational Health.....	29
2.2.2 Sickness absence and presenteeism.....	31
2.2.2.1 Patterns of sickness absence.....	31
2.2.2.2 Causes of sickness absence and presenteeism.....	32
2.2.2.3 Consequences of sickness absence and presenteeism.....	36
2.2.2.4 The use of Vocational Rehabilitation in addressing sickness absence, presenteeism and turnover... 39	
2.3 Cost effectiveness of VR interventions for employees who are either off sick or struggling to SAW.....	43
2.3.1 Outline of the comparative economic analyses models.....	43
2.3.2 Current evidence-base on the costs and benefits within VR for the SAW population.....	50
2.3.3 Economic effectiveness of VR interventions for the SAW population.....	52
2.3.4 Economic effectiveness of interventions or therapies used within VR services for the SAW population.....	56

2.3.5 Summary of the economic effectiveness of VR services for the SAW population	61
2.4 Literature review conclusion	61
3. Methodology	64
3.1 Introduction	64
3.2 Research methodology	64
3.3 Overview of and rationale for the use of the GM New Economy CBA to evaluate VR.	70
3.3.1 Existing economic models for evaluating workplace interventions in the public domain	74
3.4 Workings of the Greater Manchester New Economy CBA	75
3.5 Methodology Phase 1	80
3.5.1 Outcome measures: benefits and costs	81
3.5.2 Outcome measurement tools	85
3.5.2.1 Economic benefits outcome measurements used within the new CBA tool	85
3.5.2.1.1 Sickness absence	85
3.5.2.1.2 Presenteeism	85
3.5.2.1.3 Turnover	90
3.5.2.2 Non-economic benefit outcome measurements used within the wider VR service evaluation	90
3.5.2.2.1 Quality of Life	90
3.5.2.2.2 General mental health	91
3.5.2.2.3 General Physical health	92
3.5.2.2.4 Job Satisfaction Scale	93
3.5.2.2.5 Summary of outcome measures to be utilised in the study	93
3.5.3 Methodology for determining the reference case, the intervention case and the net effectiveness percentage for each outcome	98
3.5.4 Literature review search strategy	104
3.5.5 Calculating costs to be used in the CBA tool	107
3.5.5.1 Sickness absence costs (MSDs and Mental ill-health)	107
3.5.5.2 Presenteeism costs	109
3.5.5.3 Turnover costs	110
3.6 Methodology Phase 2:	112
3.6.1 Organisation 1	114
3.6.1.1 Aims:	114
3.6.1.2 Methodology:	115
3.6.1.3 Ethical approval	116
3.6.1.4 Sampling technique:	116
3.6.1.5 Procedure primary data collection.	117
3.6.1.6 Primary data outcome measures	118
3.6.1.7 Procedure secondary data collection	118
3.6.1.8 Data analysis.....	118
3.6.2 Organisation 2	119
3.6.2.1 Aims:	119
3.6.2.2 Methodology:	120
3.6.2.3 Ethical approval.....	120

3.6.2.4	Sampling technique:	120
3.6.2.5	Procedure primary data collection.	120
3.6.2.6	Primary data outcome measures:	121
3.6.2.7	Procedure secondary data collection	121
3.6.2.8	Data analysis.....	121
3.7	Methodology Phase 3	122
3.8	Methodology Phase 4	124
3.8.1	Sampling.....	125
3.8.2	Sample size.....	126
3.8.3	Focus group procedure	126
3.8.4	Focus group analysis	127
3.9	Summary of the research methodology used in each phase.....	128
4.	Results	130
4.1	Introduction	130
4.2	Phase 1 results	131
4.2.1	Identifying the reference and intervention cases in order to determine the deadweight and estimated net effectiveness percentage of each outcome to be used within the practical CBA tool.....	132
4.2.1.1	Sickness absence due to MSDS: reference and intervention case results	132
4.2.1.2	Sickness absence due to mental health conditions: reference and intervention case results	137
4.2.1.3	Turnover reference and intervention case results	144
4.2.1.4	Presenteeism reference and intervention case results	146
4.2.1.5	Deadweight calculations based on the net effectiveness of the interventions determined from the literature searches	149
4.2.2	Unit costs to be used in the CBA mode	150
4.2.2.1	Sickness absence due to MSDs and Mental ill-health: unit costs	150
4.2.2.2	Presenteeism: unit costs.....	151
4.2.2.3	Turnover: unit costs	151
4.2.2.4	Benefits/outcomes of VR service that are not in the CBA tool but could be added if data was available	151
4.3	Phase 2 results.....	152
4.4	Organisation 1.....	152
4.4.1	Participants: organisation 1	153
4.4.2	Primary data and results: organisation 1:.....	155
4.4.2.1	Primary outcome data analysis: organisation 1	157
4.4.2.2	Primary outcome data results: organisation 1	157
4.4.3	Secondary data results: organisation 1:	161
4.4.3.1	Sickness absence results: organisation 1	161
4.4.3.2	Turnover: organisation 1	163
4.4.3.3	Costs: organisation 1	164
4.5	Organisation 2.....	164
4.5.1	Participants: organisation 2	165
4.5.2	Primary data and results: organisation 2.....	166
4.5.2.1	Primary outcome measure results: organisation 2	166

4.5.3 Secondary data results: organisation 2	168
4.5.3.1 VR service costs: organisation 2.....	168
4.5.3.2 Sickness absence costs: organisation 2.....	171
4.5.3.3 Turnover rates: organisation 2	174
4.6 Results Phase 3 results.....	177
4.6.1 Organisation 1 – synthesis of data to be used in the CBA tool from phase 1 and 2 for the revised outcomes.....	178
4.6.1.1 Organisation 1: costs	178
4.6.1.2 Organisation 1: benefits.....	180
4.6.1.2.1 Benefit 1: MSD sickness absence < 6-months.....	182
4.6.1.2.2 Benefit 2: MSD sickness absence > 6-months.....	185
4.6.2 Organisation 1 CBA results	189
4.6.3 Organisation 1 CBA: Sensitivity analysis results	192
4.6.4 Organisation 1 CBA: Scenario analysis results	196
4.6.5 Organisation 2 – synthesis of data to be used in the CBA tool from phase 1 and 2 for the revised outcomes.....	198
4.6.5.1 Organisation 2: costs	198
4.6.5.2 Organisation 2: benefits.....	200
4.6.5.2.1 Benefit 1: MSD sickness absence < 6-months.....	200
4.6.5.2.2 Benefit 2: MSD sickness absence > 6-months.....	202
4.6.5.2.3 Benefit 3: Mental health conditions sickness absence < 6-months.....	202
4.6.5.2.4 Benefit 4: Mental health conditions sickness absence > 6-months.....	205
4.6.5.2.5 Benefit 5: Turnover	205
4.6.5.2.6 Benefit 6: Presenteeism	206
4.6.6 Organisation 2: CBA results.....	209
4.6.7 Organisation 2: sensitivity analysis results	210
4.6.8 Organisation 2 CBA: Scenario analysis results	216
4.7 Phase 4 results	219
4.7.1 Focus group	220
4.7.1.1 The usefulness of the CBA tool.....	220
4.7.1.2 The usefulness of the report.....	221
4.7.1.3 The ease of using the CBA tool.....	222
4.7.1.4 Further development of the CBA tool	224
5. Discussion	228
5.1 Aims	228
5.2 Objectives:.....	228
5.3 Research Rationale	229
5.4 Objective 1: To identify from the published literature the outcomes of VR interventions for organisations and employed individuals.....	229
5.5 Objective 2: To revise the GM New Economy CBA tool to ensure that the practical CBA tool developed is capable of analysing the costs and benefits of VR interventions.....	234
5.6 Objective 3: To collect the relevant data required to populate the revised practical CBA tool, from two VR services and the organisations to which VR is provided.	239

5.7 Objective 4: To implement and test the revised practical CBA tool incorporating the developed outcomes to identify the cost-benefits of the VR interventions and services in a real-world setting.....	243
5.8 Objective 5: To appraise the value of the revised practical CBA tool to the VR provider and the organisation to which VR is provided.	246
6. Conclusion and recommendations	248
6.1 Summary of the research	248
6.2 Recommendations	250
6.2.1 For research	250
6.2.2 For practice.....	252
6.3 Limitations of the research	252
6.4 Future work	254
6.5 Conclusion.....	255
7. References	256
8. Appendix	320
Appendix 1: EQ-5D-5L.....	320
Appendix 2 : Work Limitations Questionnaire.....	324
Appendix 3: WLQ Time Loss Module	357
Appendix 4: General Health Questionnaire (GHQ-12), Job Satisfaction Scale (JSS), and Patient-Specific Functional Scale (PSFS).....	358
Appendix 5: Search terms:	363
5.1 Sickness absence due to MSDs reference and intervention case search strategy	363
5.2 Sickness absence due to mental health conditions reference and intervention case search strategy	363
5.4 Turnover reference and intervention case.....	364
5.5 Presenteeism reference and intervention case	367
Appendix 6: Focus group questions	368
Appendix 7: Ethical approval letters	370
Appendix 7.1: Ethical approval letters for organisation 1	370
Appendix 7.2: Ethical approval letters for organisation 2	372
Appendix 8: SPSS results for normal distribution of mental health sickness absence data.....	374
Appendix 9: New CBA tool, case study and glossary of key terms used for the focus group.....	379
Appendix 10: Focus group consent form.....	390

I List of tables

Table 1: Definitions of Vocational Rehabilitation.....	24
Table 2: Summary of comparative economic analyses	47
Table 3: Positivism, interpretivism, and epistemologies (Wilson, 2010, cited in Dudovisky, 2018)	67
Table 4: Presenteeism instrument Characteristics	87
Table 5: Summary of outcomes considered and used within this research for organisation 1 and 2.....	95
Table 6: Assumptions underpinning the reference and intervention case for each outcome	100
Table 7: Methodology for determining the reference and intervention case for each economic outcome	106
Table 8: Summary of included articles, with sickness absence findings reported in terms of days sick leave per year or percentage difference over a year.....	134
Table 9: Summary of included articles for mental ill-health, with sickness absence findings reported in terms of mean number of days to full return to work.	139

Table 10: Sickness absence costs for organisation 1 (NHS employer, year 2010 – 2011, average salary £71.18 per day, £25,980.70 per annum).....	150
Table 11: Sickness absence costs for organisation 2 (Public organisation employer, year 2014 – 2015; average salary £22,942.75.00 per annum).....	150
Table 12: Baseline socio-demographic data of all participants in organisation 1, those lost to follow-up and those remaining in the trial at post- and 3-months post-VR intervention measurement.....	156
Table 13: Initial Outcome Descriptive Statistics pre-VR intervention.....	157
Table 14: Job Satisfaction Scale (Warr et al., 1979) pre-VR intervention, at discharge and at 3-months post discharge.....	158
Table 15: GHQ-12 Pre-VR intervention – Binary Scale.....	159
Table 16: GHQ-12 pre-VR and at discharge mean scores for the ‘Cases’ identified pre-VR intervention.....	159
Table 17: GHQ-12 (Likert Scale) (Goldberg, 1972) pre-VR intervention, at discharge and at 3-months post discharge.....	160
Table 18: Patient Specific Function Scale (Stratford et al., 1995) pre-VR intervention, at discharge and at 3-months post discharge.....	160
Table 19: Total cost of sickness absence 12 months pre and post VR intervention.....	162
Table 20: 12-month pre and post VR intervention sickness absence data.....	162
Table 21: Sickness absence data pre- and post-VR intervention for employees with sickness absence < and > 6-months.....	163
Table 22: Costs of the VR service provided by the NHS Primary Care Trust.....	164
Table 23: VR service costs.....	170
Table 24: Sickness absence data for all employees from March 2013 – March 2015.....	172
Table 25: 3-months pre and post referral sickness absence data of employees attending the VR service n = 65.....	173
Table 26: Turnover rates.....	174
Table 27: Confidence grade definitions and rationale for selected optimism bias corrections for organisation 1 cost (HM Treasury et al., 2014).....	178
Table 28: Confidence grade definitions and rationale for selected optimism bias corrections for organisation 1 benefits. (HM Treasury et al., 2014).....	184
Table 29: Outcomes and benefits incorporated into the GM New Economy Manchester CBA tool.....	189
Table 30: Sensitivity analysis for sickness absence < 6-months of variable: predicted incidents.....	193
Table 31: Sensitivity analysis for sickness absence < 6-months of variable: deadweight.....	193
Table 32: Sensitivity analysis for sickness absence < 6-months of variable: retention rate.....	194
Table 33: Sensitivity analysis for sickness absence > 6-months variable: predicted incidence.....	195
Table 34: Sensitivity analysis for sickness absence > 6-months of variable: deadweight.....	195
Table 35: Sensitivity analysis for sickness absence > 6-months of variable: retention rate.....	196
Table 36: Scenario analysis for sickness absence < 6-months.....	197
Table 37: Confidence grade definitions and rationale for selected optimism bias corrections for organisation 2 cost. (HM Treasury et al., 2014).....	198
Table 38: Confidence grade definitions and rationale for selected optimism bias corrections for Case study 2 benefit 1 (HM Treasury et al., 2014).....	202
Table 39: Results of the normal distribution testing of the sickness absence data for mental health conditions.....	204
Table 40: Outcomes and benefits incorporated into the GM New Economy Manchester CBA tool.....	209
Table 41: Sensitivity analysis for sickness absence due to MSDs < 6-months of variable: predicted incidence.....	211
Table 42: Sensitivity analysis for sickness absence due to MSDs < 6-months of variable: level of engagement.....	211
Table 43: Sensitivity analysis for sickness absence due to MSDs < 6-months of variable: retention rate.....	212
Table 44: Sensitivity analysis for sickness absence due to MSDs < 6-months of variable: deadweight.....	213
Table 45: Sensitivity analysis for sickness absence due to mental health conditions < 6-months of variable: deadweight.....	214
Table 46: Sensitivity analysis for turnover: deadweight.....	214
Table 47: Sensitivity analysis for turnover variable: level of engagement.....	215
Table 48: Sensitivity analysis for turnover variable: retention rate.....	215
Table 49: Scenario analysis for sickness absence due to MSDs < 6-months.....	216
Table 50: Scenario analysis for turnover.....	217

II List of figures

Figure 1: Biopsychosocial Model.....	11
Figure 2: Diagrammatic representation of the 4 phases of this research project.....	15
Figure 3: Screening strategy with inclusion criteria i.e. SAW population, work-based intervention.....	52

Figure 4: The interconnection of Worldviews, Design and Research Methods (Creswell et al., 2003)	69
Figure 5: The GM New Economy Cost-benefit Analysis model (HM Treasury, Public Service Transformation Network, New Economy, 2014)	71
Figure 6: Diagrammatic representation of the 4 phases of this research project highlighting phase 1	80
Figure 7: Graphical representation of deadweight (calculating additionality) (employment example) (adapted from Source: Adapted from European Commission (2003) The Evaluation of Socio-Economic Development, The Guide, December European Commission, Directorate General for Regional Policy: Brussels, cited in McPherson & Inglis (2008)).....	102
Figure 8: Graphical representation of deadweight (sickness absence example) (adapted from Source: Adapted from European Commission (2003) The Evaluation of Socio-Economic Development, The Guide, December European Commission, Directorate General for Regional Policy: Brussels, cited in McPherson & Inglis (2008))	102
Figure 9: Diagrammatic representation of the 4 phases of this research project highlighting phase 2.....	112
Figure 10: Diagrammatic representation of the 4 phases of this research project highlighting phase 3	122
Figure 11: Diagrammatic representation of the 4 phases of this research project highlighting phase 4.....	124
Figure 12: Visual model for mixed-methods sequential explanatory design procedures. (Adapted from Ivankova et al., 2006).....	129
Figure 13: Diagrammatic representation of the 4 phases of this research project highlighting phase 1	131
Figure 14: Flow chart of study selection process	133
Figure 15: Flow chart of study selection process	138
Figure 16: Flow chart of study selection process	145
Figure 17: Flow chart of study selection process	147
Figure 18: Diagrammatic representation of the 4 phases of this research project highlighting phase 2	152
Figure 19: Patient Cohort organisation 1	155
Figure 20: Patient Cohort organisation 2.....	166
Figure 22: Diagrammatic representation of the 4 phases of this research project highlighting phase 3	177
Figure 23: Screenshot of CBA tool Costs tab for organisation 1	179
Figure 24: Implementing the CBA tool (Adjusted from HM Treasury et al., 2014).	181
Figure 25: Section of the CBA tool demonstrating the inputted figures for outcome: sickness absence < 6-months	187
Figure 26: Continued Section of the CBA tool demonstrating the inputted figures for outcome: sickness absence < 6-months.....	188
Figure 27: Screenshot of the CBA output metrics for combined outcomes organisation 1	190
Figure 28: Screenshot indicating the underlying calculation of the ROI results box	191
Figure 29: Screenshot of CBA tool Costs tab for organisation 2	199
Figure 30: Screenshot of benefits 1,2,3,4, 5 and 6 for organisation 2.	207
Figure 31: Screenshot of benefits 1,2,3,4 and 5 for organisation 2 continued.	208
Figure 32: Screenshot of the CBA output metrics for combined outcomes organisation 2.....	210
Figure 33: Diagrammatic representation of the 4 phases of this research project	219

III Acknowledgements

I would like to thank my supervisors, Margaret Coffey, Tony Syme and Christine Smith, for their consistent support, encouragement, feedback, advice and patience. I would also like to thank Julian Cox from New Economy for his advice, use of the model and sense checking of my work.

To my parents, Gail and Rae Brown, my partner Paul Baybut, and my family, friends and colleagues, who have all given me unwavering support throughout this journey, I would like to extend my thanks for their encouragement and faith over the years.

IV Declarations

The data included in this thesis for organisation 1 was collected during a joint research project in which I was the research assistant. As research assistant I contributed to the design of the project, including completing the ethics documentation and shaping the project to enable data relevant to cost-benefit analysis to be collected. My role involved me collecting, inputting and analysing the data and contributing to the write up of the final report.

V Abbreviations

A&E	- Accident and emergency
ACEOM	- American College of Occupational and Environmental Medicine
ATW	- Access to Work
BCR	- Benefit cost ratio
BHF	- British Heart Foundation
BIS	- Department for Business, Innovation and Skills
BSP	- Business Source Premium
CBA	- Cost benefit analysis
CBI	- Confederation of British Industry
CBT	- Cognitive behavioural therapy
CCA	- Cost consequence evaluation
CEA	- Cost effectiveness evaluation
CEEU	- Central Expenditure Evaluation Unit
CIPD	- Chartered Institute of Personnel and Development
CSP	- Chartered Society of Physiotherapy
CUA	- Cost utility analysis
DH	- Department of Health

DNA	- Did not attend
DWP	- Department for Work and Pensions
ECC	- Essentially contested concept
Eq-5D	- EuroQol-5 dimension
ESA	- Employment support allowance
EWPS	- Endicott Work Productivity Scale
FC	- Friction cost
GDP	- Gross domestic product
GHQ	- General Health Questionnaire
GM	- Greater Manchester
GP	- General practitioner
HC	- Human Capital
HLQ	- Health and Labour Questionnaire
HPQ	- The WHO Health and Work Performance Questionnaire
HR	- Human resources
HSE	- Health and Safety Executive
HWQ	- Health and Work Questionnaire
ICF	- International Classification of Functioning, Disability and Health
JSS	- Job satisfaction scale
LBP	- Lower back pain
LEP	- Local enterprise partnership
LFS	- Labour force survey
MRC	- Medical research council
MSD	- Musculoskeletal disorder
NI	- National insurance
NICE	- National Institute for Health and Care Excellence
NPE	- Net present efficiency
NPV	- Net present values
OECD	- Organisation for Economic and Co-operation Development
OH	- Occupational Health
ONS	- Office for National Statistics
OSP	- Occupational sick pay
PCT	- Primary Care Trust
PHQ	- Patient health questionnaire

PSFS	- Patient Specific Function Scale
PwC	- Price Waterhouse Coopers
QALYs	- Quality adjusted life years
RCT	- Randomised controlled trial
ROI	- Return on investment
RTW	- Return-to-work
SAW	- Stay-at-work
SF-6D	- Quality of Well-being Scale, the short form
SIGN	- Scottish Intercollegiate Guidelines Network
SPS-6	- Stanford Presenteeism Scale
VR	- Vocational Rehabilitation
VRCMs	- Vocational Rehabilitation Case Managers
WAI	- Work Ability Index
WCA	- Work capability assessment
WHO	- World Health Organisation
WLQ	- Work Limitations Questionnaire
WPSI	- Work Productivity Short Inventory
WoS	- Web of Science

Abstract

Sickness absence and presenteeism are estimated to cost the UK economy £100 billion a year. Vocational Rehabilitation (VR) has been advocated within the UK, and internationally, as an effective means to address ill-health within the workplace; however, there is a paucity of research exploring its cost-effectiveness. A robust economic model, using evidence-based assumptions would assist in developing an evidence-base, as well as enable organisations to assess the cost-effectiveness of VR services they utilise. Within the UK, there is no economic tool for evaluating VR for the employed population. This research adapted an existing cost-benefit analysis (CBA) model creating a new practical CBA tool able to capture and analyse the effects of VR from an organisational perspective.

A mixed methods explanatory sequential design, with two distinctly independently yet interactive phases was used. The quantitative phase consisted of three elements, firstly a systematic review to develop the outcomes in the CBA tool, namely sickness absence due to musculoskeletal and mental health conditions, presenteeism, and turnover. In order to develop these outcomes, new reference and intervention cases specifically for VR interventions were created using a mirror image of the traditional CBA model. Secondly, in order to generate data to test the new CBA tool, two pre-experimental repeated-measures within-group (time series) studies were conducted, exploring two in-house VR services, for employees with musculoskeletal and mental health conditions. Lastly, the new CBA tool was implemented and tested, and sensitivity and scenario analysis of the results were conducted. The qualitative phase consisted of an analysis of a focus group of VR service personnel to explore the practical utility of the new CBA tool.

This research produced a practical CBA tool, capable of analysing the costs and benefits of VR services. The scenario and sensitivity analysis indicated that in order for the CBA results to be robust sufficient sample sizes would be needed. Organisation 1's results (Net present value (NPV) = -£84,122.01, BCR = 0.05, n = 127) indicated that the VR service was not cost effective. Organisation 2's results (NPV = £4,940.61, BCR = 1.17%, n = 43) indicate that the VR service was cost effective. Organisation 1 did not include turnover data and had known errors in the sickness absence data, which may account for this difference. The CBA tool was well-received by the VR personnel (n = 4), indicating that it was user-friendly, would help with objectively assessing the economic value of VR in different settings, and assist service design through

identifying where to allocate resources. The new CBA tool is still in its early stages and can be developed further as the evidence-base in VR grows. This model lays the foundations for organisations to assess the costs/benefits of the services they provide or receive and for researchers to use in their economic evaluations of VR interventions.

1. Introduction

The introduction will outline the background and rationale for this research, the aims and objectives, an overview of the thesis, and the context in which the research is situated. This will be achieved firstly by providing a synopsis of the current costs and causes of sickness absence and presenteeism in the UK and internationally, thereby highlighting the need to manage ill-health effectively within the workplace. Secondly, an overview of the UK government policy and reforms within health and work is presented, summarising the national drivers to address sickness absence and presenteeism, and the growing advocacy for Vocational Rehabilitation (VR) as a means to achieve this. Thirdly, the rationale for using VR to address sickness absence and presenteeism will be explored. Following this the research aims and objectives will be outlined. And, lastly a brief overview of the thesis, synthesising the content in each chapter, and a description of the two VR services evaluated will be provided to give context to the thesis.

1.1 Background and Rationale

1.1.1 Current UK costs of ill-health within the workplace

Sickness-absence is defined as nonattendance at work, with the employee attributing this to sickness and the employer accepting it as such (Reetoo, Burrows, & Macdonald, 2009; Whitaker, 2001). Presenteeism is defined as employees choosing to attend work, whilst they are not well enough to be at work, and working at reduced productivity (Hampson, Soneji, Jacob, Mecu, & Mc Gahan, 2017; Aronsson, Gustafsson, & Dallner, 2000; Brown, Burton, Gilson, & Brown, 2014; Bergstrom, Bodin, Hagberg, Aronsson, & Josephson, 2009; Claes et al., 2011). Both sickness absence and presenteeism result in poor economic and health outcomes for organisations, individuals and society (Stevenson & Farmer, 2017; Chartered Institute of Personnel and Development (CIPD), 2014a; Black, 2008; Bevan, Passmore, & Mahdon, 2007). It is estimated that within the UK ill-health among working age individuals costs the economy £100 billion a year; moreover, employers face an annual bill of around £9 billion for sickness absence costs and turnover due to ill-health (Department for Work and Pensions (DWP) & Department of Health (DH), 2016; Black & Frost, 2011). Turnover is defined as ‘employees leaving and being replaced in the workforce’ (Hampson et al., 2017). In addition to the cost to the economy, sickness absence has a financial cost that society bears, ‘through costs to the

health service (estimated at £5–11 billion a year) and to the government directly through payment of benefits (£29 billion a year) and the loss of tax revenue (£28–36 billion)’ (Baker-McClearn, Greasley, Dale, & Griffith, 2010, p312), as well as losses to the employees in terms of reduced income (Stevenson & Farmer, 2017; CIPD, 2014a; Black, 2008). These costs of sickness absence are reflected internationally, with the European Foundation for the Improvement of Living and Working Conditions (2010) reporting an average rate of absence between 3% and 6% of working time, and estimating the cost of sickness absence in 27 EU member states and Norway as 2.5% of gross domestic product (GDP). According to the CIPD & Simply Health’s (2016) annual survey of absence management, the most common causes of short-term sickness absence are minor illnesses, such as colds, flu, upset stomachs, headaches and migraines, stress, musculoskeletal disorders (MSDs), mental health conditions and home/family/carer responsibilities. MSDs, back pain, mental health conditions, stress, and acute medical conditions are the top 5 most common causes of long-term sickness absence (CIPD & Simply Health, 2016). The term MSD is defined by the Health and Safety Executive (HSE) (2013) as ‘covering any injury, damage or disorder of the joints or other tissues in the upper/lower limbs or the back’ (HSE, 2013, N.P.). Mental health is defined by the World Health Organisation (WHO) (2018) as ‘a state of well-being in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community’ (p.1). Moreover, MSDs and mental health conditions are leading causes of global disability (Joyce, Modini, Christensen, & Mykletun, 2015; Hoy et al., 2014). The UK has faced a challenging economic climate in the last decade with the double dip recession in 2012 (Office for National Statistics (ONS), 2012a) and more recently the uncertainty surrounding the predicted impact of Brexit resulting in projections of the economy slowing down in 2017/2018 (Organisation for Economic and Co-operation Development (OECD), 2017). Thus, it is imperative that ill-health is managed effectively to reduce costs to the economy.

1.1.2 Current UK sickness absence and presenteeism statistics

Figures from two different Annual Surveys indicate a downward trend of the number of working days lost in the UK and working days lost per employee from 2003 to the present.

The ONS (2014) reported that the number of days lost in the UK in 2013 (131 million days) had decreased from the 1993 figure (178 million days). Similarly, the number of working days lost per employee had dropped from 7.2 days per employee in 1993 to 4.4 days per employee

in 2013. According to the ONS (2014) report 'Sickness Absence in the Labour Market' the number of days lost due to sickness absence remained constant in the 1990's and up to 2003 (ONS, 2012b), after which a decline was noticed until 2011, where numbers appeared to plateau. However, the plateau was not noticed in the CIPD's 2014(a) Annual Survey Report: 'Absence Management' which reported a decrease in the number of days lost per employee from 7.6 days in 2013 to 6.6 days in 2014. The differences in the reported sickness absence trends in the ONS and the CIPD may be explained by the fact that the CIPD relies on appropriate representatives within the responding companies to summarise sickness absence data, and also by the low number of respondents to the survey (n=518 organisations). Thus, whilst the figures differ, the trend towards decreasing sickness absence between 2003 and 2013 is broadly supported by both the CIPD and ONS. For the years 2014 and 2015 there was a slight increase in levels of sickness absence however, looking at the latest data from the ONS on sickness absence (137.2 million days) the overall trend of decreasing levels of sickness absence has continued (ONS, 2016). The CIPD & Simply Health Sickness Absence Annual Survey (2016) supported these findings, although giving slightly different figures. This survey reported the average number of days' absence per employee in 2016 as 6.3 days, a drop from 2013, where, according to their figures, it was 7.6 days per employee. This recent downward trend is also noted in the public-sector sickness absence figures reported: 2014: 7.9 days; 2013: 8.7 days; 2012: 7.9 days; 2011:9.1; 2010: 9.3 (CIPD, 2014a). However, there is still a notable difference in the amount of sickness absence between the public and the private sectors with public sector employees on average having 3 more days' sickness absence per year (CIPD & Simply Health, 2016). The Confederation of British Industry (CBI) (2013) estimates that if the public sector could decrease their sickness absence levels to those of the private sector it would save the taxpayer around £1.2 billion a year.

Although absence rates are decreasing overall, sickness absence due to mental health conditions has increased by 5% since 2009 (Stevenson & Farmer, 2017). This increase may be due to increased reporting and improved awareness of mental health (Hampson et al., 2017). Additionally, it is important to consider that low absence rates do not necessarily indicate good sickness absence management (Centre for Mental Health, 2011), nor better employee health, but might reflect job market pressures. Studies suggest that levels of presenteeism are increasing annually (Stevenson & Farmer, 2017). The focus on reducing absenteeism may possibly exacerbate presenteeism through the use of workplace absence management policies such as return-to-work (RTW) interviews and trigger points (Garrow, 2016). Presenteeism losses,

usually associated with reduced productivity, increased mistakes and lowering of the company standards (Garrow, 2016; Schultz & Edington, 2007, cited in Brown et al., 2014), ‘have been shown to incur 5.1 times more costs than those incurred for absenteeism’ (p.241). Moreover, presenteeism, is linked to an increase in future sickness absence (Bergstrom et al., 2009; Caverly, Cunningham and MacGregor, 2007; Hansen & Andersen, 2009; Hansson et al., 2006; Kivimaki et al., 2005; Schultz, Chen, & Edington, 2009; Schultz & Edington, 2007; all cited in Claes, 2011). On average, it is estimated that an individual with a mental health disorder will have an additional 8.0 days of reduced-qualitative functioning, and those with physical disorders an additional 3.5 days of reduced-qualitative functioning (De Graaf, Tuithof, van Dorsselaer, ten Have, 2012). The impacts of presenteeism are more pronounced when comorbidities are present (Holden et al., 2011), therefore, it is important when considering workplace health to be mindful of not solely focusing on sickness absence, which is easily measurable, at the expense of truly understanding the workplace health needs, potentially failing to proactively manage presenteeism (Stevenson & Farmer, 2017; Garrow, 2016; Cocker et al., 2014; Pauly, Nicholson, Polsky, Berger, & Shard, 2008).

1.1.3 Overview of UK government policy and reforms within health and work between 2005-2017

In 2005, the UK government published a strategy for the improving and maintaining the health of working age individuals, the ‘Health, work and wellbeing: caring for our Future’ (DWP, DH & HSE, 2005). Wellbeing, defined as thriving/functioning across multiple domains of life (Diener, Scollon, & Lucas, 2013, cited in Alder & Seligman, 2016; DH, 2014), is commonly used as an indicator of national progress beyond living standards, accordingly informing the design and assessment of public policies (Alder & Seligman, 2016; La Placa & Knight, 2014). The ‘Health, work and wellbeing’ strategy formed part of the wider welfare reform agenda that was outlined in the Government’s 2004 White Paper ‘Choosing Health: Making Healthier Choices Easier’ (DH, 2004). The drivers for this strategy were economic, because whilst the UK had successfully reduced accidents at work by 10% since 1997, at the time, an estimated 40 million working days were being lost per year to occupational ill health and injury, with an estimated cost of £12 billion, not including the impact on the health of the individuals, their families, the cost to colleagues and the overall impact on productivity across the economy (HM Government, 2005). In addition, it was noted that one third of individuals in receipt of the Incapacity Benefit had originally been employed. The aims of the strategy were to improve and

maintain the health and wellbeing of the working age population, and supporting individuals to remain or RTW and contribute effectively to society.

As a result of this strategy, sickness absence and health at work became a priority, and research into how to maintain a healthy workforce was commissioned. This led to Waddell and Burton (2006) independent review 'Is work good for your health and wellbeing?' The review concluded that there are 'economic, social and moral arguments that work is the most effective way to improve the wellbeing of individuals, their families and their communities' (p7). It can minimise harmful effects of long-term sickness absence, improve quality of life and physical and mental health, improve social inclusion and reduce poverty (Waddell & Burton, 2006; Waddell, Burton, & Kendall, 2008). There is a consensus, within the UK and internationally, that good work (i.e. work that is appropriate for the individual, fair and decent, allowing for the employee to develop and be fulfilled (Taylor, Marsh, Nicol, & Broadbent, 2017)) not only improves physical and mental health, it also promotes recovery and aids rehabilitation, and is protective of health (Royal Australasian College of Physicians, 2011; Black & Frost, 2011; Marmot, 2010; WHO, 2007; Waddell & Burton, 2006; Waddell et al., 2008).

In 2008, Dame Carol Black's report 'Working for a healthier tomorrow' identified various challenges for improving health at work. Challenges included: general practitioners (GP's) who do not feel adequately trained to offer advice to patients on how to remain in work or RTW; the sick note which focused on what could not be done, as opposed to what could be done; poor information and assistance for employers; and 'a weak and declining academic base, a lack of good quality data and a focus solely on those in work, which impedes the profession's capacity to analyse and address the full needs of the working age population' (p.16). Following the recommendations in this review, several initiatives were trialled, such as 'Fit for Work Service pilots'; 'OH advice services for small businesses and GP's'; and the 'fit note', a revision to the sick note which allows GP's to advise on whether an individual may be fit to work with light or alternative duties, was rolled out. Moreover, as the high costs of mental health were clearly documented, estimated to be £77 billion in England in 2002/03 (Sainsbury Centre for Mental Health, 2003), a supplementary report focusing on mental health and work (DWP, 2011) was commissioned alongside Dame Carol Black's review. The findings of this report (DWP, 2011) echoed the conclusions in Dame Carol Black's review as to interventions that appeared to be effective in assisting individuals with mental health conditions to RTW, such as early access to healthcare; and workplace education and support.

Concurrent to the Mental Health and Work report, and Dame Carol Black's review, Waddell et al.'s (2008) scientific review 'VR: What works, for whom and when?' assessed the evidence-base, synthesising 450 reviews and reports, on the effectiveness and cost benefits of VR. Waddell et al. (2008) define VR as "whatever helps someone with a health problem to stay at or RTW" (p.5), although definitions of VR vary, (see section 2.2.1.1), there is a consensus that VR follows the key principles of early rehabilitation, work-focused health-care and accommodating workplaces, which have been shown as effective strategies in RTW (Schaafsma et al., 2013; Higgins, O'Halloran, & Porter, 2012; Desiron, DeRijk, Van Hoof, & Donceel, 2011; Accident Compensation Corporation (2004), cited in Ellis et al., 2010; Schaafsma et al., 2010; Lambeek et al., 2010). Waddell et al.'s (2008) review provided practical suggestions on which VR interventions were likely to work, so as to inform policies around work and health. The review concluded that many aspects of VR are effective and cost effective. This conclusion was later supported with Black and Frost's (2011) review of sickness absence advocating VR as an effective means of addressing sickness absence, due to its multi-faceted bio-psychosocial approach.

The financial market crisis of 2007-2008 and ensuing global recession of 2008-2009 left the UK feeling the effects of deep recession into 2014 (UK Commission for Employment and Skills, 2014). Moreover, in 2010, the UK election resulted in the formation of a new coalition government; the Conservatives and Liberal Democrats replaced the previous Labour administration. The financial crisis and change in leadership in the UK resulted in policy changes not only encouraging the reduction of sickness absence and assistance of individuals to stay in work, but also providing a parallel reform to the benefit system, aimed at assisting individuals back into the workforce (UK Commission for Employment and Skills, 2014). The Welfare Reform Act of 2007, led to the Incapacity Benefit being replaced by the Employment and Support Allowance (ESA) (Clayton et al., 2010). Further reforms to the benefit system were planned, and the Universal Credit (UC) system was rolled out across the UK from April 2013, with ESA to be subsumed into this in 2017 (Parliament.uk, 2014a).

ESA is a two-tiered benefit linked to a Work Capability Assessment (WCA). The WCA, through focusing on a person's ability, discriminates whether individuals are unfit for work due to health conditions, fit for work, or with workplace adjustments able to RTW (Harrington, 2010). The result of the WCA impacts on the benefits received (Harrington, 2010). The

systematic review by Clayton et al. (2010) of UK studies into RTW initiatives, found that the introduction of WCA had a number of potential implications, with the evidence reviewed suggesting that the existing programme would need to be modified if it was to meet the complex needs of this population. Moreover, there have been a large number of complaints surrounding the results of the WCA and implementation of them (Citizens Advice Bureau, 2010). However, despite the criticism, as a result of the WCA, in 2014, according to a House of Commons Speaker (Mike Penning), 1 million incapacity benefit assessments have been conducted, resulting in 700,000 people been helped into work or looking for work (Parliament.UK, 2014b). The roll out of the UC has been on-going, and in 2017 every job centre had access to the UC. The target population of the UC differs between job centres, with some centres offering this to single unemployed individuals and other centres offering the UC to all claimants i.e. the full service. It is envisioned that by 2022 all claimants will be migrated onto the full service. The on-going roll out was evaluated in terms of the short-term impact on the labour market. The evaluation was limited to single unemployed individuals with no children and is a piece of work that is developing and being updated continuously. The latest 2017 results analysed data from 27,000 claimants across 94 offices. Preliminary results indicate that claimants on UC (63%) are more likely to have been in work at any point in the 6-months following the initiation of their claim than matched claimants on the Job Seekers Allowance benefits (59%) (DWP, 2017). However, the planned roll out has been criticised by a variety of individuals, such as Labour, SNP and Tory MP's, Dame Louise Casey, and Sarah Wollaston, chairwoman of the Health committee, stating that the system is flawed and calling for a pause to its roll out (Howarth, 2017; Butler, 2017). These flaws have resulted in some claimants being without money for 6 weeks, incurring rent arrears, losing their homes and in some cases becoming reliant on food banks (Watts, 2017). Following the criticism of the rollout, there was a vote in parliament calling on the government to pause the roll out of the UCs (Howarth, 2017), which prompted an emergency parliamentary debate on the 24th October 2017 (Parliament.uk, 2017). Following the debate, the decision was made to continue with the roll-out of Universal Credit.

When considering the health of the working population a key concern is that of the ageing workforce (Sundstrup et al., 2018). According to the DWP (2013) estimates, by 2024 nearly 50% of the adult population will be 50 years or over and many of these will leave work early due to ill health. This will have extensive consequences, both for the economy and individuals in terms of self-provision for later life (Sundstrup et al., 2018; DWP, 2013). In 2007, the UK government introduced reforms to the pension system, 'The Pensions Act 2007', increasing the

State pension age for men and women from 65 to 67 years between 2026 and 2028 and potentially further increasing it from 67 to 68 years between 2044 and 2046 (Gov.UK, 2014). The state pension age is regularly reviewed and these projections may change (Gov.UK, 2014). In addition to the raising of the retirement age, the mandatory default retirement age was phased out (Weyman, Wainwright, O'Hara, Jones, & Buckingham, 2012). However, when considering the retirement age increase, Marmot's review 'Fair Society, Healthy Lives' (2010), states that 'with the levels of disability shown, more than three-quarters of the population do not have disability-free life expectancy as far as the age of 68' (p.12). In light of the reality of an older working population, the knowledge that poor health is a barrier to extending working lives (Edge, Cooper & Coffey, 2017) and the evidence of ill-health increasing as one ages, the general health of the workforce needs to be maintained. This is alongside the need for effective services to be provided to assist those with injuries and ill-health to be active members of the workforce.

'Health at Work - an independent review of sickness absence', carried out by Dame Carol Black and David Frost (2011), explored ways in which the current sickness absence system could be changed to assist individuals to stay-at-work (SAW), reducing costs to the individual, organisations and society. The report recommended that expenditure by employers on services targeted at assisting employees to SAW, such as VR, should attract tax relief (Black & Frost, 2011). In 2013, the government released a response to this review, that was 'shaped to complement both health and welfare reforms and the growth agenda by introducing measures that directly supported people with health conditions to stay in work, whilst also addressing business concerns about the sickness absence system' (DWP, 2013, p.7). The plans were multi-tiered, focussing on: improving sickness absence management within organisations; supporting health care practitioners in assisting individuals to stay in work; introducing a Health and Work Assessment and Advisory Service (in 2014) to make occupational health (OH) more easily available; to save employers money on statutory sick pay and increase productivity; and reforming the benefits available to job seekers and those off work due to ill-health (DWP, 2013). In addition, the government outlined a commitment to assist individuals to SAW thereby limiting the number of people falling out of work and on to benefits. Improving the health of the workforce was re-emphasised, as well as plans for future foci such as addressing the health and resilience of the ageing workforce and preparing the youth for entering the workforce (DWP, 2013). The response was further elaborated on in the report: 'Improving health and work: changing lives, the Government's Response to Dame Carol Black's Review of the health

of Britain's working-age population' (DWP & DH, 2013). In this response, the government outlined the strategies for support they will put in place, namely;

- Creating new perspectives on health and work; through educating GP's; providing an electronic fit note; introducing health, work and wellbeing co-ordinators; and forming a National Centre for Working Age Health and Wellbeing.
- Improving work and workplaces; through providing a business health check tool; developing a national strategy for mental health and employment; expanding NHS Plus, which currently looks at developing clinical and OH standards; providing an OH Help line for smaller businesses; and providing a challenge fund for innovative workplace health approaches.
- Supporting people to work; through piloting early interventions; and improving and changing Access to Work.

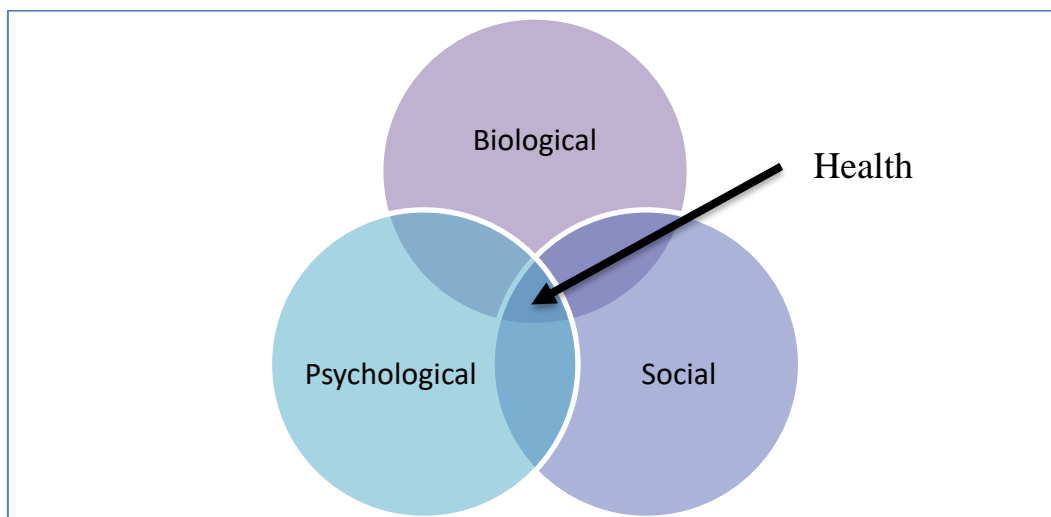
Building on these reforms, the Work, Health and Disability Green Paper 2016 (DWP & DH, 2016) was presented to parliament and opened out to consultation. The green paper contains policies aimed to address the current inequality within the workplace regarding disabled employees. The paper highlights the current situation i.e. only 48% of disabled individuals are in employment as opposed to 80% of the non-disabled population. The paper outlines the need for change and the various agencies within which change needs be implemented e.g. employers, health-care providers, and employers. Moreover, it proposes solutions to the identified problems and inequalities. In response to this Green Paper consultation, and a number of related consultations and reviews, Improving Lives: the future of Work, Health and Disability (DWP & DH, 2017) outline the government strategy to meet the vision of one million more disabled people in work within the following ten years. The strategy highlighted the importance of preventing ill-health resulting in unemployment i.e. assisting people to SAW. Moreover, it outlined the need for all individuals accessing support regardless of their health condition, ensuring the mental health conditions and MSDs are a key part of their programme (DWP & DH, 2017). The Improving Life's: the future of Work, Health and Disability (DWP & DH, 2017) paper groups VR services under the umbrella title of OH, and as part of the strategy, is the vision of early access to occupational/vocational support for all employed individuals, reducing the risk of people falling out of work (DWP & DH, 2017).

1.1.4 Rationale for using Vocational Rehabilitation as an intervention to reduce sickness absence and presenteeism

Sickness-absence and presenteeism behaviour are influenced by a variety of factors; personal motivations, workplace and societal (Sheppard & Frost, 2016; Yeomans, 2011; Chatterji & Tilley, 2002). To address the multifaceted nature of sickness-absence, VR's bio-psychosocial approach, i.e. considering the individual, their health problem and the social aspects impacting on their health (Waddell, 2002), has recently been advocated as an effective intervention in the UK for sickness-absence (DWP & DH, 2017, Black & Frost, 2011; Boorman, 2009; Carroll, Rick, Pilgrim, Cameron, & Hillage, 2009; Waddell et al., 2008). VR is widely adopted internationally as an intervention to assist in aiding employees to SAW, with international research on the definition of VR drawing on practitioners from: Africa, the Americas, Eastern Mediterranean, Europe, South-East Asia, and Western Pacific (Escorpizo, Finger, Glassel & Cieza, 2011a). VR concepts such as inclusive rehabilitation, early intervention, prevention of ill-health, employer engagement and responsibility in RTW, case management and effective multi-disciplinary teams are well established in a number of European countries namely: Austria, Denmark, Germany, Sweden, Finland, and Norway (Belin, Dupont, Oules, Kuipers, & Fries-Tersch, 2016; Matthews et al., 2013; Wells, 2016; Burstrom, Nylén, Clayton, & Whitehead, 2011; European Foundation for the Improvement of Living and Working Conditions, 2009). Belgium, France, Iceland, Italy, Luxembourg, Switzerland and the UK although having well-established frameworks for rehabilitation and RTW are limited in the co-ordination and implementation of RTW processes (Belin et al, 2016). However, recent developments and policies within the UK imply a recognition of the need for integrated and comprehensive RTW approaches (Belin et al, 2016). A commonly accepted definition of VR is 'whatever helps someone with a health problem to SAW, return to and remain in work: it is an idea and an approach as much as an intervention or a service' (Waddell et al., 2008, p.5) (see section 2.2.1.1. for further discussion on the definition of VR). In light of the multi-faceted underpinning biopsychosocial model and all-encompassing definition of VR, a VR service may include a number of different elements or interventions following the same key principles of early rehabilitation, work-focused health care and accommodating workplaces (Schaafsma et al., 2013; Higgins et al., 2012; Desiron et al., 2011; Accident Compensation Corporation, 2004, cited in Ellis et al., 2010; Schaafsma et al., 2010; Lambeek et al., 2010). Examples of interventions or elements included in VR are case management, liaison with the workplace, workplace modifications, physical or mental health care treatments. The bio-psychosocial model's graphic representation (see Figure 1) implies equal weighting across all spheres,

however, this does not account for the fact that ill-health is transient and changing over time, thus the relevance and influence of each domain can vary between patients and as the disease/condition progresses (Jull, 2017).

Figure 1: Biopsychosocial Model



A recent critique of the bio-psycho-social model is that it tends to focus interventions, and subsequently research, on the individual risk factors, as opposed to considering the wider systemic influences such as compensation/benefits systems, ‘lack of role clarity for relevant personnel, poor co-ordination of RTW activities, lack of knowledge and understanding of standard procedures, poor communication and conflicting demands from other stakeholders’ (Bartys, Frederiksen, Bendix, & Burton, 2017, p. 907). In spite of these critiques, currently the bio-psycho-social model underpins VR practice (Bartys et al., 2017).

Following Waddell and Burton’s 2008 review, in 2012, the government commissioned a rapid review of the evidence into the effectiveness of interventions for people with common health conditions in helping them stay in work or RTW. This review ‘Quantifying the effectiveness of interventions for people with common health conditions in enabling them to stay in or return to work: A rapid evidence assessment’ (Dibben, Wood, Nicolson, & O’Hara, 2012), found that the evidence-base on work-related interventions for this population had not changed significantly since 2008. The review similarly highlighted the limitations of the current evidence-base on work-related interventions, namely: limited studies incorporating robust employment outcomes; few cost-benefit analyses (CBA’s) of work related interventions; and

although a well-established intervention internationally, particularly in Germany, Denmark, Austria and Scandinavian countries (Belin et al, 2016), there is restricted research into work-related interventions conducted within the UK (Dibben et al., 2012). The best evidence of cost-effectiveness was for multidisciplinary, workplace-based interventions for MSDs, notably for employees with lower back pain (LBP) (van Vilsteren, et al., 2015; Dibben et al., 2012). MSDs result in 8.3 million working days lost per annum in the UK, with an estimated 2.8 million of these due to LBP (HSE, 2014). Reasonably strong evidence for positive work-related outcomes was reported for VR, workplace rehabilitation and cognitive behavioural therapy (CBT) for LBP (Dibben et al., 2012). Concerning mental health, Dibben et al. (2012) reported reasonably strong evidence for the effectiveness of psychological interventions for depression and supported employment for people with severe mental health conditions. However, the review of Van Vilsteren et al.'s (2015): 'Workplace interventions to prevent work disability in workers on sick leave' concluded that the evidence for the effectiveness of workplace interventions on mental health is low and does not show an effect.

Waddell et al.'s (2008) review concluded that best practice case studies of VR in the UK indicate that VR is effective, and with the limited economic analyses included in these case studies, it points towards VR being a cost-effective intervention. However, within the hierarchy of evidence, case studies are considered to be of a lower quality, limiting the ability to draw robust conclusions from them, therefore, highlighting that further high-quality research into the cost and benefits of VR interventions within the UK is necessary (Waddell et al., 2008). This was supported by Dibben et al. (2012) who summarised the gaps in the VR evidence, with one of the key gaps being quantitative data for employment outcomes, especially those with costs, as currently it is difficult to provide an economic case for the interventions due to a lack of data. When considering international evidence on sickness absence and interventions to address this, the generalisability to the UK context needs to be borne in mind. Internationally, sickness absence definitions vary in terms of causes recorded -for example some countries include maternity leave as sickness absence; lengths of absence recorded, as well as in some countries estimates are made either on the stated days of absence or the potential number of working days lost (Gimeno et al., 2014; European Foundation for the Improvement of Living and Working Conditions, 2010). The sources of absenteeism figures may also vary between countries, with the two main sources being health insurance statistics or surveys of employers or individuals (European Foundation for the Improvement of Living and Working Conditions, 2010). Both sources limit comparability, as insurance statistics may be missing shorter absences where no

claims were made, and surveys may include incorrect estimates or vary across countries; for example in Norway a doctor's certificate is not needed for the first 14 days of sickness absence (Pichler, 2014) whereas in the UK a doctor's certificate is required after 7 days and in Germany after 4 days (Gimeno et al., 2014; European Foundation for the Improvement of Living and Working Conditions, 2010). These factors limit the comparability of international sickness absence data. In respect of interventions to address sickness absence, there are a number of extraneous variables that may impact on the generalisability of international studies to the UK context such as international variations within sickness absence policies and pay regulations (Pichler, 2014; Barmby, Ercolani, & Treble, 2002), access to healthcare and OH, characteristics of populations (Gimeno et al., 2014), and attitudes towards sickness absence (Holmas, Dahl, Skjeret, 2008). Moreover, there is variability within the UK itself with regards to employee access to OH and VR services (Black & Frost, 2011), and population characteristics. Thus, although studies suggest VR may be an effective solution to addressing sickness absence, more research is needed, in the UK context, to be able to draw robust conclusions (Van Vilsteren et al., 2015; Dibben et al., 2012; Waddell et al., 2008), and establish cost effectiveness.

1.1.5 Summary

Within the UK, the health of the workforce remains a national priority (DWP & DH, 2016; DWP & DH; 2013; Black & Frost, 2011), with the added considerations of the ageing workforce (Edge et al., 2017; Marmot, 2010), and increased numbers of individuals with disabilities or injuries being assessed as fit-for-work (Parliament.UK, 2014a). Sickness absence and employee ill-health has far-reaching economic/financial repercussions for the individual, the employer and society (Stevenson & Farmer, 2017; CIPD, 2014a; Black, 2008; Bevan et al, 2007). It is imperative therefore, that effective and cost-effective interventions are used to enable employees to be active contributors to the workplace, reducing sickness absence and presenteeism. VR has been advocated, internationally and within the UK, as an effective means to reduce sickness absence and presenteeism (Black & Frost, 2011; Boorman, 2009; Carroll et al., 2009; Waddell et al., 2008), this has resulted in an increasing number of employers in the UK using VR services/approaches, as well as the DWP and DH recommending VR as part of a wider national 10-year strategy to increase the employment levels of individuals with disabilities (DWP & DH, 2017). However, the evidence of its cost effectiveness is limited (Dibben et al., 2012; Waddell et al., 2008). In today's economic climate it is imperative to evaluate the costs and benefits of all interventions implemented so as to ensure the best use of

scarce resources (HM Treasury, 2011). Moreover, the financial implications of health interventions for employees are valued by decision makers (van Dongen et al., 2013). Yet according to van Dongen et al.'s (2013) review, decision-makers' economic evaluation skill sets are lacking and decisions are often made without consulting the literature. Therefore, in the current UK context it is important that organisations are supported to determine the cost-benefits of their investments without relying on academic support or costly research budgets (Burton, 2010). Thus, it is imperative that a practical tool that is easily used by the lay person is produced to economically evaluate interventions aimed at improving employee health and reducing sickness absence and associated costs in the UK working age population.

1.2 Research aims and objectives

1. To develop economic outcomes, to be used within an existing CBA model, in order to ascertain the efficacy of a practical CBA tool in evaluating the costs and benefits of VR interventions and services.
2. To implement and explore the practical application of the revised CBA tool, including the developed outcomes, using data from two VR services.

Objectives:

Phase 1:

1. To identify from the published literature the outcomes of VR interventions for organisations and employed individuals.
2. To revise the GM New Economy CBA model to ensure that the practical CBA tool developed is capable of analysing the costs and benefits of VR interventions.

Phase 2:

3. To collect the relevant data required to populate the revised practical CBA tool from two VR Services and the organisations to which VR is provided.

Phase 3:

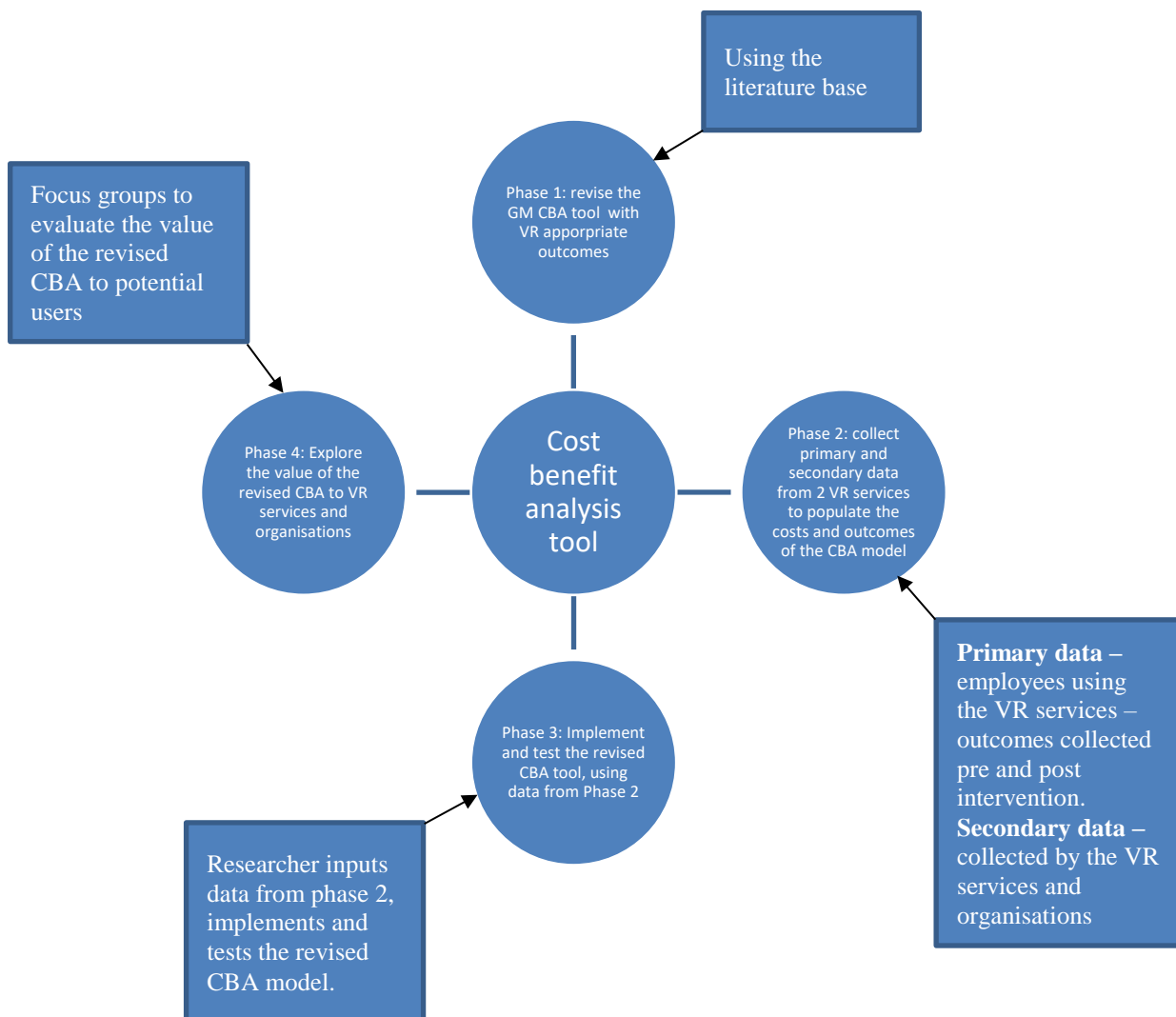
4. To implement and test the revised practical CBA tool incorporating the developed outcomes to identify the cost-benefits of the VR interventions and services in a real-world setting.

Phase 4:

5. To appraise the value of the revised practical CBA tool to the VR provider and the organisation to which VR is provided.

Figure 2 provides a visual representation of the four phases of the research and the sources of data used in each phase.

Figure 2: Diagrammatic representation of the 4 phases of this research project



1.3 Overview of the thesis

The aim of this thesis is to adapt and develop an existing CBA model into a practical economic tool capable of assessing the cost and benefits of VR for employed individuals with physical and mental health conditions, which could be used by organisations and researchers alike.

Currently within the UK there is no practical, user-friendly economic tool for clinicians and/or researchers to use. The development of such a tool would facilitate advancing the evidence-base for the cost effectiveness of VR, which is of high social relevance. This is the first CBA tool of this nature focused on capturing the costs and benefits of VR services for the SAW population, laying the foundation for future research and practice.

In order to develop the existing CBA model, to enable it to capture the costs and benefits of VR for employed individuals, the research was divided into four phases which were completed sequentially. This thesis has been organised into six chapters. The first two chapters, the introduction and the literature review, provide the background, rationale, context and overview of the evidence-base for the thesis. The next three chapters, the methodology, results, and discussion, outline the relevant information for each of the four phases in turn. And lastly the conclusion and recommendations chapter summarises the key findings from the research. An outline of the next five chapters follows.

Chapter 2 explores the literature underpinning the thesis. It draws on the evidence-base to develop an understanding of the current influences on the use of economic analyses within VR for the working population, such as the definition of VR, and the patterns, causes and consequences of sickness absence and presenteeism. It lays the foundations for this research through describing the different economic evaluation models and rationalising the choice of a CBA model for this research. It also summarises the evidence-base for the cost-effectiveness of VR for employees who are either off work or struggling to SAW. This review of the evidence identifies the gaps in the literature that a practical economic tool, such as the CBA tool developed in this thesis, would help to address.

Chapter 3 critically discusses and outlines the methodology used in each phase of this study. The chapter first explores the philosophical assumptions of the research, as this informs the choice of research philosophy/paradigm and ultimately the chosen methodology. It then

provides an overview of the existing model which forms the basis of the new CBA tool. This enables the reader to contextualise the methodology of each phase. The methodology for each phase is then discussed in turn.

In phase 1 the outcomes to be included in the new CBA tool are identified, namely: sickness absence due to MSDs and mental health conditions, presenteeism and turnover. Following this, the methodology to adapt an existing CBA model so that it is capable of including these outcomes is outlined. This includes identifying new reference and intervention cases, establishing the net effectiveness VR and the unit costs, and calculating the counterfactual, i.e. what would happen if the intervention was not in place, for each outcome. In order to calculate these components of the outcomes, the traditional CBA model was flipped, creating a mirror image. The utilisation of a CBA tool in this manner is unique to this thesis and is described in this chapter.

The findings from Phase 1 informed Phase 2 in terms of the relevant data to collect. Phase 2 evaluates two in-house VR services in two separate organisations. This section of Chapter 3 outlines the aims and research methodology of each evaluation.

Chapter 3 then outlines the methodology for phase 3, which uses the data collected from the two VR service evaluations to run and test the new CBA tool. And lastly, the methodology for phase 4, a focus group to ascertain the usability of the CBA tool within the commercial context, is described.

Chapter 4 presents the results from each phase in detail, clearly showing how the results from each phase inform the next.

Chapter 5 discusses the research in relation to the outlined objectives, considering the evidence-base and findings from this research. The possible implications of the findings on VR practice and further research are highlighted.

Chapter 6 concludes the thesis by summarising the key findings and putting forward recommendations for future research and practice, as well as acknowledging the limitations of this research.

1.4 Description of the two VR services (organisation 1 and 2) researched within this project

This section provides a description of the two VR services (organisation 1 and 2) used in the organisations so as to provide a reference for the PhD.

1.4.1 Organisation 1

Organisation 1 was a Primary Care Trust (PCT) in the North-West of England that was piloting a new in-house VR service between 2010-2012. As the VR service formed part of a trial of a new VR model, it was limited to MSD conditions only. The main aims of the service were to reduce sickness absence in employees who were off work with MSDs and enable employees who were struggling at work due to an MSD to stay in work, which was anticipated would result in a decrease in sickness absence costs. Additional aims of the service were to increase employees' job satisfaction and mental health. By meeting these aims, it was hypothesised that the service would lead to improved efficiency and effectiveness of the NHS staff within the Primary Care Trust, resulting in improved quality of health-care and patient satisfaction of patients being treated within the PCT.

This service used a VR worker-centred model for employees with MSDs, incorporating the following elements of VR:

- Case management, liaising with the workplace (line managers, HR, OH), liaising with and referral to GP's and other health care professionals such as counselling and podiatrists as required.
- Bio-psychosocial work focussed assessments, conducting workplace assessments and functional capacity evaluations where required.
- Accommodating workplaces in terms of temporary work modifications.
- Providing quick access to physiotherapy treatment, offering appointments at flexible times to accommodate shift workers.
- On-going support via telephone or email to facilitate a sustained RTW.
- Promoting and encouraging healthy workplace practices and physical activity.

The service was provided by a specialist occupational physiotherapist, with the capacity to refer patients to the outpatient physiotherapy team where appropriate. In addition, the VR service,

through introducing workplace health champions, encouraged healthy workplace practices such as increasing physical activity at work.

1.4.2 Organisation 2

The VR service is an in-house service for a national organisation. The organisation provides employment services and specialist support for employees with disabilities. This VR service is for all health conditions as opposed to organisation 1 which was solely for MSDs, and thus there are more facets to the service which will be detailed.

The VR service was set up in 2010 as a pilot in 2 regions of the UK and was rolled out nationally in August 2011. The purpose of the VR service is to provide services commercially outside of the organisation, as well as providing an internal service. The service was introduced internally in response to criticisms of their previous VR providers, who: focused on the medical view point and thus did not provide appropriate workplace information for line-managers to assist employees to RTW; did not adequately address concerns which resulted in re-referrals; and the wait for reports was too long. In addition, an in-house service made sense, as: having an external provider of VR resulted in extra work for managers and HR; an external organisation was unable to ensure that adjustments were implemented; an in-house service would have internal knowledge of the business and who to contact to resolve issues; ergonomic assessments provided by Access To Work (ATW), took a long time, delaying a possible RTW; and lastly, it was thought to be a more cost-effective way of providing VR.

The VR service consisted of 10 VR Case Managers (VRCMs) who are internal to the organisation and 14 associates (contract VR case managers). Of the 10 internal, 5 VRCMs were dedicated to the organisations internal contract.

The VR service aims to support the health of employees, providing advice to line-managers and employees on how to enable the employee to continue to work or RTW whilst considering their health condition and/or disability. This is achieved through assessments with the employees, discussions with the line managers, and liaising with medical professionals such as GP's and consultants.

Additionally, the service has an external OH provider to whom employees are referred to if:

- The employee is not aware or not sure of their condition, health, prognosis and they have not been to see a consultant or their GP.
- Medical confirmation is required to enable the VRCMs to consider medical retirement.
- The individual does not want to be assessed by an employee of the organisation.

Following the assessment and above actions, a report with an action plan recommending adjustments or interventions is produced and provided to the line manager. If necessary, VRCMs will attend RTW meetings with the line manager and employee in order to mediate. In addition, if an employee is suffering from continuous ill-health and it is considered by both the employees GP and the VRCM that the employee is unlikely to RTW within 5 years, an employee may be retired on medical grounds.

Examples of adjustments or interventions that may be recommended are:

- Work station assessment
- Phased RTW
- Changes to working arrangements e.g. adjusted or changed role, working hours, break arrangements, start/finish times, the place of work or environment
- Modifications to the workplace and/or equipment
- Additional training or coaching
- Physiotherapy
- Support worker, reader or interpreter
- Additional supervision or support from a colleague
- Travel to work support
- Mediation or RTW meeting
- Mental health support services
- Counselling and/or EAP intervention
- Support groups, websites
- Liaison with support workers and/or families
- Job demands analysis
- Dyslexia assessments
- HR liaison
- Conference calls
- Advice and guidance

The most common of these adjustments has been a phased RTW. It was reported that approximately 50% of the referrals to the service were off-sick, and that they all had a phased RTW in their action plan. The organisation had a workplace adjustments policy.

The referral process was that employees were referred by line managers to Human Resources (HR) following a trigger, namely: having been continuously absent for four weeks, having had frequent short-term absences, or having difficulties at work due to a health condition or disability. Alternatively, a request can be made by an employee, as recommended in the 'People Handbook' if an employee is feeling stressed. Each case is reviewed by the HR business partners, and if appropriate, referred to the service. At this point the service would allocate a VRCMs. At the time of the study there was no ability to self-refer into the service. The referral was acknowledged by the administration team. The VRCM would conduct the triage within seven days. A face to face assessment or telephone assessment was subsequently undertaken within seven days of the triage, and a report was produced within five days of the assessment. Each case was labelled as basic, intermediate or complex. The number of assessments and weeks of case management was determined by this classification.

- Basic (one telephone assessment and 8 weeks case management)
- Intermediate (one telephone or face to face assessment and 12 weeks case management)
- Complex (one face to face assessment and 16-26 weeks case management)

Each case was reviewed every 2 weeks.

In addition, the VR service provided the following services to the organisation:

- Advice and guidance on specific workplace adjustments
- Health promotion, through health awareness days
- Organisation of workplace assessments via a private supplier of ergonomic and posture equipment and/or Access to Work, a DWP scheme to support employees with disabilities

2. Literature review

2.1 Introduction

The literature review will firstly identify current influences on the use of economic analyses within VR for the working population. This will be achieved by discussing the difficulties in defining VR, proposing that VR is an essentially contested concept (ECC), outlining what a VR approach is and discussing the differences between OH and VR; reviewing sickness absence and presenteeism, the patterns, causes and consequences; and exploring the use of VR as an intervention to address sickness absence and presenteeism. Secondly, it will outline the different economic evaluation models, and explore the cost effectiveness of VR interventions for employed individuals/employees who are either off sick or struggling to SAW. This will form the main body of the literature review, in line with the aim of the research project, and will be achieved through examining the evidence of the cost-effectiveness of VR for the SAW population; the evidence of the use of CBA in VR, in the SAW population; and through examining the evidence-base for the cost-effectiveness of various workplace interventions that VR may draw on to enable an employee to RTW or SAW.

2.2 Current influences on the use of economic analyses within VR for the working population

The following section explores the concept of VR, grappling with its definition, proposing that VR is an ECC, discussing who provides VR, and providing an overview of the overarching aim and approach of VR for the employed population and, lastly it discusses the differences/similarities between VR and OH.

2.2.1 Vocational Rehabilitation

The following search strategy was used to identify articles to inform the discussion on the definition of VR. The following databased were searched: EBSCO host: Including Medline, Business Source Premium, Academic Search Premier, Sports Discuss and Cinahl; Web of Science (core database), OVID host: including Psychinfo, HMIC, Ovid Medline; Cochrane. In addition, citation tracking was utilised. Key terms: Vocational Rehabilitation, Define, Definition, Defined, Definition of meaning, theoretical models, practitioners. Limitations applied: publication year 2007 – 2017, academic journal article.

2.2.1.1 Definition of VR

VR, although gaining attention both in government and private sectors over the last decade, is a term that is commonly misunderstood within the UK and internationally (Langman, 2012; Escorpizo et al., 2011b). The DWP defines VR as ‘a process to overcome the barriers that an individual faces when accessing, remaining or returning to work after an injury, illness or impairment. This process includes the procedures in place to support the individual and/or employer or others (e.g. family and carers), including help to access VR and to practically manage the delivery of VR.’ (DWP, 2004, p.14). Waddell et al. (2008) define VR as ‘whatever helps someone with a health problem to SAW, return to and remain in work: it is an idea and an approach as much as an intervention or a service’ (p.5). The VR Association (VRA) further expands and clarifies the definition of VR defining VR as ‘any process that enables people with functional, physical, psychological, developmental, cognitive or emotional impairments to overcome obstacles to accessing, maintaining or returning to employment or other useful occupation’ (VRA, 2013, p. 7). These definitions have relied on ‘perceived main activity, not bounded by reference to organisational or individual accreditation, qualification, skills or any legislative framework’ (Langman, 2012, p. 9). This is due to the fact that there are currently no mandatory organisational or individual accreditation requirements specifying VR practitioner standards (Langman, 2012). In 2014, the VRA produced a document outlining the VRA Standards of Practice; however, as yet there is not a legal requirement for VR practitioners to follow these.

When analysing commonly accepted definitions of VR, within the UK, namely those from the: DWP, 2004; National Institute of Health and Care Excellence (NICE), 2009b; VRA, 2013; and Waddell & Burton, 2008 (see Table 1) it is apparent that the definitions describe a process, or a set of activities, with the common goals of gaining or maintaining employment. Whilst these definitions provide an umbrella term, they do not clarify which underpinning processes are involved, or provide a theoretical model.

Table 1: Definitions of Vocational Rehabilitation

Source	Definition
Fadyl, Mcpherson, Nicholls (2015)	‘In the context of health care, VR refers to practices directed at enabling people who are experiencing work disability (either pre-existing or due to current illness or injury) to obtain and maintain work or employment. When and how VR occurs, and the details of what it entails are specific to the historical and cultural context in which it is situated’ (p.506)
VRA (2013)	‘Any process that enables people with functional, physical, psychological, developmental, cognitive or emotional impairments to overcome obstacles to accessing, maintaining or returning to employment or other useful occupation’ (p.7).
NICE (2009b).	‘This involves helping those who are ill, injured or who have a disability to access, maintain or return to employment or another useful occupation. It may involve liaison between OH, management, human resources and other in-house or external facilitators. It may result in transitional working arrangements, training, social support and modifications to the usual tasks’ (p.47).
Waddell et al. (2008)	‘Whatever helps someone with a health problem to SAW, return to and remain in work: it is an idea and an approach as much as an intervention or a service’ (p.5)
DWP (2004)	‘A process to overcome the barriers that an individual faces when accessing, remaining or returning to work after an injury, illness or impairment. This process includes the procedures in place to support the individual and/or employer or others (e.g. family and carers), including help to access VR and to practically manage the delivery of VR.’ (p.14)

Moreover, VR has expanded from historically focusing on gaining employment for individuals with health conditions, to including enabling the employed population to SAW (American College of Occupational and Environmental Medicine (ACOEM), 2006). Correspondingly, the spectrum of ways of delivering VR has increased as individual services use elements of existing VR activities to design their own practices for their specific target population. Thus, as VR has evolved, it has been suggested that it is now more appropriate to refer to it as an approach where ‘there is a wide spectrum of VR approaches that vary by type and intensity’ (Waddell, et al., 2008 p. 12).

In 2012, 23 international experts developed a set of ‘activity and participation’ categories highlighting target areas for VR interventions (Finger et al., 2012). The categories include traditional work domains (e.g. undertaking multiple tasks); non-traditional work domains (e.g. toileting and dressing); and environmental factors (e.g. support for people, including for example technology, drugs policies and systems). The Core Set was developed using the International Classification of Functioning, Disability and Health (ICF) conceptual framework,

to provide a much needed ‘common language among clinicians, researchers, insurers, and policymakers in the implementation of successful VR’ (Finger et al., 2012, p. 429). Due to the complexities of VR it is questioned whether the ICF model has sufficient work specific categories and personal factor categories to adequately capture the VR experience (Finger, de Bie, Selb, & Escorpizo, 2016). Finger et al. (2016) mapped VR concepts from the literature and a focus group to the ICF model. In doing this the authors enriched the model with VR specific constructs, however, it is acknowledged that further work is required to explore personal factors related to VR. Moreover, exploration of themes complementary to the ICF such as wellbeing and quality of life is needed (Finger et al., 2016).

During the Core Set’s development, it was noted that although there is a common understanding of VR, ‘there is no common definition of VR at the conceptual level’ (Finger et al., 2012, p.436). This lack of a definition at the conceptual level makes evaluating the effectiveness of VR interventions problematic, particularly when we consider the Medical Research Councils’ (MRCs) guidance (Craig, Macintyre, Mitchie, Nazareth, & Petticrew, 2008) which recommends that health interventions are generally described fully, so that they can be implemented properly for evaluation purposes and replicated by others. Moreover, the MRC (Craig et al., 2008) assert that the intervention should have a coherent theoretical basis, and that this theory is systematically used to develop the intervention, highlighting the importance of having a theoretical model.

Considering the above, it could be argued that VR is an essentially contested concept (paper in preparation) i.e. ‘a group of concepts exist which inevitably leads to endless disputes about the proper meaning of these concepts’ (Choi & Majumda, 2014, p 363). Should this be accepted, this would validate various interpretations and adaptations of practice, and emphasises the need to clearly describe interventions when researching VR.

Using the above outlined current definitions of VR, it can be concluded that it is a process of assisting those who have been sick or injured to RTW using any relevant intervention, such as case management of individuals, prevention of injury or illness in the workplace, or providing healthcare to staff as part of absence management (Irving, Chang, & Sparham, 2004). It must also be acknowledged that VR has different meanings to different stakeholders (DWP, 2004). According to Irving et al. (2004) some individuals take a narrower definition of VR, separating VR from medical rehabilitation, and focusing solely on assisting individuals to return to

employment, following the accepted hierarchy of occupational outcomes. The hierarchy of outcomes refers to placing the potential VR outcomes in a hierarchy of desirability, and they are pursued in sequence. The hierarchy of outcomes are:

- The same job, with the same employer
- A modified job with the same employer
- A different job, with the same employer
- The same job, with a different employer
- A modified job, with a different employer
- A different job, with a different employer
- Vocational and/or academic retraining (Kendall & Thompson, 1998, cited in Waddell et al., 2008).

The range of VR practitioners (considered below), and VR theoretical models further complicate the definition of VR.

2.2.1.2 VR practitioners

As VR uses a multidisciplinary approach (Gobelet, Luthi, Al-Khodairy, & Chamberlain, 2007), VR practitioners are drawn from a diverse range of professional and disciplinary backgrounds such as case managers, occupational therapists, employment retention officers, physiotherapists, and GP's. Langman (2012) proposes that these can be viewed as 'core' and 'non-core' practitioners. Core practitioners are defined by Langman (2012) as: 'practitioners from a range of disciplinary backgrounds and in a variety of activities, spend the whole or substantial part of their time in working with disabled people, or with service delivery staff, with the aim of individuals securing or retaining employment or self-employment' (p.10). Whereas non-core practitioners spend some time assisting employment or retention, this is only part of their work (Langman, 2012). This split in practitioners contributes to the wide spectrum of approaches falling under the umbrella of VR.

Although there appear to be two strands of VR practitioners, there are commonalities across both: the goal of returning to or retaining employment, early person-centred intervention, the acceptance of the hierarchy of outcomes (Irving et al., 2004), and adopting a bio-psycho-social

approach to ensure the correct intervention or mixture of interventions are utilised to assist individuals to overcome identified barriers to work (Langman, 2012).

2.2.1.3 Aims of VR

The primary aim of VR is to improve individuals' capability for work, and converting that into actually working, although it appreciates that this need not be paid employment but could consist of voluntary work or a meaningful activity (College of OH Therapists, 2008; Waddell et al., 2008). The improvement of the injury, illness and impairment that the individual has is not the main goal of VR, although through the process of VR, health may be improved (Waddell et al., 2008). VR is a service that is used with both employed and unemployed individuals, with an illness, impairment or injury. With regards to the unemployed population, VR seeks to assist these individuals to gain employment. For individuals who are employed, VR focuses on helping those who are off sick to RTW and assist those who are at work, but at risk of sickness absence, to SAW (VRA, 2013). Individuals will have varying reasons why they are struggling to RTW or SAW. Hence, VR aims to provide a bio-psychosocial approach i.e. considering the individual, their health problem and the social aspects (Bartys et al., 2017; Waddell, 2002), ensuring that the various influencing factors and reasons that the individuals are struggling to RTW or SAW are addressed (see section 1.1.4 for a critique of the bio-psychosocial model).

2.2.1.4 VR approach

VR is described as an approach, rather than a specific treatment or intervention. This demonstrates the understanding that there are a variety of different influences on individuals and their ability to RTW/SAW that need to be addressed. Traditionally VR was more concerned with unemployed individuals struggling to RTW and the models were clearly demarcated and defined as (1) traditional vocational assessment and counselling, (2) case management, (3) assertive community treatment and (4) supported employment, particularly the individual placement and support model (Cockburn & Kirsh, no date). Nowadays, the focus in VR has expanded to include enabling the employed population to SAW, recognising the benefits of preventing the downward spiral associated with long-term sickness absence (ACOEM, 2006; Varekamp, Verbeek, & van Dijk, 2006). Correspondingly, the spectrum of models has increased as individual VR organisations/services are using elements of these models to design their own unique model to address their specific target population and their unique barriers.

Thus, as VR has evolved it is now more appropriate to refer to VR as an approach. Waddell et al. (2008) state that 'there is a wide spectrum of VR approaches that vary by type and intensity' (p. 12). These range from the simple level intervention following basic principles of a VR approach which can be delivered within the workplace, or primary health care to help facilitate RTW, to the more complex cases requiring structured VR services (Waddell et al., 2008). This heterogeneity in the service provision of VR renders it difficult to compare the effectiveness of different services. Buys, Matthews & Randall (2015) conducted a transnational comparative analysis of VR knowledge and skill set, and identified the common knowledge and skill domains that can be attributed to VR, namely; vocational counselling, workplace disability case management, and workplace intervention and programme management. The VRA (2013) states that the process of VR requires input from a range of professionals from different disciplines, and provide the following list of examples of interventions that may be used within VR:

- 'assessment and appraisal
- goal setting and intervention planning
- provision of health advice and promotion, in support of returning to work
- support for self-management of health conditions
- career (vocational) counselling
- individual and group counselling focused on facilitating adjustments to the medical and psychological impact of disability
- case management, referral, and service co-ordination
- programme evaluation and research
- interventions to remove environmental, employment and attitudinal obstacles
- consultation services among multiple parties and regulatory systems
- job analysis, job development, and placement services, including assistance with employment and job accommodations
- the provision of consultation about and access to rehabilitation technology' (VRA, 2013, no page).

A VR approach is commonly accepted as following the key principles of early rehabilitation, work-focused health care and accommodating workplaces, which have been shown as effective strategies in RTW (Schaafsma et al., 2013; Higgins et al., 2012; Desiron et al., 2011; Accident Compensation Corporation (2004), cited in Ellis et al., 2010; Schaafsma et al., 2010; Lambeek

et al., 2010). Additionally, as discussed earlier, VR adopts a bio-psycho-social model, i.e. considering the individual, his or her health problem and the social aspects of disease (Waddell, 2002), ensuring that the various influencing factors and causes of sickness absence are addressed. However, it is questioned whether this model is too patient centred, as opposed to considering the wider systemic influences on health (Bartys et al., 2017).

2.2.1.5. Differences between VR and Occupational Health

The differences between OH and VR are clear when looking at VR for the unemployed population looking to return to employment. However, when considering VR in the workplace for the SAW population, this distinction becomes less clear, in fact, this raises the question: is there a difference between OH and VR? Prior to discussing this question, it is important first to clearly define OH.

OH is defined jointly by the International Labour Organisation and the World Health Committee on OH (1950) as 'the promotion and maintenance of the highest degree of physical, mental and social health of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs' (Health Environment and Work Website (HEWW), 2013). To achieve this, OH is responsible for identifying health hazard risks within the workplace; advising on planning and organisation of work and working practices, providing advice and training on OH, safety and hygiene, and ergonomics; health surveillance, providing relevant vaccinations, organising first aid and emergency treatment, and occupational rehabilitation i.e. helping people stay in work and at times health promotion (HEWW, 2013; Wales Audit Office, no date; Bomel Limited, 2005). Thus, it is seen that OH has a multi-faceted role within the workplace, with only a component of its role focusing on sickness absence management. However, OH is recommended as an integral part of effective sickness absence management, and should be considered early in terms of long-term sickness absence (HSE, 2010; Electricity Industry OH Advisory Group, 2008; CBI, 2006 & CIPD, 2006, cited in Hayday, Broughton, & Tyers, 2007).

As the demands and challenges facing the workforce in the UK have changed, health in the workplace has taken a prominent position in UK national agendas. In 2008, Dame Carol Black's review challenged OH to meet the current workplace challenges; broaden its traditional remit, underpin its work with evidence and increase its capacity. The NHS Future Forum (2012)

summary report focused on four key themes, one of them being how to ensure that the public's health stays at the heart of the NHS. One of the key challenges addressed was the management of long-term conditions. Harrison (2012) argues that the workplace is integral to addressing this challenge, and that providing optimal management of chronic conditions should be a core activity for OH professionals. Thus, there is an increasing demand on OH to change, widen its skill set through incorporating skills that were traditionally within the remit of HR, such as communication, negotiation skills, and adapt to the present challenges within the UK. Currently, within the UK, OH specialists are under threat, with fewer physician trainees and OH consultants being considered for the shortage occupation list; consequently there is a growing concern with the changes to work and the workforce (i.e. an increase in the ageing workforce, an increase in the number of long-term illnesses) of the ability of OH specialists to meet the future demand (Harrison, 2012; Harrison & Dawson, 2016; The Council for Work and Health, (2014); Centre for Workforce Intelligence, 2012; O'Donnell & Reymond, 2009).

In order to meet these challenges, it is suggested that OH is provided by an integrated team comprising a variety of health professionals, e.g. occupational physiotherapists, occupational therapists, counsellors, psychologists and GP's (The Council for Work and Health, 2014; Harrison, 2012). In response to Harrison's editorial, Andrew Frank's (2013) letter to the editor commented on the contribution that rehabilitation professionals provide to OH, recognised in the Council for Work and Health. Frank (2013) suggested that rehabilitation professionals can assist OH in 'developing their knowledge of patients working life and the inter-relationships between health and work' (p.306) as well as assisting with the use of case management and other strategies to improve job retention, which, Frank (2013) stated are currently used by the best OH departments. Moreover, O'Donnell & Reymond (2009), in a commentary article, suggest that VR services, although they may overlap with OH in some areas, if viewed as complementary to OH, and the strengths of each identified, could be used in combination with OH to bridge the gap. OH practitioners' strengths are their medical knowledge, whereas the strengths of VR practitioners are identified as assisting with non-medical barriers to RTW, and having the time to work in the field with individuals, whereas OH practitioners are often constrained by time limitations (O'Donnell & Reymond, 2009).

Thus, in answering the initial question posed as to the difference between OH and VR, it can be concluded that there is overlap between the two, with similar goals, however the skill sets of the practitioners differ, and in some cases the underpinning philosophies and models of

management also differ. It is hypothesised that rather than viewing the two as competitors, if viewed as complementary services, they could together meet the current demand facing the UK. This viewpoint is supported within the Improving Life's: the future of Work, Health and Disability (DWP & DH, 2017) response paper. The paper, which outlines a strategy to increase the employment rate of disabled individuals, uses the term OH as an umbrella to term encompassing services such as vocational rehabilitation with the shared goal of protecting and promoting the safety, health and wellbeing of employed individuals.

2.2.2 Sickness absence and presenteeism

The following search strategy was used to identify articles to inform the discussion on the sickness absence and presenteeism both of which have been shown to have a negative impact on organisations.

The following databases were searched: EBSCO host: including Medline, Business Source Premium, Academic Search Premier, Sports Discuss and Cinahl; Web of Science (core database), OVID host: including Psycinfo, HMIC, Ovid Medline; Cochrane. In addition, citation tracking was utilised. Key terms: Sick, Sick absence, absenteeism, sick listed employee, sickness absence, ill-health, sick leave, work disability, presenteeism. Limitations applied: publication year 2007 – 2017, academic journal article

2.2.2.1 Patterns of sickness absence

Sickness absence is commonly measured by frequency and duration. Long-term and short-term sickness absence are terms frequently used to describe patterns of sickness absence. There is no consensus on the definition of long-term sickness absence, within the UK it is commonly defined as 28 calendar days or 20 working days (CBI, 2011; NICE, 2009b), with short-term sickness absence being less than 20 working days.

Current levels of sickness absence within the UK have been discussed in the introduction: however, historically it is seen that sickness absence patterns vary across countries, genders, ages, social class, employment type, public and private organisations, the size of organisations and geographical areas, indicating various influencing factors on whether individuals choose to take sickness absence (ONS, 2016). Within the UK, women consistently have higher levels of

sickness absence (2.5%) than men (1.6%); an increase in sickness absence is seen with an increase in age (2.9% for ages 65 and over); public sector organisations report higher sickness absence levels (2.9%) than the private sector (1.7%) and self-employed sector (1.4%); larger organisations with large workforces report the highest sickness levels (2.5%); workers in elementary occupations have higher levels of sickness absence (2.7%) compared to managers and professionals (1.1%) and differences in geographical areas are seen with London having the lowest percentage sickness absence levels (1.4%) and Scotland and Wales showing a higher percentage (2.5% and 2.6% respectively) (ONS, 2016).

The complexity of these variations may be due to factors such as differences in the occupation or organisation, public private sector differences, socio-economic factors, economic changes (either nationally or within an organisation), cultural changes/beliefs, labour market conditions and sickness absence insurances (Edge et al., 2017; Allebeck & Mastekaase, 2004; Yeomans, 2011; Kristensen, 1991). Thus, the indications are that the influences on an individual's decision to take sickness absence are multi-faceted. To further understand the reasons underlying sickness absence behaviour the causes of sickness absence need to be explored.

2.2.2.2 Causes of sickness absence and presenteeism

As identified when looking at the patterns of sickness absence, sickness absence is a complex issue. This complexity is again seen when examining its causes. Historically, long-term sickness absence, which accounts for approximately 32% of absenteeism, was most commonly caused by MSDs in manual workers and stress in non-manual workers (CIPD, 2010; Holmes, 2008). However, in 2011 the CIPD Absence Management survey concluded, for the first time, that stress is the most common cause of sickness absence in both manual and non-manual employees. In 2014, stress continued to be the main cause of long-term sickness absence in public organisations (CIPD, 2014a), and in 2016/2017 12.5 million work days were lost due to work-related stress, anxiety or depression, accounting for 49% of all sickness absence days (HSE, 2017a). This impact of mental health conditions is further noted in Stevenson & Farmer's (2017) report which states that 300,000 individuals with long-term mental health conditions lose their job every year, and 15% of people in work have symptoms of an existing mental health condition. This can be hypothesised to be due to the economic climate and labour market within the UK at that time and presently, with large-scale public organisational change and restructuring, as well as job cuts, decreased pension benefits and pay freezes, and the

uncertainty surrounding Brexit contributing to increased employee stress levels. It is widely accepted that job insecurity and fear of finding alternative employment are associated with increased levels of stress (De Witte, Pienaar, & De Cuyper, 2016; Allebeck & Mastekaase, 2004; Green, 2015). In 2014 MSDs accounted for the largest number of days off sick (ONS, 2014), although this is no longer the case, MSDs resulted in 8.9 million sickness absence days in 2016/2017, and is in the top 5 causes of short and long-term sickness absence (HSE, 2017b; CIPD & Simply Health, 2016). Thus, it is seen that both mental health disorders and MSDs are significant reasons for sickness absence. Other common causes of long-term absenteeism are acute medical conditions (for example stroke, heart attack and cancer), recurring medical conditions, mental ill health and injuries or accidents not related to work (Stevenson & Farmer, 2017; CIPD & Simply Health, 2016; CIPD, 2011; CBI, 2011).

Understanding the causes of sickness absence is further complicated by the inability of many absence measures to adequately verify the causes of sickness absence (Wegge, Schmidt, Parkes, & Van Dick, 2007). Both the CIPD and CBI sickness absence surveys rely on an appropriate representative within the responding company to summarise sickness absence for the organisation and to complete the surveys. This, along with the relatively low number of respondents (CIPD respondents $n = 592$; CBI respondents $n = 223$), may affect the response rate and the accuracy of the data, both in terms of sickness absence record keeping, as well as accuracy of cause of sickness absence (Holmes, 2008). The Labour force survey (LFS is a survey of households) and includes questionnaires on workplace injuries and work-related illness. The results from this survey differ slightly from the results published by CBI and CIPD, with the LFS (2011) stating the most common cause of sickness absence in men is MSDs and in women is stress and mental health conditions. However, Holmes (2008) looked at the feasibility of comparing the results from the CBI and CIPD surveys to the LFS, and found that due to the differences in data collection, target population (organisations versus employees respectively), and question focus (work-related illnesses compared to general sickness absence), the results are not comparable. However, although the results differ slightly, the general finding is that stress and MSDs are common causes of sickness absence.

Presenteeism and sickness absence are closely linked, and in exploring the causes of sickness absence it is also necessary to consider the reasons why individuals choose to SAW whilst feeling ill i.e. presenteeism (John, 2010; Aronsson et al., 2000; Dew, Keefe, & Small, 2005). With the recent trend of a decrease in the days of sickness absence both in the private and public

sector (CIPD, 2014a), there has been a corresponding increase in the number of people reporting that they are attending work whilst they are ill (Stevenson & Farmer, 2017; CIPD, 2015; CIPD, 2012). This is highlighted in the CIPD and Simply Health 2016 Absence Management Survey, where 72% of respondents reported observing presenteeism within the workplace. Baker-McClearn et al.'s (2010) research exploring absence management and presenteeism identified two categories influencing presenteeism - personal motivations and workplace pressures. Personal motivations to attend work whilst feeling ill included: beliefs such as no-one else could perform their job, loyalty to their own professional image, obligation and commitment to the organisation, colleagues, and clients, financial worries, and individual lifestyle factors (Garrow, 2016; Baker-McClearn et al., 2010; John, 2010; Hansen & Anderson, 2008; Dew et al., 2005; McKeivitt, Morgan, Dundas, & Holland, 1997). Workplace pressures identified influencing presenteeism were management style and management of absence, RTW interviews, triggers and sickness absence policies, loss of incentives, risk to promotion prospects/job insecurity, working time arrangements, job demands, peak pressures, pressure from manager or colleagues, job meets needs of others e.g. health care workers, organisational commitment, workplace culture and other unfavourable conditions e.g. poor working positions/postures, shift work (Garrow, 2016; John, 2010; Baker-McClearn et al., 2010; Chatterji & Tilley, 2002). Additional workplace pressures currently at play in the UK, possibly resulting in presenteeism, are the perceived threat of redundancies and job insecurity (Stevenson & Farmer, 2017; CIPD, 2015; CIPD, 2012). The interplay and impacts of personal motivation and workplace pressures, highlights the complex nature of presenteeism and sickness absence.

Allebeck and Mastekaase (2004) encapsulate the complex nature of sickness absence behaviour through categorising the various theoretical approaches and explanatory models that have been used in sickness-absence research, namely, medical, sociological, psychological and economic/organisational. Although these categories are based on distinct theoretical approaches, it is evident through looking at each in turn, that they overlap and interlink. From a medical science perspective, biological factors are the primary explanation of the cause of sickness absence. However, using the medical theoretical perspective to explain sickness absence is limited, as is demonstrated by the fact that ranking in some organisations the top five reasons for short-term absenteeism are home/family responsibilities and absence not due to genuine ill health (CIPD & Simply Health, 2016; CIPD, 2015; CIPD, 2014a; CIPD, 2011). Moreover, when considering MSDs it is recognised that 12-weeks post injury the MSD is no longer the primary obstacle to the individual returning to work; at this point the wider

psychosocial influences have greater influence over the individuals returning to work (Sheppard & Frost, 2016).

Using a sociological explanatory model to explain the causes of sickness absence encompasses investigating the influencing factors on individuals in terms of societal factors, living and work conditions (Allebeck & Mastekaasa, 2004). Marital status, relational problems, domestic responsibilities, number of dependants, social networks and personal social support have also been linked to reasons for sickness absence (Batt-Rawden & Tellnes, 2013; Melchior, Niedhammer, Berkman & Goldberg, 2003; Kristensen, 1991). Again, merely viewing sickness absence from a sociological perspective is limiting.

Psychological research into sickness absence develops an alternative array of causes for sickness absence behaviour and its variation in individuals, encompassing individual personality factors and their interaction with the environment and risk factors. Individual factors, such as mental health, personal lifetime events, personality and personal coping styles, influence stress levels (Lee, Lee, Liao, & Chiang, 2009; Georgellis, Lange, & Tabvuma, 2012; Golbasi, Kelleci, & Dogan, 2008; Ilies & Judge, 2002). This theoretical perspective highlights the importance of examining psychological explanations when considering sickness absence behaviour.

Additionally, organisational/workplace factors are shown to have an influence on job satisfaction and individual stress levels, which are both strongly linked to levels of sickness absence (Wegge et al., 2007; Fairbrother & Warn, 2003). Organisational factors which impact on job satisfaction and stress include the ethical morality of the company (Huhtala, Kaptein, & Feldt, 2016; De Tienne, Agle, Phillips, & Ingerson, 2012; Charles, 2001); job characteristics such as pay, security, type of work, hours of work, flexible job design, flexible work hours (Dionne & Dostie, 2007; Jose & Cabral, 2005); organisational communication (Lee et al., 2009); trust in management (Baptiste, 2008); and career prospects (Theodossiou & Zangelidis, 2009). Low levels of job satisfaction and high levels of stress have been linked to increased levels of sickness absence; conversely, high levels of job satisfaction have been shown to have a positive effect on organisational commitment and improved stock market performance where individuals value their co-workers and strongly identify with the organisational goals (Edmans, 2011; Aghdasi, Kiamanesh & Ebrahim, 2011). Additionally, job satisfaction has been shown

to be an indicator of job quality and to positively impact on customer satisfaction (de Bustillo Llorente & Macias, 2005; Snipes, Oswald, Latour, & Armenakis, 2005).

Thus, it is clear that individuals' experiences of physical or mental health conditions can be influenced (either positively or negatively) by a variety of factors, such as medical, societal, organisation and psychological (CIPD & Simply Health, 2016; Batt-Rawden & Tellnes, 2013; Lee et al., 2009; Georgellis et al., 2012; Golbasi et al., 2008; Ilies & Judge, 2002; Wegge et al., 2007; Aghdasi et al., 2011; Dionne & Dostie, 2007; Theodossiou & Zangelidis, 2009; Baptiste, 2008; de Bustillo et al., 2005; Snipes et al., 2005). The influence of these factors needs to be considered and addressed when managing sickness absence and presenteeism, emphasising the need for a bio-psycho-social model.

2.2.2.3 Consequences of sickness absence and presenteeism

As identified when looking at the determinants of sickness absence and presenteeism, absence behaviour is multifaceted. This complexity is again highlighted when exploring the consequences of sickness absence and presenteeism. To fully appreciate the consequences, it is necessary to consider sickness absence and presenteeism from a variety of stakeholders' perspectives; the employee, the employer/organisation, and society. The consequences of sickness absence and presenteeism for the various stakeholders will be discussed in turn below.

As discussed in section 1.1.1, sickness absence results in a large economic cost, not only for organisations but for employees and the wider society too (Stevenson & Farmer, 2017; DWP & DH, 2016; Black & Frost, 2011; CIPD, 2011; Black, 2008; Bevan et al., 2007). Additionally, the costs outlined in section 1.1.1 do not include the 'hidden' costs of sickness absence for the individual, the organisation and society. Organisations may incur additional costs such as staff turnover, staff recruitment and retraining, loss of skill base, overtime, increased burden on colleagues, and time spent managing sickness absence (Baker-McClearn, 2010). According to CIPD & Simply Health (2016), the median cost of sickness absence is £522 per employee per year. These costs differ according to the business sector as well as the size of the organisation, with public sector organisations having a median of £835 per employee (CIPD & Simply Health, 2016). Additionally, the costs will differ according to the actions taken by the individual. For example, if the individual retires due to ill-health, the organisation will have the

additional turnover costs. In 2014, non-genuine sickness absence is believed to account for one day in eight of all sickness absence in the UK (CIPD, 2014a). In 2016, non-genuine illness continues to be within the top 5 causes of sickness absence for some organisations, and thus it needs to be considered as to why this is the case e.g. do the policies on flexible working, carer allowances need to be reconsidered in these cases? (CIPD & Simply Health, 2016).

There is also an economic cost of sickness absence to the individual. Employees may incur a degree of economic hardship from extra costs such as transport to hospital visits, special diets and supplements, lost income, losing their home and ability to support their family (Taylor, Cunningham, Newsome, & Scholarios, 2010; NICE, 2004; Alter, 2009).

From a humanitarian perspective, it is necessary to understand the wider impact of sickness absence on an individual, which is dependent on the length of sickness absence. Long-term sickness absence has been linked with various consequences, such as poor mental health, and there is a consensus that it is a strong predictor of claims for disability allowance and therefore welfare dependency (Black & Frost, 2011; Hultin, Lindholm & Moller, 2012, Waddell et al., 2008). Floderus, Goransson, Alexanderson & Arronsson's (2005) cross-sectional study, analysing the influence of long-term (12-18 months) sick leave on patients' life situations, found that more than 60% of their participants reported negative effects related to leisure activities, sleep and psychological health. Gender, age and diagnosis influenced the experience of both positive and negative consequences of sickness absence, with women reportedly experiencing more positive consequences than men, which were attributed to their relationships with their partners and children (Floderus et al., 2005). On the other hand, Nyman, Andersson, Spak & Hensing's (2009) longitudinal study found that women with long-term sick leave were more likely to report ill-health at a 5-year follow-up. However, these results need to be viewed with caution due to methodological limitations such as small sample size (Nyman et al., 2009). Furthermore, it is important to keep in mind when reviewing research into sickness absence, due to the complexity and interplay of sickness absence and the underlying illness, it is difficult to directly attribute outcomes specifically to sickness absence and results need to be viewed with caution. Bearing these limitations in mind, Waddell et al.'s (2008) literature review 'VR: What works, for whom and When' concluded that good work is positive for an individual's health, with the negative aspects of sickness absence outweighing any positive consequences.

When considering the consequences of presenteeism from the perspective of the employer, presenteeism is viewed to have an impact on productivity (employee's efficiency) and be a threat to workplace safety (Garrow, 2016; John, 2010; Baker-McClearn et al., 2010, Pilette, 2005). Although productivity is difficult to measure, studies have suggested that presenteeism results in greater productivity losses than absenteeism (Stevenson & Farmer, 2017; Garrow, 2016; Dixon, 2005; Caverley et al., 2007). These findings may refer to 'unmanaged' presenteeism, in other words, employers may not be aware that the employees are in work whilst they are feeling unwell, and the employees are not using work as part of a managed rehabilitation process, so as to ensure the period of presenteeism is short-lived. Presenteeism may be preferable to the employee and employer, as the structure of the workplace has been shown to assist recovery from certain ill-health conditions (Cocker et al., 2014). Studies suggest that if presenteeism is managed effectively, both the employer and the employee may reap long-term benefits from short-term presenteeism (Baker-McClearn et al., 2010; Vingard et al., 2004; Aronsson & Gustafsson, 2005). The benefits for organisations may include reduced turnover costs, reduced training needs, and increased team stability. For employees, the effective management of presenteeism may reduce the risk of employees losing their confidence, skills, and social networks, as well as the decrease the risk of dropping out of the work market.

Conversely, some studies suggest that presenteeism due to workplace pressures adversely impacts employee morale and increases absence (Taylor, Baldry, Bain, & Ellis, 2003; Bergstrom et al., 2009). Additionally, if the employee is not getting better due to being at work, this can lead to longer periods of lower productivity than if one were to take sick leave (Baker-McClearn et al., 2010). This is supported by Dixon's (2005) US Survey, which reported that employee burnout and lost productivity was 7.5 times greater with presenteeism than absenteeism. Additionally, according to analysis by Kivimaki et al. (2005), based on a cohort of 5,071 male British civil servants, without a previous history of myocardial infarction, unhealthy employees who do not take sick leave, compared to unhealthy employees who had moderate levels of sickness absence, had twice the incidence of serious coronary events. As within this cohort there was a small number of coronary events ($n = 62$), the findings do need to be further substantiated, however, it does highlight the need, for individuals, employers, organisations and healthcare practitioners to be aware of the potential harmful effects of presenteeism (Kivimaki et al., 2005).

As is seen from the potential positive and negative consequences of presenteeism, for both the organisation and the employee, it is imperative when implementing workplace rehabilitation strategies that they are well thought out and designed to support the individual. Thus, ensuring that sickness absence is not merely displaced, resulting in higher levels of long-term presenteeism, possibly resulting in ineffective and unproductive workforces. With the consequences of sickness absence and presenteeism having far reaching economic, fiscal and social costs and impacts, and in the current economic climate within the UK, it is imperative that effective solutions to reducing these costs are found.

2.2.2.4 The use of Vocational Rehabilitation in addressing sickness absence, presenteeism and turnover

The wide variation within what is classified as VR creates difficulties in synthesising the evidence-base. The seminal report by Waddell et al. 'VR, what works for whom and when' (2008) synthesised the evidence into the following categories: health conditions (mental health, musculoskeletal and cardio-respiratory); delivery of VR (primary healthcare, workplace interventions, specialist rehabilitation services and social security interventions) and timing and co-ordination of interventions. Although some approaches discussed in this report have evolved over the years, such as the stepped care approach (Burton, 2010; Kendall, Burton, Main, & Watson, 2010), the basic concepts remain the same. Dibben et al.'s (2012) rapid review of the evidence utilised the same categories. Dibben et al.'s (2012) and Coleman, Sykes & Groom's (2013) critiques of the literature, echoed those of Waddell et al. (2008), highlighting that the studies lacked robust quantification of employment outcomes; evidence on CBA was limited and reliant on poor quality studies; and limited evidence for UK based intervention.

Using these categories, identified originally by Waddell et al. (2008), enables the identification of common elements of the VR approach specific to the area of interest. This research is focused on VR workplace interventions for employees with ill-health who are trying to SAW or RTW, rather than on those who are trying to gain employment. The main causes of sickness absence are MSDs and mental health conditions.

There is a consensus that VR is effective in the treatment of MSDs in the working age population (Alexander, Cooper & Mitchell, 2017; van Vilsteren et al., 2015; Dibben et al., 2012; Waddell et al., 2008). However, the type of modes and interventions under the VR umbrella

that are effective is less clear. There is a consensus that the following elements of VR have relatively moderate to strong evidence in their effectiveness in improving work outcomes and decreasing pain and disability in adults with MSDs:

- Exercise and increasing activity (Alexander et al., 2017; Waddell et al., 2008)
- Brief education (Alexander et al., 2017)
- Cognitive Behavioural Therapy (Dibben et al., 2012; Waddell et al., 2008)
- Workplace interventions such as modified work, changes to workplace or work design, early RTW (Alexander et al., 2017; van Vilsteren et al., 2015; Waddell et al., 2008; Dibben et al., 2012; Odeen et al., 2013)
- Multidisciplinary rehabilitation including the liaison with all stakeholders (Alexander et al., 2017; Waddell et al., 2008; Dibben et al., 2012; National Spinal Taskforce, 2013)
- Biopsychosocial rehabilitation (Alexander et al., 2017; Waddell et al., 2008; National Spinal Taskforce, 2013)
- Work-focused health intervention (Odeen et al., 2013; Coleman et al., 2013)
- Case management (Schandelmaier et al., 2012; Dibben et al., 2012; Hanson, Burton, Kendall, Lancaster, & Pilkington, 2006)

The effectiveness of other elements of VR on MSDs, such as early intervention is less clear. Waddell et al. (2008) and Coleman et al. (2013) state that there is evidence of the benefits of early intervention on health. Contradicting this, Dibbin et al. (2012) concluded that there is insufficient evidence with regards to the impact of early interventions on work outcomes. There is agreement that further high-quality research is needed in this area due to heterogeneity of interventions (Alexander et al., 2017; van Vilsteren et al., 2015; Waddell et al., 2008; Dibben et al., 2012; Odeen et al., 2013; Lambeek et al., 2010).

Considering the evidence-base in respect of mental health conditions and VR, Waddell et al. (2008) identified that there is limited focus of occupational outcomes within the mental health literature, with little or no evidence showing that VR is effective. However, 'there is general consensus that organisation-level interventions (disability management, improved communication, early contact with absent worker, an agreed rehabilitation plan, flexibility in work organisation and RTW arrangements) are applicable to mental health problems, and limited evidence that they improve work outcome' (Waddell, et al., 2008, p.22). These findings were supported by Dibben et al.'s (2012) review, which additionally concluded that there is strong evidence indicating positive effects of psychological and workplace-based interventions

for depression. Moreover, evidence indicates that employees with severe mental health conditions benefit from supported employment (Dibben et al., 2012). A recent Cochrane review synthesising the evidence on interventions to improve RTW in people with depression, concluded that there is moderate quality evidence that work-directed interventions, such as work-modification and coaching, alongside clinical interventions reduce the number of sick days compared to the clinical intervention alone (Nieuwenhuijsen et al., 2014). However, this conclusion is based on 5 studies and further research is needed on work-directed interventions to improved RTW in employees with depression.

With regards to the delivery of VR in the workplace, there is a consensus that proactive, approaches, workplace accommodations and modified work can be effective (Alexander et al., 2017; Van Vilsteren et al., 2015; Dibben et al., 2012, Waddell et al., 2008). In addition, it is imperative to consider the timing of interventions. There is strong evidence that the longer the duration of sickness absence, the lower the chances of returning to work, with an increasing number of obstacles occurring (Black & Frost, 2011; Hultin et al., 2012; Waddell, et al., 2008). However, the majority of the evidence in support of VR is from Germany and Scandinavia, questioning the transferability of these findings to the UK context, which may differ in terms, of structural, social and cultural differences (Dibben et al., 2012).

There is some evidence that early interventions decrease the length of sickness absence and associated risks of long-term incapacity (Gabbay et al., 2011; Hoefsmit, Houkes, Nijhuis, 2012; Waddell et al., 2008; Coleman et al., 2013). However, there is uncertainty over the best time to intervene, i.e. what is early, as many health conditions will improve within 3-6 weeks of onset, and to-date there is limited ability to effectively screen for those at risk of long-term disability (Waddell et al., 2008; Dubbin et al., 2012; Coleman et al., 2013). To overcome this uncertainty, Waddell et al. (2008) recommend the use of a stepped-care approach. Stepped care is an approach that guides care based on individual needs, starting with 'simple, low-intensity, low-cost interventions and 'stepping up' to more intensive, complex and costly interventions for people who fail to respond' (p.40). This facilitates appropriate allocation of resources when managing ill-health. It is an approach that is widely used within health care professions (Cambridgeshire and Peterborough NHS Foundation Trust, 2013; Franx, Oud, Lange, Wensing, & Grol, 2012; Jakicic et al., 2012). This stepped care approach has evolved in regards to VR, and in 2010 Kendall et al. refined an evidence-based 3-phase stepped care approach for MSDs, using the onset of injury to provide a timeline. This bio-psycho-social stepped care approach,

recommends early access to evidence-based information, advice and early stage rehabilitation in the acute/early stage of injury. During the sub-acute/intermediate stage, the approach recommends facilitating RTW or SAW, through appropriate interventions such as case management, RTW planning or physiotherapy. And in the chronic/persistent stage where the focus is on preventing chronicity of the disease, it recommends exploring and resolving the obstacles to RTW, utilising a multi-disciplinary team (e.g. psychologists, occupational therapists, and physiotherapists) and evidence-based methods such as cognitive behavioural therapy to address these.

Considering presenteeism, it is important to note that the evidence-base is young; however emerging findings indicate that workplace interventions and elements of VR may reduce presenteeism levels and increase productivity (Hammond et al., 2017; Cancelliere, Cassidy, Amendolia, & Cote, 2011; Knapp, McDaid, & Parsonage, 2011). However, as key elements of VR are early intervention and accommodating workplaces, which facilitate early RTW, there is an inherent risk of displacing the costs of sickness absence rather than reducing these costs. Thus, it is imperative that presenteeism is considered, both within individuals who do not take sickness absence and those that do.

In summary, VR is advocated as an effective means of addressing sickness absence in the workplace and may assist with presenteeism and reducing turnover (Alexander et al., 2017; Black & Frost, 2011; Boorman, 2009; Cancelliere et al., 2011; Knapp et al., 2011) and through exploring the current evidence-base, it can be hypothesised that a best practice approach of VR within the workplace, for common health conditions, would consist of the following elements:

- workplace based interventions
- case management, ensuring timely liaison and co-ordination of rehabilitation with all stakeholders as required (e.g. management, HR, GP, specialist, health-care professionals (physiotherapist), and employee),
- early intervention, using a stepped-care approach (i.e. intervention when and as needed),
- multi-disciplinary work-focused rehabilitation
- and accommodating workplaces, allowing for the implementation of early RTW and temporary modified work arrangements

(Alexander et al., 2017; Van Vilsteren et al., 2015; Coleman et al., 2013; Dubbin et al., 2012; Accident Compensation Corporation (2004), cited in Ellis et al., 2010; Schaafsma

et al., 2010; Lambeek et al., 2010; Boorman, 2009; Waddell et al., 2008, Irving et al., 2004 ; Hanson et al., 2006).

2.3 Cost effectiveness of VR interventions for employees who are either off sick or struggling to SAW

2. 3.1 Outline of the comparative economic analyses models

Although VR approaches are indicated to be effective interventions for sickness absence and presenteeism, in today's economic climate it is necessary to explore the cost and benefits of any intervention so as to ensure the best use of scarce resources (Rabarison, Bish, Massoudi and Giles, 2015; NICE, 2013a; NICE, 2012; HM Treasury, 2011; MRC, no date). This is achieved through economic evaluations. Prior to discussing the evidence-base for the cost effectiveness of VR interventions it is necessary to understand what economic evaluations are and gain an understanding of the different economic analyses models.

A widely accepted definition of an economic evaluation is 'the comparative analysis of alternative courses of action in terms of both their costs and consequences' (Drummond, Sculpher, Torrance, O'Brien, & Stoddart, 2005, p.9). Whilst this definition is simple and concise, and currently used in a variety of academic papers (for examples, Shiell, Donalson, Mitten & Curry, 2002; Shemilt, et al., 2008; Brouwer & Georjoui, 2012; Sutton et al., 2015; Gray & Wilkinson 2016), its relevance has recently been questioned, as it has not changed for decades and the comprehensiveness and usefulness in expanding areas, such as health economics is uncertain (Botchkarev, 2016). To address this uncertainty Botchkarev (2016) identified sixty non-identical definitions of economic evaluations, ascertained their common focus points and compared them to the commonly accepted definition by Michael Drummond. Botchkarev (2016) identified improvements to the commonly used Drummond definition, and proposed a new definition i.e.

“Focusing on the optimal allocation of resources with the best value for money, Health Economic Evaluation is a data intensive analytic research process, based on a structured framework of methods for systematic identification, measurement, valuation, comparison, analysis and reporting of inputs (resources) and costs associated with them in relation to outcomes (benefits) and values associated with them, regarding healthcare goods and services (ranging across health programs, preventive, diagnostic and treatment interventions, medical devices, drugs), which is conducted with an objective

to provide economic evidence to inform decision and policy makers in order to improve investment efficiency” (p.6).

However, this is specific to the field of health economics, which differs from organisational or business economics in terms of outcomes. For example, when considering interventions to reduce ill-health in employees, organisations are interested in productivity as opposed to utilisation of health care resources. Thus, currently, the Drummond definition is still accepted within the fields as a concise and generic overview.

Economic analyses are used to prioritise and distribute resources. They provide decision-makers with a means to identify which services are more economically effective with regards to the outcomes that are of importance, for example, identifying services or interventions which have a greater health gain for the money spent (Botchkarev, 2016; Cox et al., 2011; Stone, no date). Klein, Day & Redmayne (1996) argue that without a formal rationing system such as the use of economic evaluations to inform decisions, informal rationing mechanisms for example, denial, selection, deflection, deterrence, delay, and termination will occur. Thus, using a formal rationing mechanism ensures that an informed decision is made. Although economic analyses provide information on the cost-effectiveness of a service, there are barriers to their use, such as methodological quality, possible conceptual and methodological inadequacies, the applicability of the research, generalisability of the research, difficulties in evaluating complex interventions, the priority of patient care over economic resources, the potential to oversimplify, which may set up a project to fail by promoting unrealistic expectations, no standard way to assign monetary value to qualitative outcomes, and the ability of the decision makers to understand the analyses (Anderson & Hardwick, 2016; van Velden, Severens, & Novak, 2005; Williams, Bryan, McIver, Moore & Hendron, 2008). Moreover, the limitations of economic analyses include a risk of bias regarding assumptions and data selection, and the fact models often rely on non-experimental, observational data from time series or cross-sectional studies (Towse & Drummond, 1997). However, decisions do need to be made with limited data and thus, there is a need for economic analyses (Towse & Drummond, 1997). Therefore, it is useful to view them as decision aid tools, and take other sources of information, perspectives e.g. societal, and considerations e.g. ‘the feasibility of implementing an intervention, the acceptability of the intervention to a population, ethical and political concerns, and regulatory and legal issues’ (Stone, no date, p.458), into account prior to making a decision (Cox et al., 2011; Snell, 2011; Sculpher, Claxton, Drummond & McCabe, 2006).

There are a number of broad economic evaluation approaches, namely; cost minimisation, cost effectiveness, cost utility, cost benefit, and cost consequence (van Dongen et al., 2014; Miller et al., 2013; Gray, 2011; Drummond et al., 2005). In order to determine the economic evaluation that will be most appropriate for evaluating VR it is first necessary to understand the differences between approaches to economic evaluation:

- A cost minimisation evaluation is used to compare interventions with similar clinical effects. No value is placed on the health outcomes; it is only the costs that are explored. A cost minimisation evaluation is often used to find the intervention that achieved the desired outcome at the lowest possible cost (van Dongen et al., 2014; Drummond, Sculpher, Claxton, Stoddart, & Torrance, 2015; Gray, 2011; Walter et al., 2006; Drummond et al., 2005). It is a simple economic evaluation and easy to implement, however, it is limited to comparing interventions with the same outcomes and effectiveness is assumed to be similar (Phillips, Veenstra, Van Beber, & Sakowski, 2003; Briggs & O'Brien, 2001; Towse & Drummond, 1998)
- A cost effectiveness analysis (CEA) is used to compare interventions that address the same health problem (Stone, no date). A CEA is typically based on a single outcome and the outcome of the intervention is expressed in natural units, such as years of life saved, lives saved, and cases detected, or cases successfully treated (Miller et al., 2013). Thus, the results are expressed in terms of the ratio gain in health (related effect) to the monetary cost (resources used) of the health gain. The evaluations are made on the basis of this ratio across the different interventions (Drummond et al., 2015; van Dongen et al., 2014; Snell, 2011; Walter et al., 2006; Weinstein & Stanson, 1977). The results are easily understandable; however, the analysis is restricted to the same condition/disease (Phillips et al., 2003).
- A cost utility analysis (CUA) is a type of CEA and is utilised when the outcome used to measure the impact of the intervention is expressed as a utility or quality of health outcome, a quality-adjusted-life-year (QALY) (Drummond et al., 2015; van Dongen et al., 2014; Gray, 2011). The US National Library of Medicine (2014) defines a QALY as:-

‘Units of measure of utility which combine life years gained as a result of health interventions health care programmes with a judgment about the quality of these life years. A common measure of health improvement used in cost-utility analysis, it measures life expectancy adjusted for quality of life.’ (World Bank, 2001, cited in The US National Library of Medicine, 2014, p1.).

A QALY attempts to measure both mortality and morbidity i.e. a year of living in perfect health may be equated to 1 QALY, whereas as a year of living with a chronic condition might be equated to 0.7 QALY (Stone, no date). An advantage of a CUA is that they allow for comparison of different health effects, and consequently different health interventions (Drummond et al., 2015; Drummond, 2005; Stone, no date). However, on the flip side there is a debate over the monetary value placed on the QALY, moreover, it is accepted that the outcome measure, quality of life, may not fully capture the health gain from certain interventions (Gray, 2011). Moreover, this is reliant on patients’ preferences regarding quality of life and results can be difficult to interpret (Phillips et al., 2003).

- A CBA is used when the outcomes are to be expressed in purely monetary terms (Drummond et al., 2015; Snell, 2011, Gray, 2011). This evaluation allows for the comparison of any health or non-health interventions, enabling the analysis to capture non-health effects, and the efficiency of interventions with different goals (Gray, 2011; House, 1998). A CBA is simply described as a tool to decide on the worth of an intervention through weighing up the advantages and disadvantages (McIntosh, Clarke, Frew, & Louviere, 2011) and determining whether the expected return is worth the effort (benefits greater than the costs) (van Dongen et al., 2014; McIntosh et al., 2011; Drummond, 2005; Treasury board of Canada Secretariat, 1998). However, the reduction of all costs and benefits to monetary terms, may lead to incorrect conclusions, if significant benefits cannot be monetised (House, 1998). Moreover, CBA’s run the risk of inaccuracies in quantifying/evaluating costs and benefits, subjectivity in underlying assumptions and inaccurate calculations, possibly resulting in inaccurate or skewed results (Phillips et al., 2003).
- A cost consequence analysis (CCA) outlines all the outcomes and their units of measurement, allowing the decision makers to place their own weights on the various outcome measures (Gray, 2011; Mauskopf, 2017; Kelly, McDaid, Ludbrook & Powell,

2005). However, the lack of a ratio makes comparing interventions difficult (Phillips, et al., 2003).

Table 2: Summary of comparative economic analyses

Method of analysis	Comparison	Measurement /assessment of costs	Measurement /assessment of outcome	Cost-outcome comparison
Cost-minimisation analysis	Used to compare interventions with the same effectiveness or efficacy to establish the cheapest alternative	Monetary	None	None
Cost-effectiveness analysis	Used to compare interventions that produce a common health effect	Monetary	Natural units	Costs per outcome unit
Cost-utility analysis	Used to compare interventions that have morbidity and mortality outcomes	Monetary	Utility values	Costs per QALY
Cost-benefit analysis	Used to compare different programmes with different units of outcomes (health and non-health)	Monetary	Monetary	Benefits/costs (BCR)
Cost-consequence analysis	Used to compare different programmes with a variety of economic and non-economic outcomes	Monetary	Combination of all outcomes: Monetary/ natural units/ utility values	None

(Drummond et al., 2015; van Dongen et al., 2014; Gray, 2011; Walter et al., 2006; Drummond, 2005; Stone, no date).

When choosing an economic analysis model to utilise for research, the outcomes of interest and the perspective of the analysis influence the decision (van Dongen et al., 2014). Economic analyses can provide information on costs and benefits of interventions from different perspectives e.g. societal, organisational or individual (WHO, 2009). Each of these perspectives includes different costs and benefits. An analysis from a societal perspective looks at costs and savings to society, such as a reduction in taxes; whereas an analysis from an organisational perspective will look at the costs and savings specific to the organisation such as a reduction in sickness absence rates; and an analysis from an individual's perspective would include costs and benefits to the individual such as reduced medical care costs (WHO, 2009). All of these perspectives would be relevant when evaluating the cost benefits of VR as the costs

of sickness absence are wide reaching (see section 1.1). When considering an economic analysis of VR in the context of this project the following are noted:

- VR is a multi-faceted programme with an array of interventions. This results in a number of outcomes from a number of perspectives.
- VR services differ in terms of VR interventions utilised, timings of interventions, target populations and VR practitioners.
- The effects of VR are both health e.g. improved mental or physical health and non-health related e.g. increased productivity.
- The organisation purchasing the VR intervention is the main stakeholder; consequently most workplace interventions are evaluated from the organisations perspective (van Dongen et al., 2014; Tompa, Dolinschi, & de Oliveira, 2006; Uegaki et al., 2010; van Dongen et al., 2011; van Dongen et al., 2012; Verbeek, Pulliainen, & Kankaanpää, 2009). Traditionally workplace health interventions to improve staff health and reduce sickness absence are purchased by the employer/organisation, thus generating research from an organisational perspective. Due to the growing awareness of the costs of sickness absence, effectively addressing sickness absence and helping employees with health conditions to stay in the workplace has become a national and international priority (DWP & DH, 2017, Black & Frost, 2011). This has resulted in a suggestion for the government to consider subsidising VR services (Black & Frost, 2011) and thus a need to explore the wider social/exchequer benefits too. This development is seen in more recent research (e.g. Wynne-Jones et al, 2018) where the costs and benefits of VR are considered from a variety of perspectives including the social/exchequer and the individual.
- This research aims to provide an economic analysis tool that can be used by researchers and VR services, to evaluate the cost benefits of VR. As the current literature predominantly evaluates VR from an organisational perspective, and VR services are still currently providing their services to organisations, this perspective was considered an appropriate starting point for the economic analysis tool, and the focus of this research. However, in choosing the model it is important to consider the impact of this work moving forwards, and thus a model that allows adaptation in the future to incorporate wider social and individual benefits is needed.

Therefore, in order to capture all the outcomes, both health and non-health, of VR from an organisational perspective, and considering the models outlined above, a CBA would be the appropriate method of analysis to use. In addition, employers are generally more interested in the results produced from a CBA i.e. how does the intervention impact on the company's profit (van Dongen et al., 2014). Moreover, as a variety of perspectives may be of interest to the user, the CBA is useful as it allows the benefits to be measured to be determined by the user (Meijester et al., 2011). Thus, by utilising a CBA tool, future work incorporating different stakeholders' perspectives can be easily added to the new CBA tool. Additionally, there is a need to monetise the impact in order to assist with decisions over resource allocation, again justifying the use of the CBA methodology. Another benefit of CBA models is that they enable the integration of a variety of outcomes into a single unit of measurement: pounds sterling (Kelly et al., 2005), which would allow for the model to be used to compare a number of different VR programmes. Moreover, Cagno, Micheli, Masi, & Jacinto (2013) advocate a CBA as opposed to CEA for OH and safety evaluations as it yields more meaningful results for the organisations. Another benefit of using a CBA model is that they allow organisations to explore information at various stages of the implementation of interventions:

- Pre-delivery (predictive) – CBA can inform ex-ante appraisals of what return on investments an intervention may be expected to deliver (HM Treasury, Public Service Transformation Network, New Economy, 2014).
- During delivery – regular CBAs provide information on the performance of the intervention against desired outcomes, allowing for adjustments and improvements to the intervention throughout delivery (HM Treasury et al., 2014).
- Post-delivery – allows the organisation to judge the worth of the intervention, as well as providing direction for improvements (HM Treasury et al., 2014).

Lastly, for interventions where a control/comparator group is not feasible, a CBA model allows for the use of comparator groups to calculate the net effectiveness, enabling an estimation of what would have happened should the intervention not have been in place (HM Treasury et al., 2014).

There are limitations to using a CBA as the only method of economic analysis, as not all benefits or costs can be reduced to a monetary value. Kelly et al. (2005) acknowledge the practical difficulties in applying a CBA and suggest the use of CCA within a pragmatic framework to

capture various outcomes (Gray, 2011). A CCA does not restrict the type of outcome to a unit of measurement e.g. pounds, allowing all outcomes to be presented (Mauskopf, 2017; Kelly et al., 2005). Additionally, the inclusion of a CCA allows for more transparency in reporting the outcomes and may have greater resonance with the stakeholders involved with commissioning (Trueman & Anokye, 2012; Gray, 2011). However, the use of a CCA relies on the decision makers applying their own subjective weighting system to different outcomes (Gray, 2011), which may result in subjectivity and renders comparisons problematic (Keating & Keating, 2014; Little, 2011). Thus, the use of a CBA would enable a more objective comparison.

Although a CBA is not all-encompassing, with the economic pressures faced today, there is a demand for simple tools to be available for organisations to enable them to determine the costs and benefits of interventions (NICE, 2013b; Burton, 2010). Additionally, there is a need to be able to compare the effectiveness of interventions, to ensure the most cost-effective interventions become the focus of decision-making. Thus, it is important to examine the economic analyses used within VR, identify the limitations and gaps, and build on these to develop a practical economic analysis model, such as a CBA tool, specific to VR interventions.

2.3.2 Current evidence-base on the costs and benefits within VR for the SAW population

VR interventions target a wide and varied population, helping employed individuals to SAW, this includes employees who are off sick, or at risk of going off sick, and unemployed individuals to RTW. Within the RTW population there is a wealth of research exploring the costs and benefits of VR, with the overarching conclusion that VR programmes are cost-effective when returning people to work (Khan, Ng, & Turner-Stokes, 2009; Van den Hout, De Bucj, & Vlieland, 2007; Murphy et al., 2006; Shepard & Reif, 2004; Dixon et al., 2002; Crowther, Marshall, Bond, & Huxley, 2001). However, the generalisability of these studies to the UK context is questionable as the research is mainly based in America, Canada and Scandinavian countries, all of which have different societal and economic structures to those found in the UK.

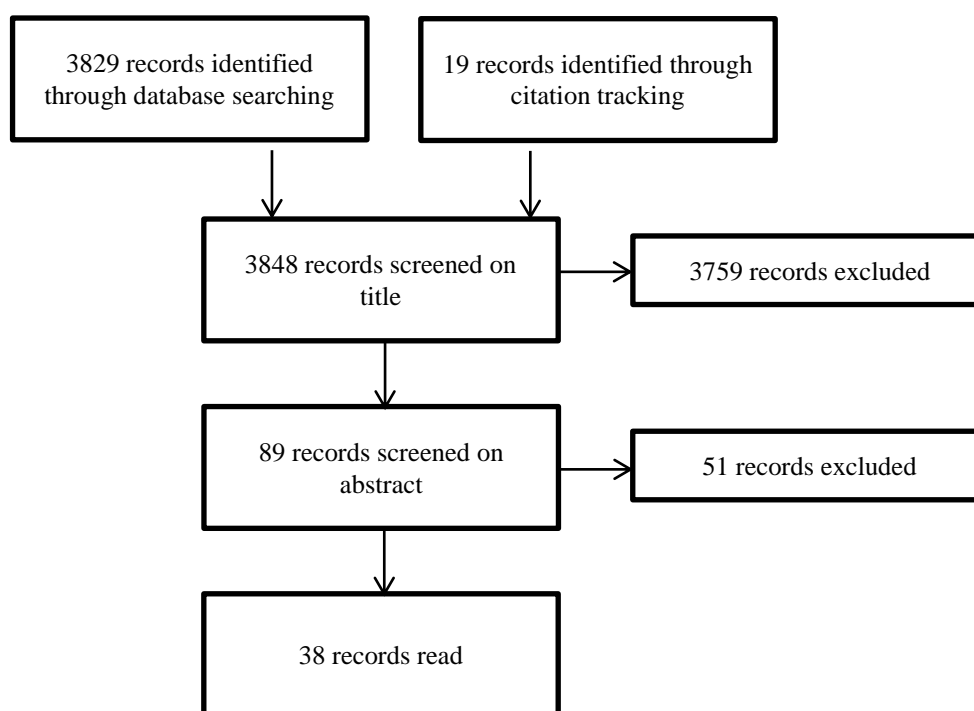
There is a scarcity of evidence on the costs and benefits of VR interventions within the SAW population i.e. looking at preventing sickness absence, decreasing presenteeism, etc. This lack of evidence is listed, in a research study for the Association of British Insurers (2005), as one

of the barriers to the implementation of work focused rehabilitation within the UK (Wright, Beardswell, & Marsden, 2005). Thus, developing this evidence-base would be beneficial for the VR industry. Furthermore, Pruett, Swett, Chan, Rosenthal, & Lee (2008) highlighted that an additional difficulty in the evidence-base underpinning the cost effectiveness of VR is the expansive definition of VR, leading to a broad array of interventions being used, which need to be explored to understand the cost benefits of VR. Thus, the focus of this section of the literature review will be to explore the evidence-base of the costs and benefits of VR, and its various interventions, in the SAW population, identify limitations and gaps, and explore the reasons for the dearth of research in this area. Additionally, as the key aim of this research is to develop and utilise a practical CBA tool for VR, the evidence of the use of CBA in VR, in the SAW population, will be explored.

As the use of a CBA tool for VR in the SAW population is the main focus of the research project, a comprehensive search (outlined below) of the literature for this section was conducted.

Search strategy: the following databases were searched: Cinahl, Medline, Cochrane, Business Source Premier, Web of Knowledge and Health management information consortium. The following key terms were explored: CBA, VR, occupational rehabilitation, case management, sickness absence, sick leave, absenteeism, presenteeism, RTW, SAW, employment. The following limit was set: years 2000 – 2013.

Figure 3: Screening strategy with inclusion criteria i.e. SAW population, work-based intervention



2. 3.3 Economic effectiveness of VR interventions for the SAW population

Following the screening strategy outlined in Figure 3, thirty eight articles were identified for further reading. Whilst reviewing the literature on the economic effectiveness of VR interventions for the SAW population, it was found that relatively few studies had incorporated economic analyses (Busch, Bodin, Bergstrom, & Jensen, 2011; Van den Hout et al., 2007; Waddell et al., 2008; Karrholm et al., 2006). In addition, the analyses used different economic models, namely: CBAs and cost effectiveness analysis (CEA).

CBA as a method of exploring the costs effectiveness of VR for the SAW population was utilised in two randomised controlled trials (RCT) conducted in Sweden and Holland, and case-studies conducted in the UK (Busch et al., 2011; Van den Hout et al., 2007; Waddell et al., 2008). Busch et al.'s (2011) RCT, conducted in Sweden, compared the long-term effects of three different interventions on patients with chronic pain to a control group. All three of the interventions (physiotherapy, cognitive behavioural therapy and behavioral medicine rehabilitations, which was a full-time multidisciplinary programme including all aspects of the physiotherapy and cognitive behavioural therapy) included a vocational element: workplace visits, and invitations for work managers to attend the discharge session and agree a RTW plan.

When comparing the sickness absence patterns 10 years after the intervention, it was found that on average the multidisciplinary group, which the authors refer to as the ‘Vocational Multidisciplinary group’, had 42.98 fewer days’ sickness absence days per year than the control group. The reduction in the other two groups (physiotherapy and cognitive behavioural therapy) when compared to the control group was not statistically significant. Correspondingly, the CBA, including all direct and indirect costs, over 10 years, showed substantial cost savings for the VR group with a decrease in costs by 53,382 EUR per individual compared to the other two groups. Costs of the interventions (booked expenses, salaries and taxes of the therapists), sickness absence, using the human capita approach, and disability pension were used to populate the CBA model. Sickness absence and disability pension data were obtained from the Swedish Social Insurance Agency.

The strengths of Busch et al.’s (2011) research is that it is a longitudinal study with a randomised design, thus, it allows for an in-depth exploration of patterns of sickness absence over time. The economic evaluation was possible due to the comparator group, enabling the researchers to identify what would have happened had the intervention not been in situ. The use of the CBA model was comprehensive and transparent, within the analysis the time value of money was accounted for through discounting expenses by 3%, which is the percentage recommended by the WHO (Edejer et al., 2003). Additionally, calculating the costs of disability pensions included a societal perspective. A possible limitation of the research was the use of a human capita approach to value production losses due to sickness absence. A reliance on this approach, although commonly used, is cautioned against by the WHO (2009) as ‘it is unrealistic in most settings (where a pool of underemployed or unemployed labour exists)’ (p. 97). Additionally, various limitations to the study call into question the generalisability of the results to VR and the SAW population in a UK context. Firstly, the interchanging use of the terms ‘behavioural medicine rehabilitation group’ and ‘vocational multidisciplinary group’, as well as the inclusion of the vocational elements in the other two groups limit the ability to link the statistically significant findings to the VR aspect of the intervention. Secondly, as the data source only recorded absence periods of greater than 14 days, and frequent episodes of short-term sickness absence were potentially excluded. Thirdly, accessing data from a database does not allow for the cross checking for human error in inputting the results. Lastly, the costs for the control group were set at 0, which as stated by the authors is probably an underestimation. Bearing these limitations in mind, Busch et al.’s (2011) economic analysis suggests that VR is cost-effective.

Conversely, Van den Hout et al.'s (2007) RCT, conducted in Holland, using both a CBA and CEA model to analyse the economic effectiveness of VR concluded, that VR for people with arthritis who perceived they were struggling to SAW, the programme costs were less than the total savings of other health care and non-health care costs (Van den Hout et al., 2007). However, the cost benefit findings were not statistically significant. The VR intervention used in Van den Hout et al.'s (2007) study comprised of a multidisciplinary team providing a basic, systematic assessment, followed by education, vocational counselling and guidance, and medical or non-medical treatment. The data collected for the CBA included healthcare, patient and productivity costs. These costs were based on questionnaires completed by the participants, which may have resulted in recall bias (Hassan, 2006). Another limitation to consider is that arthritis is a progressive disease, thus the follow-up time period of two years may not provide an accurate picture of the long-term effectiveness and cost benefit of the intervention. When calculating the costs, statistical analysis was used, and there was no formal CBA methodology utilised. With regards to job retention, no reduction in job loss was established, thus the authors concluded that from a societal perspective it was unclear whether the VR intervention programme reduces or increases total costs in respect of people with arthritis. From these two studies, it is seen that the results from using a CBA model to explore the cost-effectiveness of VR for the SAW population are inconclusive. Busch et al.'s (2011) results indicated a positive cost-benefit ratio i.e. the economic benefits of the VR intervention were shown to be greater than the economic costs. However, Van den Hout's (2007) conclusions remained unclear as to whether the VR intervention reduced societal costs. Although both studies used interventions that have similar components such as the multidisciplinary nature of the interventions, there were variations in the target populations and the definitions of VR used. Moreover, they both have limitations in the methodology and use of a CBA model. These limitations and variations confine the generalisability of the findings and indicate the need to interpret the results with caution. Furthermore, as the studies were conducted in Sweden and Holland respectively this potentially limits their applicability to the UK context.

Looking at the UK context, best practice case studies of VR outlined in the UK Industrial Injuries Advisory Council report on the effectiveness of VR (Waddell et al., 2008). These case studies indicate that VR is effective and point towards VR being a cost-effective intervention. However, case studies are not considered good quality of evidence (Mann, 1996), thus

highlighting that further high-quality research into the cost and benefits of VR interventions within the UK is necessary (Waddell et al., 2008).

A limitation of using a CBA as a method of exploring cost-effectiveness within VR and the SAW population is that it requires the monetisation of outcomes to provide a comparable cost-benefit ratio, as well as needing a comparator/control group. To overcome the difficulty of monetising all outcomes used, alternative economic analyses have been utilised to examine the cost effectiveness of VR interventions for the SAW population. Karrholm et al. (2006) used a CEA to explore the economic benefits of a multidisciplinary VR intervention focussing on enabling employees off sick to RTW. Sixty-four employers from a Swedish public co-operation project were rehabilitated, and their sickness absence rates for a year and a half post the intervention were compared to the previous year, as well as a matched pairs comparison group. Karrholm et al. (2006) estimated the economic benefit of the intervention to be 1,278 EUR per month and person, based on the whole group; and up to 2,405 EUR per month, per person for the sub group of employees who had more than 8.5 days sick leave per month. Moreover, Karrholm et al. (2006) noted that these economic benefits only provide a limited estimation of the economic benefits of improving the health of employees, highlighting likely additional economic benefits such as increased productivity. These findings are in line with the conclusion in Waddell et al.'s (2008) review, that there is strong evidence that VR interventions are effective, but limited evidence that they are cost-effective. Thus, reiterating the need for further research into the cost and benefits of VR interventions, specifically within the UK.

As seen when examining the evidence-base of CBAs and VR, a difficulty in the usability of the research and findings is the wide variety of definitions of the VR intervention itself. This lack of heterogeneity creates difficulties when trying to compare outcomes and results. This lack of heterogeneity also generates the question, when reviewing the evidence on the use of CBAs within VR, of whether to narrow the included literature to interventions labelled as VR only, or to include a broader body of evidence by including economic analyses of interventions that VR includes? Pruett et al.'s (2008) literature review of the essential components of VR, found that although there is a lack of literature supporting the efficacy of VR, components of VR are supported by empirical evidence. This evidence of effectiveness of components of VR interventions is also observed in Burton's (2010) review 'Healthy Workplace Framework and Model'. To gain a wider understanding of the cost benefits analysis of VR in the SAW

population, cost benefit analyses of interventions that come under the VR umbrella will be discussed.

2. 3.4 Economic effectiveness of interventions or therapies used within VR services for the SAW population

The definition of VR, i.e. “whatever helps someone with a health problem remain in or RTW” (Waddell et al., 2008, p.5) is all encompassing, thus, it is difficult to succinctly identify the various components that a VR intervention may comprise. As discussed when defining VR, a widely accepted key component of the VR approach is work-focused health care and accommodating workplaces. Thus, economic evaluations of interventions conducted with a workplace component will be considered.

Although workplace components are part of interventions, the varied nature of interventions used in VR, create limitations in the comparability of the results. Even when the same intervention is used, the results may vary due to differences in the research and economic evaluation methodology used.

According to Waddell et al. (2008) there is ‘strong evidence that simple, inexpensive healthcare and workplace interventions in the early stages of sickness absence can be effective and cost-effective for increasing RTW rates and reducing the number of people who go off sick’ (p.39). This finding is supported in Carroll et al.’s (2009) systematic review whose main findings were that early interventions (between 2-8 weeks sick leave) and direct work input are likely to be effective and cost effective. Additionally, there is a consensus in the evidence that improved communication between all stakeholders has been shown to lead to an increased RTW rate, decreased sickness absence and be cost-effective (van Vilsteren, et al., 2015; Dibben et al., 2012; Carroll et al., 2009; Waddell et al., 2008).

Loisel et al. (2002) and Bultman et al. (2009) both studied the economic impact of the Sherbrooke model, a Canadian intervention model that comprises of both occupational and clinical input as part of a coordinated and tailored work rehabilitation programme, whereby the interdisciplinary team works together to screen for work disability and develop RTW plans (Bultman, 2009). Loisel et al. (2002) found no significant cost-benefit; however, Bultman et al. (2009) found a positive cost-benefit ratio in favour of the intervention. The differences in these

results may be due to the fact the Loisel et al.'s (2002) sample consisted of patients with sub-acute low back pain, whereas Bultman et al. (2009) included any MSD. Additionally, the two interventions were carried out in different countries, Canada and Denmark respectively, questioning the transferability of the intervention in different areas. Lastly, the economic analyses included different outcome measures and were conducted from different perspectives, reducing the comparability of the results. Loisel et al.'s (2002) CBA was populated with the costs borne by the insurers such as income replacement costs, health care costs, intervention costs, costs of work hours spent by the employees participating in the intervention, and the costs of sickness absence for low back pain. These costs differ to those from an employer or societal perspective. Bultman et al. (2009) performed the CBA from a societal perspective (considering the impact of the intervention on the welfare of the whole of the society), using productivity and health care costs as outcomes. The impact on the individual or employer was not determined as the different organisations employing the participants may have had differing sickness absence policies and practices.

This lack of clarity over the cost-benefits of VR interventions for the SAW population is further complicated when the variety of mental and physical conditions that VR may address are considered. To date economic evaluations of workplace health have mainly been focused on physical conditions. According to NICE (2009a) no economic studies looking specifically at mental health at work have been published since 1990. Graveling, Crawford, Cowie, Amati, & Vohra's (2008) review of workplace interventions promoting mental wellbeing in the workplace, concluded that the evidence suggests that there are tangible benefits from mental wellbeing interventions; however, due to the low quality of the research an unequivocal statement on the effectiveness cannot be made.

In the VR and mental health conditions research conducted since 2009, McDaid and Park (2011) found studies exploring the economic return on investment, and reporting positive economic findings from a number of workplace health promotion and stress management programmes. These programmes focused on those who had already been diagnosed as having a mental health condition, and the studies were largely in the USA, thus, questioning their generalisability to the UK context. In addition, they excluded a significant population of employees who may have had mental health needs. Knapp et al.'s (2011) study targeted a wider population, exploring the cost-effectiveness of an intervention for depression and anxiety, which included screening all employees and offering those at risk cognitive behavioural

therapy. In the economic modelling to assess the cost-effectiveness of this intervention, they concluded that the intervention appeared to deliver cost savings through the reduction of sickness absence and improved levels of productivity, linked to decreased presenteeism (Knapp et al., 2011). These findings are supported by Kroger, Bode, Wunsch, & Kliem's (2015) matched controlled study, where employees accessing work focused cognitive behavioural therapy as opposed to usual care cognitive behavioural therapy resulting in significantly less sickness absence at 12 months follow-up. However, these findings may not be generalisable due to the small sample size ($n = 36$), and the inclusion criteria of depressive disorder, which may have a different impact on sickness absence level compared to other mental health disorders such as anxiety. Moreover, the costs considered, such as health care insurance plans, may not be relevant to a UK context.

Conversely, Van Oostrom et al.'s (2008) economic analyses of a workplace intervention for people with common mental health disorders (measured using the Four-Dimensional Symptoms Questionnaire (Terluin, 2006, cited in Van Oostrom et al., 2008), indicated no significant sustainability of results in both the CEA and CUA, and with regards to the CBA it demonstrated a higher cost of the intervention than the benefits. The intervention comprised of a stepwise approach to devising a RTW plan with the work supervisor. The outcomes used in the economic analysis were RTW, sickness absence (as a proxy measure of productivity), quality of life adjusted years (QALYs) and healthcare utilisation, with a follow-up period of 12 months. The CBA was conducted from the employer's perspective, whereas the CUA and CEA were from a societal perspective. Although these results, contradict other research, the intervention used within this study is a minimal input intervention and perhaps was not detailed enough to properly address the distress employees were experiencing. In addition, the studies demonstrating positive findings (Knapp et al., 2011 & Kroger et al., 2015) are not UK based studies and thus the generalisability of these results to the UK context is questionable. The case studies displayed on the UK Health, Work and Wellbeing website (DWP, 2009), although low in the hierarchy of evidence, indicate positive economic results, with regards to decreased absenteeism and staff retention, for interventions focusing on mental health conditions.

From the studies discussed above, there is some evidence that VR interventions for mental health conditions are cost-effective. However, there are question marks over the quality of research in this area, and limited availability of case studies presented in corporate literature (Mc Daid & Park, 2011). Hamberg-van Reenen, Proper and van der Berg's (2012) systematic

review of economic evaluations of worksite mental health interventions concluded that due to the limited number and poor methodological quality of studies in this area, further research is needed. Due to the far-reaching social, economic and individual costs of mental ill health, research into the effectiveness of VR interventions for mental health issues have been highlighted as a priority (Black, 2008; Lelliot et al., 2008, cited in Waddell et al., 2008).

In respect of the cost benefits of VR for physical conditions, Palmer et al. (2012) carried out a high quality systematic review looking at the effectiveness of interventions in the community and workplace setting to reduce sickness absence and job loss in employees with MSDs. The review included thirty-four RCTs and eight cohort studies. Eight, out of the forty-two included studies had conducted a formal CBA. The results concluded that the cost-benefits of VR in physical conditions are uncertain. However, the majority of results did suggest overall net savings, although, in two reports (Hlobil et al., 2007 & Steenstra et al., 2009, both cited in Palmer et al., 2012) with 95% CI, the findings indicated substantial net losses. The typical outcomes used within the economic analyses were sickness absence and the cost of the intervention. Four studies (Bultman et al., 2009; Jensen, Bergstrom, Ljungquist, & Bodin, 2005; Loisel et al., 2002; Steenstra et al., 2006; all cited in Palmer et al., 2012), assessed benefits in terms of reduced health care costs, and one study included the cost of health care. Palmer et al. (2012) concluded that community and workplace interventions for MSDs do reduce job loss and sickness absence, however only weak recommendations could be put forward. Additionally, there is limited and inconclusive cost benefit data, thus the cost-effectiveness of the interventions are uncertain (Palmer et al., 2012). The included studies were mostly conducted in Europe and North America; covered a variety of anatomical sites of MSDs, although few differences were found by anatomical site; and the included interventions all varied, again highlighting the lack of homogeneity within this area of research, reducing the comparability and generalisability of the results.

Conversely, Hanson et al.'s (2006) cost-effectiveness of case management for MSDs in the UK, showed a reduction in costs when exploring the following outcomes: healthcare costs, treatment duration, sick leave and time off work, productivity, compensation claims and litigation (number and length till closure). Moreover, Tompa, de Oliveira, Dolinshic, & Irvin's (2008) and Pruett et al.'s (2008) systematic reviews concluded that there is credible evidence supporting the financial benefits of disability management interventions for several intervention components and features, with moderate evidence for work/vocational interventions. Pruett et

al.'s (2008) review showed positive CBA results ranging from a 3 to 18 ratio, with a ratio over one indicating a positive return. Although these findings apparently contradict Palmer et al.'s (2012) conclusion, the different focus of the systematic review may account for this discrepancy, with Tompa et al. (2008) and Pruett et al. (2008) focused on disability management interventions as opposed to workplace interventions. This extensive variability of VR interventions once more demonstrates the obstacles to research within the field of VR. Tompa et al. (2008) identified 17 economic evaluations, 8 of those were of a medium or high quality, and 3 of those 8 were identified as using CBAs as the method of economic evaluation (Loisel et al., 2002; Jensen et al., 2005; and Arnetz, Sjogren, Rydehn, & Meisel, 2003). However, on further examination, when using the definition of a CBA and a CEA provided in the introduction, Jensen et al.'s (2005) economic analysis fits the definition of a CEA as opposed to a CBA. This lack of clarity amongst research studies of the differentiation between the various economic analyses available further complicates the picture when reviewing the cost-effectiveness of VR interventions.

In conclusion, when considering CBAs conducted for interventions with workplace components for physical health conditions, it is seen that the evidence is limited and inconclusive for the cost benefits of these interventions in the SAW population. This conclusion echoes that of the conclusions drawn earlier for mental health conditions.

With regards to the sustainability of the interventions there are few studies that follow participants over the long-run, although, Jensen et al. (2009) conducted a simple cost-effective analysis of a multidisciplinary intervention for neck and back pain and showed a positive cost-effectiveness over 7 years. Additionally, Squires, Rick, Carroll, & Hillage (2012) used the Markov mathematical model to synthesise evidence on workplace interventions for MSDs, and to analyse the long-term cost effectiveness through the extrapolation of data beyond the trial period. Squires et al.'s (2012) findings suggest that interventions resulting in small improvements in RTW are likely to be cost-effective when compared to other funded interventions within the NHS.

Thus, the evidence-base on the cost-effectiveness of interventions used within VR, both for MSDs and mental health conditions, is limited and needs further development (Waddell et al., 2008; Franche et al., 2005; Steenstra et al., 2006; Hanson et al., 2006).

2. 3.5 Summary of the economic effectiveness of VR services for the SAW population

Throughout this section of the review it is seen that VR interventions are difficult to evaluate. The lack of homogeneity in the populations, conditions, interventions, and outcome measures used within VR, limit the ability to determine the effectiveness of VR (Johnston, Stineman & Velozo, 1997; cited in Pruett et al., 2008). The economic methods used in the studies looking at the cost benefits of VR, and the various interventions used within VR have a number of limitations. Overall, there was a lack of transparency, limited consensus on which model to use for an economic evaluation in the field of VR, questions surrounding the use of human capital as a measure of productivity, and limited clarity on terminology and differentiations between economic models. Additionally, when specifically considering the use of a CBA model within the field of VR, it is noted that it is seldom used, and when used the wider societal perspective is largely ignored, with few studies exploring the costs and benefits incurred by society and the individual in the SAW population. These limitations, however, are commonly found when evaluating workplace interventions, as the interventions attempt to change human behaviour, which is influenced by a wide variety of factors (Burton, 2010). Additionally, control groups are not always feasible, often relying on before and after data (Burton, 2010).

Bearing these limitations in mind, through exploring the cost effectiveness evidence-base underpinning VR, in the SAW population, it can be concluded, that although studies suggest VR may be a cost-effective solution to enabling people to SAW, more research is needed to be able to draw robust conclusions (Noben, Nijhuis, de Rijk, & Evers, 2012; Black, 2008; Waddell et al., 2008). Additionally, research within the UK is limited and the quality of studies generally low, raising questions around the generalisability of findings in the UK context.

2.4 Literature review conclusion

Sickness absence and presenteeism result in poor outcomes for organisations, individuals and society as whole, not only with regards to economic outcomes, but from a health and wellbeing perspective (Dibben et al., 2012; CIPD, 2014a; CBI, 2013; Black, 2008; Bevan et al., 2007; Aronsson et al., 2000). Due to the multifaceted nature of sickness absence and presenteeism, and the array of influencing factors on individuals experiencing episodes of sickness absence or presenteeism (Allebeck and Mastekaase, 2004; Yeomans, 2011; Baker-McClearn et al.,

2010), VR's bio-psycho-social approach has been advocated as an effective intervention for the management of sickness absence (DWP & DH, 2017; Dibben et al., 2012; Black, 2008; Waddell et al., 2008; Carroll et al., 2009). However, the cost benefits of using VR to address sickness absence, although from initial results appears promising, are still to be determined, with a need for further robust research in this area. A variety of economic methodologies have been used within the field to examine the cost effectiveness of VR interventions (Parkin, 2009; Busch et al., 2011; Van den Hout et al., 2007; Karrholm et al., 2006; Bultman, 2009; Loisel et al., 2002; Van Oostrom et al., 2010). The use of CBAs, although recommended by the NHS Health Development Agency as the ideal method of economic analysis (Kelly et al., 2005), have seldom been used to evaluate VR in the SAW population. This could be explained by the fact that not all benefits can be assigned a monetary value (Kelly et al., 2005). Additionally, in the studies utilising CBA as a methodology to evaluate VR in the SAW population (Busch et al., 2011; Van den Hout et al., 2007; Waddell et al., 2008; Loisel et al., 2002; Bultman et al., 2009; van Oostrom et al., 2010) there are number of limitations noted, both with regards to the studies and the limitations of CBA as a method of economic analysis. From this, it can be concluded that further research into a model to explore the costs and benefits of VR in the SAW population is needed. Additionally, according to Burton (2010) it is important that organisations are supported to determine the cost benefits of their investments without relying on academic support or costly research budgets, therefore 'practical CBA tools' are needed. Although there are limitations to using CBA's, CBAs are useful as they allow outcomes to be monetised, provide insight into which intervention strategy will maximise the cost benefit, and enable the evaluation of costs and benefits from a variety of stakeholders' viewpoints (van Dongen, 2014; Meijester et al., 2011). Moreover, within workplace/OH studies CBA's have been widely used as they provide outputs that are of interest to organisations purchasing these services (van Dongen et al., 2014). In addition, CBA's allow for the comparisons of different services. As the service provision within VR is so varied this would facilitate identifying which VR services or elements of VR are effective. Thus, with the current challenging economic circumstances in the UK and internationally, it is imperative that a user-friendly economic analysis tool, as a method of economic evaluation for VR interventions in the SAW population is developed. Considering the outlined economic models and their uses, and the stakeholders perspectives it is seen that a CBA model would be the most appropriate model for a VR intervention when conducted from an organisational perspective. The aim of this CBA tool would be to enable organisations and researchers to compare interventions and services from a variety of

perspectives, including the wider benefits of VR interventions, helping to assist decisions that are based not only on economics, but also from a welfare and utilitarian perspective.

3. Methodology

3.1 Introduction

This chapter discusses the methodology used to meet the aims of this study, namely:

1. To develop economic outcomes, to be used within an existing CBA model, in order to ascertain the efficacy of the CBA tool in evaluating the costs and benefits of VR interventions and services.
2. To implement and explore the practical application of the revised CBA tool, including the developed outcomes, using data from two VR services.

The chapter begins with an overview of the methodological approaches, including a critical appraisal of mixed methods as the methodological approach underpinning this research. This is followed by a discussion of the rationale underpinning the use of the Greater Manchester (GM) New Economy CBA model within this study. In addition, an explanation of the economic workings of the GM New Economy model will be presented. The CBA model is described prior to discussing each phase of the research, to inform the reader of how the CBA model operates in order to conceptualise the methodology of each phase. Lastly, a discussion of the research designs used each stages of this research, with their respective strengths and limitations will be presented.

3.2 Research methodology

Prior to determining the methodological approach, it is recommended to firstly determine the underlying philosophical assumptions of the research, as this influences the choice of research philosophy/paradigm and ultimately the chosen methodology (Bashir, Syed and Quershi, 2017; Saunders, Lewis, and Thornhill, 2015; Scotland, 2012). The necessity of identifying the philosophical underpinnings has been debated, with suggestions that ignoring the underpinning philosophy and simply focusing on using methods appropriate to answering questions is sufficient (Holden & Lynch, 2004). With others asserting that reviewing the underpinning philosophy is good practice (Jackson, 2013) and may open the researcher to other possibilities, enrich their research skills and enhance their confidence in their methodological choices (Holden & Lynch, 2004; Sikes, 2004). The philosophical underpinning of the research is identified by discussing: epistemology, ontology and axiology, and identifying where along the

continuum of objectivism (i.e. there is a single truth) and subjectivism (i.e. there is no such thing as one objective truth, but rather a number of subjective truths) the research assumptions are situated (Jackson, 2013; Holden & Lynch, 2004). Ontology refers to the nature of reality, explaining the knowledge and assumptions about reality (Bashir et al., 2017; Saunders et al., 2015; Scotland, 2012). Epistemology, refers to the study of knowledge, how do you know something, how it knowledge acquired and interpreted (Basher et al., 2017; Saunders et al., 2015; Scotland, 2012). Axiology concerns the values that the researcher places on the study (Denzin & Lincoln, 2005; Saunders et al., 2015).

Contemplating each of these three assumptions in relation to the research subject of this thesis guides the choice of research paradigm and methodology. Ontology, i.e. what is real, shapes the way in which the researcher sees and studies the research objects (Saunders et al., 2015; Scotland, 2012). In this study the CBA model, the organisation purchasing VR, the VR provider and the employees, are the research subjects. The aim to develop economic outcomes to use in an existing model to ascertain the efficacy of the CBA tool in evaluating the costs and benefits of VR interventions indicate an objective/quantitative paradigm, as there is a single truth (Scotland, 2012), i.e. outcomes will be developed for the CBA tool. Quantitative approaches are based on 'positivism'; all phenomena can be reduced to empirical indicators which represent the truth' (Sale, Lohfeld & Brazil, 2002, p.44). Quantitative research, through robust methodology used, such as randomisation, blinding, control groups and large samples, intends to identify a casual or generalisable relationship between variables that is objective and uninfluenced by human perception (Watson, 2014; Sale et al., 2002; Creswell, 2002). However, the second aim, to implement and explore the practical application of the revised CBA tool, indicates a more subjective / qualitative paradigm, as there may be a number of truths/views, influenced by a number of factors (Scotland, 2012), on the implementation and practical application of the CBA tool. Qualitative methodology is based on 'interpretivism' and 'constructivism', i.e. 'there are multiple realities or truths, based on one's construction of reality' (Sale et al., 2002, p.45). As this construction of reality is widely influenced and fluid in nature, the 'truth' exists in the moment it is constructed, however, it is not generalisable or fixed (Sale et al., 2002).

Epistemology considers what is acceptable and valid knowledge, and how we gain this knowledge (Jackson, 2013; Saunders et al., 2015; Scotland, 2012). This is influenced by what individuals think is real. In the multidisciplinary context of business there are a variety of

sources of knowledge such as numerical data, text data, and narratives, which are all considered legitimate sources of knowledge (Saunders et al., 2015). In this study, again the different aims have different underlying assumptions. Aim 1 takes a more objective stance, where the researcher and the subject (the CBA tool) and its efficacy in evaluating VR interventions are independent from each other. Whereas with aim 2, a more subjective viewpoint is adopted, as the implementation and practical application of the CBA tool by the researcher is by necessity interactive both during the implementation stage and whilst ascertaining the practical application of the CBA tool. Thus, when considering the ontology and epistemology, different research assumptions (objective/quantitative and subjective/qualitative) are seen to be underpinning the choice of methodologies needed to answer the different questions posed, indicating a need for a mixed methods approach.

The axiology, i.e. the values of the researcher and the subjects, influences decisions with regard to the research methodology and data interpretation (Saunders et al., 2015; Dudovisky, 2018). Saunders et al. (2015) recommend that researchers outline their values regarding the subject area, which will heighten the researchers' awareness of potential bias or ethical dilemmas. In this study, the researcher's beliefs prior to starting the research were as follows:

- VR is an effective intervention for enabling individuals with physical or mental health disorders returning to work.
- Organisations purchasing VR are fundamentally interested in the economics/financial benefit of the intervention.
- VR services are currently unable to adequately demonstrate their value.

Paradigms are defined as a 'set of interrelated assumptions about the social world which provides a philosophical and conceptual framework for the organized study of that world' (Filstead, 1979, p. 34, cited in Ponterroto, 2005). There are a number of paradigms within research, the three most common ones being positivism (an objective approach to research which is based on the ideology that science is the essence to finding answers), interpretivism (a subjective approach to research which involves the researcher interpreting aspects of the study) and pragmatism (a mixed approach which is underpinned by the understanding that there are a number of ways to conduct research, and that a number of realities are needed to provide the full picture) (Dudovisky, 2018; Scotland, 2012). Table 3 outlines these three paradigms, linking them to the ontology, research approach, axiology and research strategy. This illustrates that this research falls under a pragmatic paradigm. When taking both aims of the study into account

the ontology was objective and subjective, the research strategy was quantitative and qualitative, and the axiology may be biased.

Table 3: Positivism, interpretivism, and epistemologies (Wilson, 2010, cited in Dudovisky, 2018)

	Research approach	Ontology	Axiology	Research strategy
Positivism	Deductive	Objective	Value-free	Quantitative
Interpretivism	Inductive	Subjective	Biased	Qualitative
Pragmatism	Deductive/ inductive	Objective/ subjective	Value free/biased	Quantitative/ Qualitative

Guided by the realisations from considering the underlying philosophical assumptions and paradigms, a mixed methods approach was the most apt research methodology to be utilised across the different stages within this research. A commonly accepted definition of mixed methods is an approach to research that involves the collection, analysis and interpretation of both quantitative and qualitative data in relation to the same subject; it may be in one study or in a series of studies (Leech & Onwuegbuzie, 2008). In 2011, a study into the acceptance of mixed methods in business and management indicated minimal acceptance (14%) (Cameron & Molina-Azorin, 2011). However, although there is no institutionalisation of mixed methods within this field, Molina-Azorin, Bergh, Corley and Ketchen (2017) propose that mixed methods are commonly used within organisational research although researchers have not necessarily characterised their work as such.

The proposed strength of mixed methods is that it enables a complementary analysis of a question to be carried out, drawing on two different views of the same phenomenon (Molina-Azorin et al., 2017; Sale et al., 2002) thereby allowing for a broader, in-depth analysis of a phenomenon (Molina-Azorin et al., 2017). Moreover, triangulating the results from various methods theoretically increases the results validity (Niglas, 2004, cited in Molina-Azorin et al., 2017). Thus, mixed methodology is recommended as a useful tool to explore complex phenomenon (Creswell & Plano Clark, 2007; Sale et al., 2002). Moreover, mixed methods research provides the ability to use one method to elaborate or clarify the findings from another, and uses the results from one method to develop the use of the second method and expand the breadth of the topic area (Molina-Azorin et al., 2017). However, these advantages may be misnomers, as although it could be argued that ‘more is better’ with regards to research and that

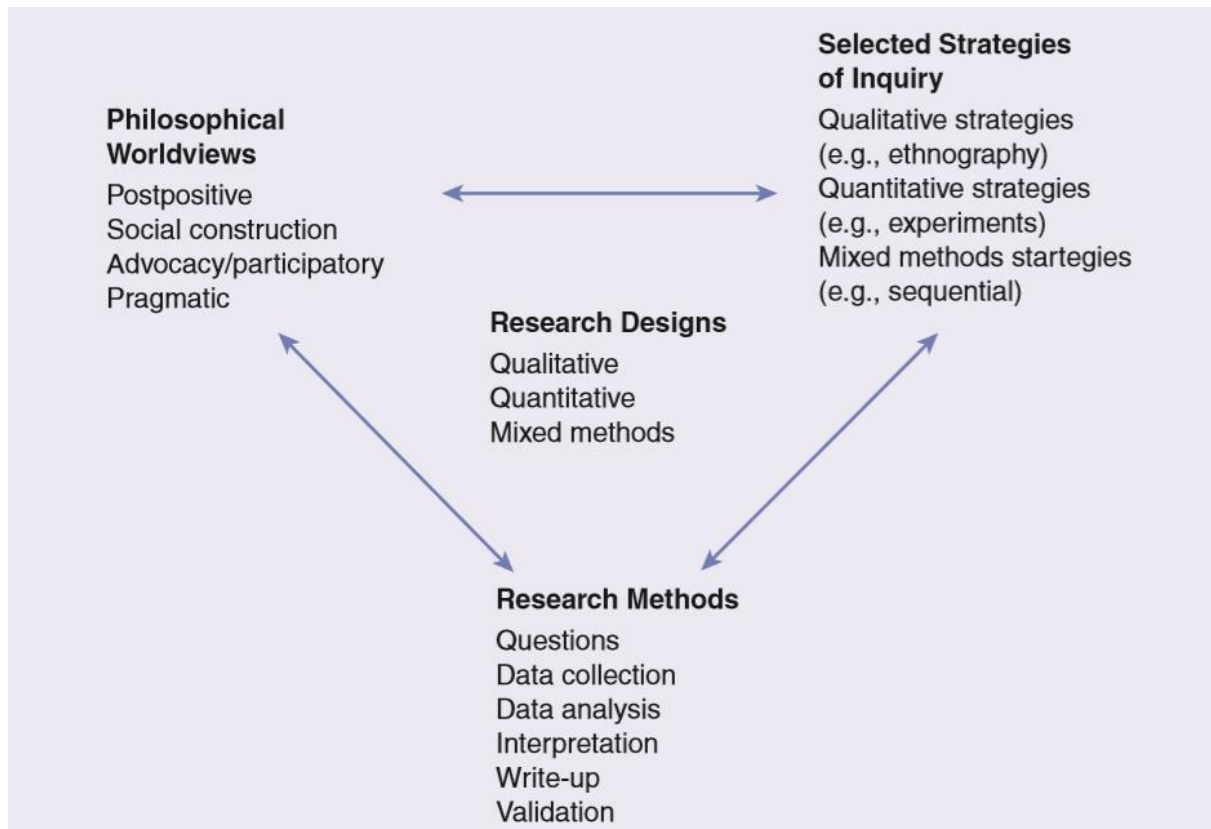
the strengths of the two different paradigms offset the weaknesses of each other (Creswell and Plano Clark, 2007; Molina-Azorin et al., 2017), it may in practice result in diluting the important contributions of a single method (Hesse-Biber, 2015). Moreover, there is a debate regarding whether quantitative and qualitative research methods can answer the same research question. If the two methods cannot answer the same question, yet the results from both methodologies agree, are they substantiating the findings or are the two methodologies merely researching different phenomena (Moffat, White, Mackintosh & Howel, 2006; Sale et al., 2002; Breakwell, Smith & Wright, 2012). However, in spite of this debate there is consistent agreement that qualitative and quantitative paradigms can be combined (Sale et al., 2002; Breakwell et al., 2012; Gelo, Braakmann, & Benetka, 2008). It is recommended that a solution to the quantitative-qualitative debate is to use the two methodologies to complement each other, using the strengths of each methodology to bolster the weaknesses in the other, allowing for a wider exploration of the complexities of the phenomenon under investigation (Molina-Azorin et al., 2017; Gelo et al., 2008; Moffat et al., 2006; Sale et al., 2002).

The mixed methods approach used in this research is an explanatory sequential design, with two distinctly independently yet interactive phases (Creswell, Plano Clark, Gutmann, & Hanson, 2003; Gelo et al., 2008; Greene, 2007). The design gives priority to the quantitative methods, and implements the methods in a sequential timing, collecting quantitative data in the earlier stages, and qualitative in the later stage (Greene, 2007; Gelo et al., 2008).

Creswell et al.'s (2003) framework 'The Interconnection of Worldviews, Design and Research Methods' (see Figure 4), focuses on the type of method, their relative importance, and in which sequence they will be used. However, a limitation in using this framework is that little consideration is given to how the question and the design of the methods intertwine (Hesse-Biber, 2015). Thus, this design becomes empirical in nature, focussing on getting the right design and working through set steps (Hesse-Biber, 2015). When overlaying the question as to how the methods and the research questions link, it is seen that it is the research question that determines the timing of the two methodologies, as well as the relative importance, addressing this limitation (Morse, 1991; cited in Hesse-Biber, 2015). Therefore, the question in relation to the timings of the two methodologies was considered when designing this research. A further advantage of the explanatory sequential design is that it allows for the distinct demarcation of the two methods, increasing the ease of implementation and write-up, as well as allowing for emergent approaches (Creswell & Plano Clark, 2007; Gelo et al., 2008). This is necessary for

this study, as the qualitative research question is reliant on the quantitative findings. However, the limitations of this design are the length of time it takes to implement, as well as the need for the researcher to decide which participants to select for the qualitative research (Ivankova, Creswell, & Stick, 2006; Creswell & Plano Clark, 2007).

Figure 4: The interconnection of Worldviews, Design and Research Methods (Creswell et al., 2003)



Through utilising the explanatory sequential mixed methods design, with two distinctly independently yet interactive phases, mixing the methods sequentially during data collection, and giving priority to the quantitative strand this enabled the research to answer the aims outlined above.

The objectives of the research are divided into four phases, namely:

Phase 1:

1. To identify from the published literature the outcomes of VR interventions for organisations and employed individuals.

2. To revise the GM New Economy CBA model to ensure that the practical CBA tool developed is capable of analysing the costs and benefits of VR interventions.

Phase 2:

3. To collect the relevant data required to populate the revised practical CBA tool from two VR Services and the organisations to which VR is provided.

Phase 3:

4. To implement and test the revised practical CBA tool incorporating the developed outcomes to identify the cost-benefits of the VR interventions and services in a real-world setting.

Phase 4:

5. To appraise the value of the revised practical CBA tool to the VR provider and the organisation to which VR is provided.

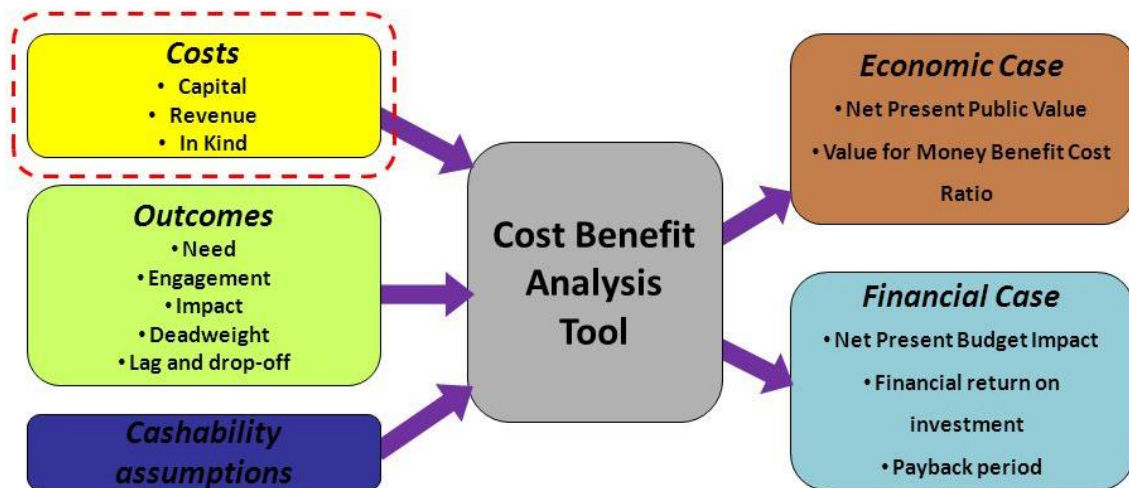
The methodology to address each phase will be discussed in turn. Prior to discussing each phase, an understanding the GM New Economy is necessary to contextualise each phase.

3.3 Overview of and rationale for the use of the GM New Economy CBA to evaluate VR.

The New Economy ‘is wholly-owned by the GM Combined Authority and provides policy, strategy and research support to the ten GM Local Authorities, the GM Local Enterprise Partnership (LEP) and other public and private sector bodies, with the aim of increasing GM’s Growth and Prosperity’ (HM Treasury et al., 2014, p.5). In 2011, the New Economy developed a user-friendly CBA tool to enable appraisal and evaluation of interventions focused on improving early years opportunities and offering better life chances within deprived neighbourhoods (Cox et al., 2011). This model allowed for the addition of outcomes of interest to users (e.g. hospital admissions, A&E attendance, incidents of crime, family wellbeing, unemployment, mental health etc.) and has subsequently been extended to include a variety of outcomes of interest to GM New Economy and the organisations that they work with. The CBA model’s processes and assumptions were developed in order to produce easily interpretable results, and are based on best practice and guidelines, where possible, ensuring that the lay

person and organisations have access to resources which will assist with the understanding of the cost benefits of particular interventions e.g. integrating employment and health care services (Cox et al., 2011). The CBA model enables both a return-on-investments (ROI) and a benefit cost ratio (BCR) to be determined.

Figure 5: The GM New Economy Cost-benefit Analysis model (HM Treasury, Public Service Transformation Network, New Economy, 2014)



A technical guide for the use of the CBA model has been developed and updated with ‘analysts from a number of central government departments including HM Treasury, DWP, Department for Business, Innovation and Skills (BIS), DH, Department for Communities and Local Government, Department for Education, Ministry of Justice, Home Office and the Cabinet Office (HM Treasury et al., 2014). These departments form ‘the Technical Advisory Group for the CBA methodology, along with local partners from the Whole Place Community Budget pilots and New Economy, local authorities and other public-sector agencies across GM’ (HM Treasury et al., 2014, p.5). Through the Whole Place Community Budget pilots version 1 of the guidance was tested, resulting in Version 2 of the guide being published in April 2014. Version 2 incorporates changes due to recent evidence as well as further modelling on outcomes crime, alcohol and drug dependency (HM Treasury et al., 2014). The CBA model is a working model and is updated as new outcomes are established. Allowing for the model to be easily adapted in the future and to include outcomes from a variety of stakeholders. The current version of the CBA model, which is used in this thesis, is version 4.2. This version includes the ability to incorporate cashability i.e. ‘the extent to which a change in an outcome or output (e.g. fewer

children in care) will result in a reduction in fiscal expenditure such that the expenditure released from that change can be reallocated elsewhere' (HM Treasury et al., 2014, p.36). In the development of the CBA model the following key texts were used to inform the technical details; the HM treasury's Green Book (2011); the DWP's Social CBA Framework (Fujiwara, 2010); the Business Innovation and Skills (BIS) Additionality Guidance (Department for BIS, 2009); The Cabinet office/New Economics Foundation's Guide to Social Return on Investment (Nicholls, Lawlor, Neitzert, Goodspeed, & Cupitt, 2009); and the Volunteering England's Volunteer Investment and Value Audit (Gaskin, 2011).

A unique feature of the GM new economy model is that it accounts for overly optimistic outcomes (optimism bias) by applying correction factors that account for the level of uncertainty in the data or assumptions made. These correction factors are based on the data source type, the age of the data/data analysis, the evidence-base for both the engagement/level of impact, the monetisation of outcomes, and any known data source error (Cox et al., 2011). Although optimism bias provides a greater level of robustness to the CBA model (HM Treasury, 2011), the figures produced need to be viewed with an understanding of the limitations of CBAs and it is envisioned that CBA outputs will be 'used as a decision support tool rather than a decision-making tool' (Cox et al., 2011, p.13; Keating & Keating, 2014; Snell, 2011; Sculpher et al., 2006).

Since the CBA model's inception, it has been widely used within the public sector, social enterprises and third sector organisations, highlighting its applicability to a variety of populations and interventions. At the time of writing, to the best of my knowledge, and according to the New Economy, the CBA model has not been used within the private sector. The Citizens Advice Service 2015 report 'The value of Citizens Advice service: our impact', utilised the GM New Economy CBA model to demonstrate the financial and societal impact of their activities. Furthermore, the Department for Communities and Local Government (DCLG), comprising of 120 local authorities, incorporated the use of the GM New Economy CBA model into the bidding process for the Transformation Challenge Award (DCLG, 2014). In 2017, the Work Foundation utilised the GM New Economy CBA model to evaluate 'The Bridging the Gap Programme', a programme aimed at supporting the integration of health care and employment services, to support people with health care conditions to 'move towards employment and better manage their health care condition' (Shehabi, 2017, p. i). The Work Foundations programme indicates the usefulness of this model to interventions addressing

employment, further supporting the use of this model in this research. Although widely used, an organisation trialling the GM New Economy model identified limitations of the model, such as the limited number of factors/outcomes taken into consideration potentially skewing results, and missing the true value of the services, the lack of ability to attribute the results to the interventions/services, and the complexity and time demands of the data collection (Rose, 2013). These identified limitations resulted in the organisation rejecting the findings from the CBA model (Rose, 2013). This reiterates the necessity of transparency when conducting CBA's and that the results produced are only part of the picture, thus CBAs should be viewed as decision-making tools (Cox et al., 2011; Keating & Keating, 2014; Snell, 2011; Sculpher et al., 2006).

There are many CBA models and instructions on how to conduct a CBA, all of these follow the same principles outlined in Cox et al. (2011) (Central Expenditure Evaluation Unit (CEEU), 2011; Treasury Board of Canada Secretariat, 1998). However, the advantages of using the GM New Economy CBA for this research are:

- The CBA model was developed for use within local authorities, thus there is a strong focus on the social costs and benefits as outcomes;
- The CBA model is widely adaptable to a variety of agencies;
- The CBA model is widely used within public and third sector organisations within GM, however, it has not been used within the private sector;
- It was developed as a model to be shared within GM public agencies, therefore it is presented as an excel spreadsheet with the underlying calculations completed, increasing the usability of the CBA model;
- It is an emerging model, which allows for the addition of outcomes of interest;
- It allows for the sharing of the costs and benefits to be spread across different agencies, showing a true representation of where the costs and benefits are accrued, allowing for fairer distribution of budgets;
- It has an inbuilt discount rate in line with national government recommendations;
- It is developed locally, with local expert help available;
- And it provides a ROI (measuring the cost of the programme versus the financial return for the organisation) (Cavallo, 2006)).

3.3.1 Existing economic models for evaluating workplace interventions in the public domain

To my knowledge, at the commencement of this research there were no economic models in the UK, and within the public domain, suitable for exploring the economic impact of VR interventions. During the course of the research two economic models/frameworks in the UK for analysing interventions within the workplace emerged, the 'British Heart Foundation Cost savings calculator' (British Heart Foundation (BHF) & ERS Research and Consultancy, 2016) and the 'Economic Modelling Framework' (Levy, Hillage & Bevan, 2014), moreover, in Australia a similar model, the 'Workplace Health Savings calculator' was developed by Baxter et al. (2015), these will be briefly outlined below and contrasted to the CBA model used within this thesis.

Levy et al. (2014) designed two models which allow organisations to explore the potential costs and benefits prior to implementation of new workplace policies and management practices. The first model estimates the level of effectiveness that would be needed by the implementation of new workplace policies and management practices in order to break even, and the second model estimates the maximum cost of the intervention in order to break even (Levy et al., 2014). The model is populated using benchmark data drawn from the evidence-base, as well as allowing organisations to input known data specific to their organisation (Levy et al., 2014). The outcomes or effects of the interventions are analysed in terms of sickness absence, turnover and productivity. When combined they provide the total impact of the intervention, however, there may be some overlap between these effects, and productivity needs to be focused on the direct outcomes of the intervention to minimise this overlap (Levy et al., 2014). The model is user-friendly allowing for the organisation to input their own data where necessary, as well as adjust assumptions such as the discount rate (i.e. the interest rate used to determine the present value of future cash flows) in line with the discount rate used within their organisation (Levy et al., 2014).

BHF and ERS consultancy developed a model allowing organisations to see the potential cost savings of investing in health and wellbeing initiatives (BHF and ERS Research & Consultancy, 2016). This model uses the outcomes of the interventions as sickness absence, presenteeism, and turnover. The model uses national averages and provides general guidelines to organisations. This differs from the Levy et al. (2014) model which allows organisations to

input their own data, consequently getting more focused results. As with Levy et al.'s (2014) model, the population of interest is the entire workforce, as the interventions of interest will be targeting all employees. Similarly, Baxter et al.'s (2015) model, enabling organisations to identify the potential annual savings of workplace health promotion interventions, also focuses on sickness absence and staff turnover rates as outcomes, using the entire workforce as the population.

When comparing these models to the CBA tool that this research aims to develop, Levy et al. (2014), BHF & ERS Research & Consultancy (2016), and Baxter et al. (2015) all have their target population as the entire workforce. This differs from the CBA tool in this study which aims to only look at the VR intervention's impact on those individuals with mental or physical health conditions. Moreover, these models (Levy et al., 2014; BHF & ERS Research & Consultancy, 2016; Baxter et al., 2015) allow organisations to consider alternative solutions to their identified need prior to implementation. Although this is a feature of GM New Economy CBA model, for the purposes of this research the CBA tool analyses the effects of the intervention post-implementation. All models use sickness absence and turnover as outcome measures, however, Levy et al.'s (2014) includes productivity and BHF & ERS Research and Consultancy (2016) includes presenteeism, whereas Baxter et al. (2015) state that in order to avoid over-estimating potential savings/benefits their model only includes sickness absence and turnover as outcomes. A unique feature of the GM New Economy model is that outcomes can easily be included or excluded, allowing a variety of outcomes to be in the model and adapted to individual organisations' data collected and interest.

From exploring the GM New Economy CBA model, it is seen that this model is easily adaptable and would allow for the addition of VR outcomes, and thus this model will be revised within this research.

3.4 Workings of the Greater Manchester New Economy CBA

The GM New Economy CBA model is in the form of an excel spread sheet which enables users to input data they have collected, on costs and benefits for already developed and calculated outcomes, resulting in the generation of the following outcomes:

- **Benefit Cost Ratio (BCR)** = benefits/costs

- **Net Present Values** (NPV) = benefits – costs
- **Net Present Efficiency** (NPE) = NPV of the benefits – NPV of the costs
- **Return on Investment** (ROI) = (benefits – costs)/costs

The BCR supplies information on the monetised value of the outcomes of an intervention, providing an indication of the level of return on investment achieved by the intervention (Cox et al., 2011). A BCR < 1 indicates that the costs outweigh the benefits, a BCR = 1 is breakeven point, and a BCR > 1 shows that the intervention has achieved more than it cost (Cox et al., 2011). Moreover, the CBA model produces a ROI; a profitability measure which evaluates the performance of a business (Cowen & Katten, 2009). However, ROI presents challenges when considering tax and inflation, as well as knowing what would be an adequate ROI (Cowen & Katten, 2009). Nevertheless, it still does aid decision making, and all things being equal, the higher ROI would be a more favourable investment (Cowen & Katten, 2009).

In addition to calculating a BCR and ROI, the CBA model calculates the NPV. This is calculated, by discounting future benefits and costs, in order to provide a consistent measure of costs and benefits now and into the future. This criterion is simply based on whether the sum of discounted benefits exceeds the sum of discounted costs (Keating & Keating, 2014; Snell, 2011; CEEU, 2011). The decision rule commonly accepted is that one should reject any project with a NPV of less than zero, unless there is a willingness to ‘lose money’ to achieve a non-financial objective e.g. positive employer reputation, and when offered a choice amongst alternative projects to maximise the NPV (Keating and Keating, 2014; Lee & Lee, 2006; Treasury board of Canada Secretariat, 1998).

In certain instances, BCR’s fail to produce meaningful results, for example, if a service reduces the level of costs through efficiency/streamlining, this would produce a negative BCR, suggesting that costs outweighed the benefits (HM Treasury et al., 2014). In these cases, NPE is an alternative way of assessing the worth of interventions. Interventions with a higher NPE should normally be chosen first (Keating & Keating, 2014; Cox et al., 2011). The NPV of the costs and benefits can then be used to determine the NPE.

When populating the CBA model, two types of inputs are required; costs and benefits (Keating & Keating et al., 2017; Snell, 2011). The costs refer to all the costs associated with the intervention, these can be capital, revenue (total costs of managing or delivering a product or

service) or in-kind (volunteer costs) (HM Treasury et al., 2014). It is important to consider not only what the costs are, but also which agency bears the costs and when these costs are borne. Examples of costs include salaries of staff, travel costs, training costs, equipment etc. (as discussed in section 3.5.1).

Benefits are looked at in terms of economic (economic benefits to the organisation and individuals), fiscal (savings to government agencies) and social benefits (non-economic benefits to individuals and society such as increased quality of life) (Keating & Keating, 2014; HM Treasury et al., 2014; Snell, 2011). The benefits are typically shaped by the objectives of the intervention. Possible economic benefits from a VR intervention in the SAW population are a decrease in sickness absence, a corresponding increase in productivity levels; fiscal benefits may include a decrease in the number of individuals moving out of employment and claiming social security benefits; and non-economic benefits may include an increase in worker morale, increased job satisfaction, increased job stability etc. (as discussed in section 3.5.1).

Currently, the GM New Economy CBA spread sheet allows the inputting of data around specific outcomes that have been monetised i.e. the economic value of the benefits have been calculated, such as mental ill-health, A&E visits, worklessness and benefits payments etc. (HM Treasury et al., 2014). Once the data is inputted and the CBA model is implemented, sensitivity and scenario analyses are performed to determine which variables appear to have the most influence on the cost-benefit ratio (HM Treasury et al., 2014). Sensitivity and scenario analysis is the method used to deal with uncertainty within the CBA model, i.e. assumptions employed during the modelling, discount rates used, quality of data, etc. (Keating & Keating, 2014; NICE, 2013b). Utilising the best and worst-case scenario analysis enables the identification of the factors which have the greatest impact on the results, as well as the extent of this impact (NICE, 2013b) thus enabling the evaluator to consider actions that may limit the uncertainty of these variables (Keating & Keating, 2014; NICE, 2013b; Treasury Board of Canada Secretariat, 1998).

The GM New Economy CBA model is a 'living' model, allowing for refinement and updating as new outcome measures are calculated.

The data needed to apply the CBA model for a specific outcome is:

- **The target population:** How many people could potentially access the intervention?

- **The engaged population:** How many people will access the intervention?
- **The impact:** How many people will achieve the desired outcome?
- **The deadweight:** What would have happened if the intervention had not been in place?
- **Value:** What is the value of the desired outcome?
- **Predicted impact and lag:** What is the predicted sustainability of the interventions impact?

For each outcome, the above data is derived from different sources. Typically, in a CBA conducted following the implementation of an intervention, the organisation will collect data on the target population, the engaged population and the impact. They will then input this data into the CBA model against the appropriate outcome where the deadweight, value, impact and lag have been previously calculated and standardised, i.e. the outcome has been monetised. In a predictive CBA the engagement rates and impact rates need to be calculated prior to the implementing of the CBA model. One of the key considerations with CBA models is the risk of double counting benefits; this needs to be considered when choosing the outcomes to populate the model (Rebergen, Bruinvels, van Tulder, van der Beek, & van Mechelen, 2009; Messonnier & Meltzer, 2003).

In order to monetise outcomes to be used within the CBA model it is necessary to calculate and/or obtain the deadweight value, impact and lag, as well as engagement rates. These are calculated using the existing evidence-base and expert opinion, as well as, if available, data from comparator organisations (Keating & Keating, 2014). In the initial stages of monetising outcomes, there may be insufficient data, requiring the use of assumptions within the CBA model; an inherent limitation of CBA models (Messonnier & Meltzer, 2003). To address this limitation ‘optimism bias’ correction is applied to the data collected. Additionally, it is important that any assumptions made are subject to sensitivity analysis (Keating & Keating, 2014; Snell, 2011) and updated as appropriate.

Optimism bias tables are a unique feature of the GM New Economy CBA model, to account for overly optimistic assessment of outcomes. These correction factors are based on the data source type, the age of the data/data analysis, the evidence-base for both the engagement/level of impact and the monetisation of outcomes, and any known data source error (Cox et al., 2011). The correction factors allow for percentage adjustments to be made based on the reliability,

source and age of the data. These correction factors will be applied to the revised CBA tool. Applying the correction factors provides a greater level of robustness to the CBA model (Cox et al., 2011; HM Treasury, 2013).

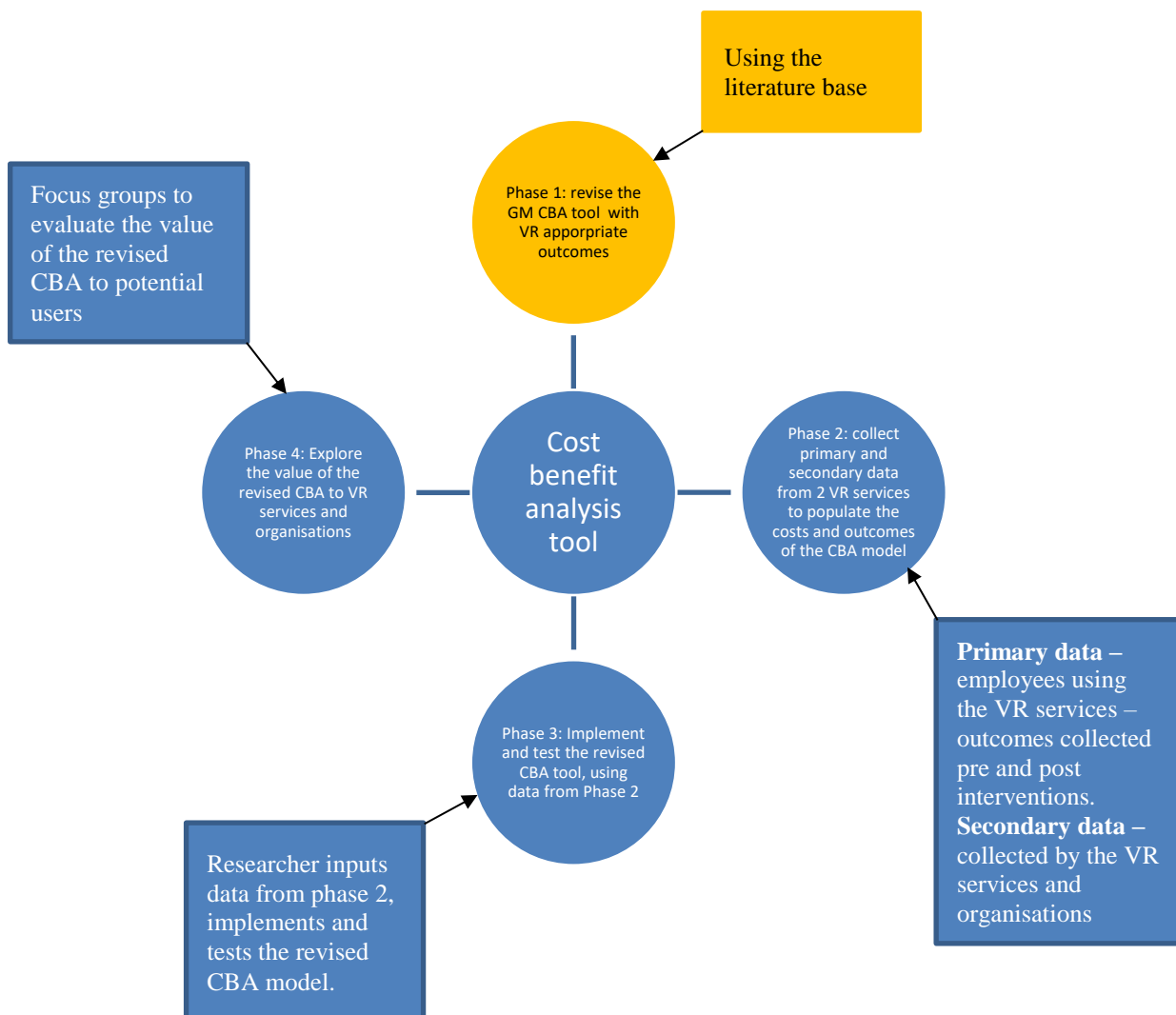
Sensitivity analysis is a method whereby various parameters in the analysis are varied in order to test the impact of this variation on the overall result (the BCR or NPV) (Keating & Keating, 2014; Snell, 2011, CEEU, 2011; Pannell, 1997). Subjecting the CBA model to a range of sensitivity tests enables a greater understanding of the degree of confidence with which the outputs can be treated (Pannell, 1997; Keating & Keating, 2014; Snell, 2011, CEEU, 2011). It is necessary to conduct this analysis as in practice most variables estimated, which may impact on the results (Environmental Assessment Institute, 2006). There are a variety of approaches to sensitivity analysis, such as simple (only changing the value of the source of uncertainty), threshold (identifying a critical value for parameters in which conclusions may change), extreme scenario (best and worst case for all values) and probabilistic/risk analysis (attaching a distribution to the variables and running a Monte Carlo simulation) (Environmental Assessment Institute, 2006; Walker & Fox-Rushby, 2001; Briggs and Gray, 1999). When conducting an analysis, it is important to use the method most suited to aims of the analysis (Pannell, 1997). CEEU (2011) state that it is not sufficient to limit the sensitivity analysis to the assumed critical variables, therefore, a comprehensive approach to sensitivity analysis needs to be performed on all cost and benefit variables. It is recommended that only one parameter is changed at a time (Keating & Keating, 2014; Snell, 2011, CEEU, 2011). CEEU (2011) recommend that the variables are adjusted significantly during the testing (i.e. between +/- 10% - 20%) to adequately assess the robustness of the CBA model. However, Snell (2011) concludes, that when a parameter is adjusted by an arbitrary percentage the result is meaningless, and recommends utilising a percentage that is 'conceptually or physically meaningful' (section A.3.2) to the decision maker. This view point is supported by Pannell (1997) who recommends that 'the modeller needs to avoid conducting sensitivity analysis in an aimless or mechanical fashion' (section 6). As this research aims to create a practical tool that is easily used by the lay person/organisations, a simple sensitivity analysis will be used, varying one parameter at a time, and changing the variables by a percentage that is conceptually meaningful for each variable.

Scenario analysis is similar to sensitivity analysis, however, it accounts for the inter-dependence of variables, looking at a range of scenarios rather than the variable-by-variable approach used

in sensitivity analysis (Snell, 2011; CEEU, 2011; Pannell, 1997). To conduct a scenario analysis a number of scenarios are formulated, e.g. best case, worst case, and for each scenario a range of values are assigned to all the cost-benefit variables, these scenarios are then used to calculate the BCR and NPV (CEEU, 2011; Pannell, 1997). An inherent weakness of sensitivity and scenario analysis, is that the analyst retains control over three aspects of the process; which variables to vary, the amount of variation that is considered clinically meaningful and what constitutes a robust finding (Walker & Fox-Rushby, 2001). Thus, it is essential to clearly outline the approach used.

3.5 Methodology Phase 1

Figure 6: Diagrammatic representation of the 4 phases of this research project highlighting phase 1



In order to meet the objectives of phase 1:

1. To identify from the published literature the outcomes of VR interventions for organisations and employed individuals.
2. To revise the GM New Economy CBA model to ensure that the practical CBA tool developed is capable of analysing the costs and benefits of VR interventions.

This section outlines the methodology required to adapt the CBA tool so that it is capable of analysing the costs and benefits of VR outcomes. It firstly identifies the benefits (outcomes of VR) and the outcome measures to be used capture these benefits. Following this the methodology underpinning the identification of the reference and intervention case for each outcome is discussed. Lastly, it identifies the unit costs for each outcome, i.e. the cost of the benefit/outcome.

3.5.1 Outcome measures: benefits and costs

In order to meet the study aims (see section 3.1), it is imperative that the outcome measures are: appropriate for use within a practical CBA tool; of relevance to organisations that may be using this tool; and capture the effects of the intervention. The following outcome measures have been identified as measurements valued by decision makers within organisations (Van Dongen et al., 2013; Levy et al., 2014; BHF and ERS Research & Consultancy, 2016) and consequently a number of them have been included in economic evaluations of workplace health interventions (Van Holland, de Boer, Brouwer, Soer, & Reneman, 2012; IJzelenberg, Meerding, & Burdorf, 2007; Oxenburgh & Marlow, 2005; Uegaki, de Bruijne, van der Beek, van Mechelen, & van Tulder, 2011):

- Sickness absence
- Employee Turnover
- Productivity
- Injuries
- Workers compensation-related costs
- Presenteeism

In addition, there is a need to include the 'hidden' costs when exploring the economic costs and benefits of interventions in the workplace (Cagno, et al., 2013; Oxenburgh & Marlow, 2005; Barham & Begum, 2005; Bevan and Hayday, 2001). Previous studies have attempted to quantify these 'hidden' costs, but ratios and estimates have varied widely, thus Oxenburgh & Marlow (2005) recommend deriving the hidden costs for each organisation. The 'hidden' costs, in addition to decreased productivity, may include 'overtime, over-employment (extra staffing), training, supervision, waste and rework, lost production time, warranty costs, maintenance, product and plant damage, and equipment down-time due to injury incidents' (Oxenburgh & Marlow, 2005, p.209).

When considering the above-mentioned outcomes to be used within an economic evaluation, it is important to ensure that the same effect is not measured twice (Zhang, Bansbak, & Anus, 2011). Oxenburgh & Marlow (2005) define productive hours as 'the total hours paid for by the employer less hours not actively producing, over a one-year period' (p.211). The reasons cited for non-productive hours include absence (due to injury or illness or other reasons such as maternity leave), training, vacation and statutory holidays. This definition is limited as it does not consider the impact of presenteeism on productivity, and consequently does not highlight the reasons for this, such as poor management, inappropriate environment (e.g. too hot, poor ventilation), poor team dynamics (Noben, Evers, Nijhuis, de Rijk, 2014; Oxenburgh & Marlow, 2005), and secondly, it does not address the quality of the productive hours (Oxenburgh & Marlow, 2005). Brouwer, Koopmanschap, & Rutten's (1999) Quality and Quantity questionnaire 'addresses the quality and quantity of work during the previous work day with two questions, each to be answered with an 11-point Numeric Rating Scale' (Van Holland et al., 2012, p. 5). However, this is over a limited time period and the results cannot necessarily be extrapolated to a longer time period. Measuring productivity is often difficult, thus proxies to estimate productivity are commonly used, such as absenteeism (Uegaki et al., 2011; van Dongen et al., 2014, van Oostrom et al., 2010), presenteeism (Spekle et al., 2010; van Dongen et al., 2014), and the impact of these on co-workers (Krol, Brouwer, & Rutten, 2013). Additionally, improvements in quality of life have been associated with increased productivity (Krol et al., 2013). However, the exact cost of sources of productivity other than absenteeism are debated, moreover there is an awareness that there is a risk of duplication of measurement of productivity if using a variety of measurements, thus there is a lack of consensus on whether to include these costs in an economic evaluation or not (van Dogen et al., 2014; Krol et al., 2013; Zhang et al., 2011).

When considering productivity, although there is a debate on its true measurement, sickness absence is an accepted proxy measure (van Dogen et al., 2014; Krol et al., 2013; Zhang et al., 2011; van Oostrom et al., 2010). Thus, to avoid duplication of the same effect, sickness absence will be the key indicator of productivity in this study and is measured in organisation 1 and 2 (described in section 1.4). As identified in the literature review, the most common causes of sickness absence are MSDs and mental health disorders (CIPD, 2014a; ONS, 2014), thus, the sickness absence outcomes in this study will focus on MSDs and mental health issues.

Additionally, it is necessary to capture the effects of ill-health on productivity when an individual does not take sick leave but has a physical or mental health condition i.e. presenteeism (van Dongen et al., 2014). When exploring the literature on measuring presenteeism, it is noted that currently there is no consensus on the best way to measure it (Garrow, 2016; Noben et al., 2014; Krol et al., 2013; Brooks et al., 2010; Terry & Min, 2010). This lack of consensus can be attributed to the fact that the evidence-base for presenteeism is an emerging evidence-base and consequently further research is needed prior to agreement being reached. Additionally, the complexities of the presenteeism phenomenon make its quantification difficult. One of the complexities is highlighted when different job characteristics are considered, for example, in a call centre, an employee's productivity may be easily quantifiable by the number of calls made, whereas quantifying the productivity in a professional job such as a lawyer would be less clear cut (Mattke, Balakrishnan, Bergamo, & Newberry, 2007; Braakman-Jansen, Taal, Kuper, & van de Laar, 2012). In an attempt to address the inherent limitations of using productivity as a measure of the quality and quantity of work an employee does on any given day, tools to measure presenteeism have been developed covering different facets of presenteeism, relying on self-reports of employees either reporting on their own estimation of their decrease in productivity, comparing their productivity to their colleagues, or estimating the amount of time that they are unproductive at work (Mattke et al., 2007; Braakman-Jansen et al., 2012). Moreover, presenteeism does not always relate to a loss in quality and quantity of work produced, but may place individuals at increased risk of sickness absence at a later date or injury or accident (Halbesleben, Whitman & Crawford, 2014). Thus, when choosing an outcome measure for research into presenteeism, it is necessary to consider the variety of tools and choose the 'best fit' tool for the population at hand, question of interest, available evidence and the target country (Noben et al., 2014). In order to explore this further, in organisation 2, presenteeism outcomes were collected.

As outlined above, turnover is commonly included in economic evaluations, exploring the impact of health interventions within the workplace (van Dongen et al., 2014; Bevan & Hayday, 2001). Turnover will be further explored in organisation 2.

As discussed in section 2.3.1 economic analyses are to be viewed as decision making aids, and it is important for purchasers of the VR services to consider the broader impacts of the service when making decisions (Cox et al., 2011; Snell, 2011; Sculpher et al., 2006). VR interventions aim to improve mental and physical health, patients' quality of life, and their work-life/job satisfaction. Job satisfaction is an indicator of wellbeing (ONS, 2017), however, as wellbeing is a broad concept with a number of dimensions and is commonly used for assessing and informing national policies as opposed to being utilised at an organisational level (Alder & Seligman, 2016; La Placa & Knight, 2014), it was not included as an outcome in this research. Measures to assess mental and physical health, patients' quality of life, and their work-life/job satisfaction are also included to allow decision makers to explore the wider impacts of VR; in organisation 1, general mental and physical health outcome data, as well as job satisfaction outcome data were collected, and in organisation 2, quality of life outcome data was collected. Different outcome measures were collected for each organisation.

The above discussion outlines the benefits to be collected in this study. The costs of implementing and running the VR intervention are also needed to enable a CBA. These costs are commonly obtained from the VR services or the organisation purchasing the service (van Dongen et al., 2014; Tompa et al., 2006; Uegaki et al., 2010; van Dongen et al., 2011; van Dongen et al., 2012; Verbeek et al., 2009) and include costs such as salaries, travel costs, training costs, equipment, overhead activities etc. (van Dongen et al., 2014; Drummond et al., 2005; Tompa, Verbeek, van Tulder, & de Boer, 2010).

3.5.2 Outcome measurement tools

3.5.2.1 Economic benefits outcome measurements used within the new CBA tool

3.5.2.1.1 Sickness absence

Sickness absence is either collected from organisation's electronic sickness absence records or self-report sickness absence from the employee participants (van Dongen et al., 2014). Johns & Miraglia (2015) used meta-analysis to explore the accuracy of self-reporting and concluded that self-reports of sickness absence have adequate test-retest reliability and converge reasonably well with organisational sickness absence records. However, participants do have a tendency to underreport their absenteeism. A commonly used self-report measurement of productivity loss is the Work Limitations Questionnaire Work Absence Module (a sickness absence self-report questionnaire) (Lerner et al., 2001; Lerner et al., 2010; Burton, Chen, Schultz, & Li, 2017; Amick et al., 2017; Keysor et al., 2017) (see Appendix 2). The questionnaire asks participants to provide the number of full and part work days lost due to ill-health, mental or physical, over the previous two weeks. By dividing the number of days of absence by the number of days normally worked within two-weeks, productivity loss due to absence is calculated (Lerner et al., 2010). Although there is no consensus of the period over which participant recall is accurate, Zhang et al.'s (2012; cited in Krol et al., 2013) systematic review concluded that a 3-month recall period for absence is the suggested limit. It can be assumed that the Work Limitations Questionnaire Work Absence Module will not be impacted by participant recall. However, accessing data from an electronic record negates participant recall concerns. Due to the tendency of participants to under report sickness absence, both measurements (i.e. electronic records and questionnaire data) will be used within this study.

3.5.2.1.2 Presenteeism

Although there is a broad understanding of the term presenteeism e.g. employees choosing to attend work, whilst they are not well enough to be at work, and working at reduced productivity (Hampson et al., 2017; Aronsson et al., 2000; Brown et al. 2014; Bergstrom et al., 2009; Claes et al., 2011), this definition does not adequately capture all interpretations of the term and limits understanding of presenteeism. When exploring the definition of presenteeism it is seen that there is no uniform definition, nor consistent measurement within research (Lohaus & Habermann, 2018). Moreover, there are subtle differences in the interpretation of presenteeism

between countries, which results in different foci, for example the US focuses on work productivity loss due to health problems, whereas the UK and Europe tend to focus on why employees come to work when they are not well and the consequences of this on their health (Lohaus & Habermann, 2018). However, both perspectives are limiting in their views, with the US perspective focusing only on the consequence of presenteeism (John, 2010), and the UK and Europe's interpretation not fully capturing the economic consequences of presenteeism to the workplace. In addition, both of these perspectives tend to focus on the negative aspects of presenteeism (Lohaus & Habermann, 2018), which contradicts the premise of VR; namely, work-based rehabilitation, early RTW, enabling individuals with health conditions to SAW, and the acknowledgement that individuals attending work with health conditions may be beneficial for the organisation and individuals (Cocker et al., 2014; John, 2010). Indeed, many employees are fully productive in spite of having a health condition (Vingard, Alexanderson, & Norlund, 2004). Before choosing an outcome measure it is important to clearly outline the interpretation of presenteeism used, as this will influence the choice of outcome measure. In this research, the focus is on the economic consequences of presenteeism, i.e. when an employee is at work how does the health condition impact on the employee's productivity.

There are a number of presenteeism outcome measurement tools (Garrow, 2016; Brown et al., 2014). Brown et al.'s (2014) review of presenteeism measures used for workplace physical activity or sedentary behaviour research identified eight self-report measurement tools for presenteeism (see Table 4 below). This review excluded papers which used instruments that were designed for specific clinical populations and formulaic calculations of time 'lost' due to health conditions (using workplace statistics).

Table 4: Presenteeism instrument Characteristics

Instrument	Country of Origin	Mode of delivery	Response method	Recall period (weeks)	Length i.e. no. of questions
Endicott Work Productivity Scale (EWPS) (Endicott, 1997)	USA	Self-administered	Likert scale (0-4)	1	25
Health and Labour Questionnaire (HLQ) (Hakkaart-van Roijen, & Bouwmans, 2002)	Netherlands	Self-administered	Various	2	30
The WHO Health and Work Performance Questionnaire (HPQ) (Kessler et al., 2003)	USA	Telephone interview	Likert scale (1-10)	1 clinical 4 employers	44
Health and Work Questionnaire (HWQ) (Shikar et al., 2004)	USA	Self-administered	Likert scale (1-10)	1	24
Stanford Presenteeism Scale (SPS-6) (Koopman, Pelletier, & Murray, 2002)	USA	Self-administered	Likert scale (1-5)	4	6
Work Ability Index (WAI) (Ilmarinen, 2007)	Finland	Self-administered	Likert scale (0-4)	Unknown	14
Work Limitations Questionnaire (WLQ) (Lerner et al., 2001)	USA	Self-administered	Likert scale (1-6)	2	25
Work Productivity Short Inventory (WPSI) (Goetzel, Ozminkowski & Long, 2003)	USA	Self-administered	Frequency and duration	2, 12, 52	4

(Brown et al., 2014, p. 244)

The characteristics of the instruments varied in terms of administration (self or researcher), length (between 4 and 44 questions), response options (either Likert scale or open questions) and recall periods (one week to across the lifespan) (Brown et al., 2014). The majority of the measurements were developed in the USA, with one developed in Netherlands (Hakkaart-van Roijen, & Bouwmans, 2002) and one in Finland (Ilmarinen, 2007). It is questionable how generalisable these tools are to a UK population.

Dennett & Thompson (2015) conducted a systematic review of measurement properties of instruments assessing presenteeism. Their review concluded that most presenteeism

instruments have had their validity studied, however, only one outcome measure, the Health and Work Questionnaire (HWQ) (Shikiar, Halpern, Rentz, & Khan, 2004), was assessed for criterion validity (Dennett & Thompson, 2015). Due to the weak validity of all presenteeism measurement tools further research into this area is recommended. These weaknesses create difficulties in choosing a suitable outcome measure. Brown et al. (2014) recommended that when choosing appropriate measurement tools, the following be considered; scale sensitivity, participant burden and time cost, licencing of tools, research interests linked to the various constructs used in the tools, and time scale researchers are interested in.

Taking Brown et al.'s (2014) guidance into account, when considering the outcome measure most suited to this research, the WLQ is the most appropriate. Whilst the following tools; Work Ability Index (WAI), Endicott Work Productivity Scale (EWPS), and WHQ had strengths (which will be discussed), their limitations resulted in them being discounted. Looking at each tool in turn, the WAI (Ilmarinen, 2007) is a comprehensive measurement of employee presenteeism, as the questions cover all the constructs identified in the review; work performance, physical tolerance, psychosocial wellbeing, social/role functioning and absenteeism (Brown et al., 2014). It allows the researcher to explore longer reference periods i.e. a year to across a lifespan (Brown et al., 2014). Moreover, it is easy to administer (Coomer & Houdmount, 2013) and easily accessible as it is in the public domain (Brown et al., 2014). The WAI is useful in identifying groups or individuals who are struggling in work (Coomer & Houdmount, 2013). However, it is not recommended if the main area of interest is work performance (Mattke et al., 2007). As this is an area of interest when considering VR services, this tool was discounted for use in this research.

The EWPS (Endicott, 1997), HWQ (Shikiar et al., 2004) and Work Limitations Questionnaire (WLQ) (Lerner et al., 2001) are the tools recommended to be considered when work performance is of interest, as these tools cover the following constructs: perceived impairment, comparative productivity and efficiency (identified in the Mattke et al. (2007) review). The EWPS scale quantifies productivity by exploring the frequency of work performance, and attitudes and behaviours (Beaton et al., 2010). The EWPS has been shown to have test-retest reliability and validity in employees with depression (Brown et al., 2014; Dennett & Thompson, 2015). However, as VR is a service for employees with any condition, a tool that has reliability and validity in respect of a variety of conditions needs to be utilised, hence the EWPS is not considered suitable to be used for this research. Looking at the HWQ, this has been identified

in two reviews as measuring the above constructs (Mattke et al., 2007; Brown et al., 2014); moreover, the Likert scale used in the HWQ has a greater range, therefore may be more sensitive to change after an intervention (Brown et al., 2014). The HWQ is a comprehensive measurement of employee presenteeism (Brown et al., 2014). It has been shown to have acceptable levels of construct and discriminant validity, and good convergent validity, although there is limited evidence on reliability and validity (Dennett & Thompson, 2015; Brown et al., 2014). Therefore, it may be suitable as an outcome measure for this research.

However, when comparing the HWQ to the WLQ, Noben et al.'s (2014) systematic review of self-reported instruments measuring 'health related productivity changes' concluded that the WLQ is the preferred choice of outcome as it has a strong evidence for content validity. The HWQ was discounted as an outcome measure. This conclusion is not supported by Dennett & Thompson's review (2015), which identifies EWPS, SPS-6 and the HWQ as the instruments with the best evidence in terms of their measurement properties. Although, interestingly the WLQ is not identified or discussed in Dennett & Thompson's (2015) review, and therefore might have been an omission. Mattke et al.'s (2007) review highlights that the WLQ contains an additional construct: an estimation of unproductive time at work. The WLQ is a self-administered questionnaire comprising of 25 questions. It takes 5 – 10 minutes to complete. The questions explore the limitations employees are experiencing at work due to their health problems, as well as looking at the productivity loss as a result (Lerner et al., 2003). The questions include work components that may be compromised by poor health, such as time management, physical demands, mental/interpersonal and output demands (Munir, 2008). The WLQ has been validated for, and used in research covering, a variety of chronic conditions and occupational groups (Munir, 2008; Tamminga, Verbeek, Frings-Dresen & de Boer, 2014; Lerner et al., 2017). Additionally, it has been shown to be sensitive to the effects of interventions (Shaw et al., 2014). Moreover, it can be used to provide a single Productivity Index score that can be used to estimate productivity loss, by comparing the percentage difference in output to a national database of normative data on healthy individuals (Lerner et al., 2009; Munir, 2008). Importantly, for this research the WLQ allows for presenteeism to be quantified as time, which enables presenteeism to be translated into a monetary value and used within an economic evaluation (Beaton et al., 2010). There is an additional component to the WLQ that can be used in conjunction with this tool that examines sickness absence, the WLQ Work Absence/time loss Module (Lerner et al., 2001) (see Appendix 3). Taking these factors into consideration the WLQ and the WLQ Work Absence Module were used within this study.

3.5.2.1.3 Turnover

Most organisations routinely collect annual turnover figures (Oxenburg and Marlow, 2005; Campion, 1991). In this research turnover information will be provided by the organisations.

3.5.2.2 Non-economic benefit outcome measurements used within the wider VR service evaluation

3.5.2.2.1 Quality of Life

There are a variety of instruments used to measure health states/quality of life (Joore et al., 2010); namely, 'EuroQol-5 dimension (EQ-5D), Health Utilities Index Mark 2 and 3, Quality of Well-being Scale, and the short form health measure (SF-6D) (Kim, Kim, Lee & Jo, 2014). These measures of health states have a value attached to them by converting them into estimates of quality-adjusted life-years (QALYs) (Joore et al., 2010). This value is subsequently used within cost-utility analysis and enables the broad effects of presenteeism and absenteeism on the health of individuals to be captured (Cocker et al., 2014). The score and resulting QALY may differ according to the instrument of measurement, as the different measures vary in terms of the health descriptive states, and the ranges of ill-health and the scoring methodology (Joore et al., 2010). The EQ-5D and the SF-6D, both quality of life measurements, have different descriptive elements of quality of life, which in turn increases their sensitivity for different patient groups. The SF-6D includes 'vitality' and 'social functioning' elements, which would increase its sensitivity for patients whose conditions impact on the social functioning of their lives and their levels of vitality, whereas the EQ-5D, looks at more functional elements such as mobility, self-care, usual activities, pain/discomfort and anxiety/depression (Joore et al., 2010). Additionally, the two tools differ in their description of 'full health' and 'worse health', with the EQ-5D reportedly having a ceiling effect (i.e. an increased proportion of respondents with best possible scores) when used within the general population and some patient groups. This ceiling effect rendered this tool more sensitive to patients with a severe health state at baseline (Oemar & Janssen, 2013; Joore et al., 2010). To address the ceiling effect the EuroQol tool was amended to include 5 levels of severity within the existing 5 dimensions, and renamed the EQ-5D, the EQ-5D-5L (Oemar & Janssen, 2013).

When considering the choice of quality of life measurement tool, a key consideration is the comparability of the results within the country of origin. Within the UK, the DH recommends that the EQ-5D-5L is used when evaluating their services; moreover, it is supported by the NICE and the Chartered Society of Physiotherapy (CSP, 2014). The EQ-5D-5L 'is a standardised measure of health status developed by the EuroQol Group in order to provide a simple, generic measure of health for clinical and economic appraisal' (Oemar & Janssen, 2013, p. 4). The EQ-5D-5L is a self-reported outcome measure that is used for a variety of health conditions and treatments/services. It is a simple quality of life measurement tool that takes a few minutes to complete (Oemar & Janssen, 2013). It comprises of 5 dimensions of health: mobility, ability to self-care, ability to undertake usual activities, pain and discomfort, and anxiety and depression (CSP, 2014). The strengths of the EQ-5D-5L are that it is a short questionnaire that takes the participant approximately one minute to complete, has good test-retest reliability and validity, (Ijzelenberg et al., 2007), has been validated across a variety of conditions, including eight chronic conditions, and across six countries (Oemar & Janssen, 2013), it allows comparability across a variety of conditions (CSP, 2014) and is widely used within the UK (Ijzelenberg et al., 2007). For this study, the EQ-5D-5L (EuroQol Group, 1990) was utilised (see Appendix 1). Although, as discussed above, the EQ-5D results can be converted to QALY'S and used within a cost-utility analysis, in this research, quality of life is measured to explore the non-economic benefits of VR as opposed to the economic benefits and thus is not used within the CBA tool. This ensures that the measurement of productivity is not duplicated (Krol et al., 2013).

3.5.2.2.2 General mental health

To capture psychological changes, sources of stress and predisposing factors of stress, there are a number of mental health measurements available such as the patient health questionnaire (PHQ) (Spitzer, Kroenke & Williams, 1999), WHO-5 (WHO, 1998) and the self-report tool General Health Questionnaire (GHQ) (Goldberg, 1972). The GHQ is commonly utilised in OH studies and workplace settings (Guidi, Bagnara, & Fichera, 2012; Jackson, 2007). This is illustrated in a review of self-reported illness at work (Lenderink et al.'s, 2012), where 33 studies reported GHQ outcomes, compared to the two studies reporting PHQ outcomes. Moreover, since its inception in 1972, it has been translated into 38 different languages indicating its widespread use (Jackson, 2007). Using this tool enables valid comparison of results. The validity of the GHQ has been determined by a number of studies (De Witte et al.,

2010; Makowska, Merecz, Moscicka, & Kolasa, 2002; Goldberg et al., 1997), with reliability coefficients ranging from 0.78 to 0.95 in the various studies (Jackson, 2007). Additionally, it has been validated within occupational settings (Stride, Wall, & Catley, 2007). The GHQ is available in different versions, the 12, 28, 30 or 60 items, all of which have been shown to have good reliability and validity (Wang & Lin, 2011).

The GHQ is easy to administer, complete and score (Jackson, 2007), and can be used to compare changes in individual pre-and post an intervention, as well as identify ‘cases’, i.e. individuals who are showing signs and symptoms of minor psychological distress (Stride et al., 2007; Weinberg & Creed, 2000; Goldberg, 1972). In order to identify individuals with minor psychological distress Goldberg (1972) specified a cut off score of greater than 3 or 4 is used (Stride et al., 2007; Weinberg & Creed, 2000; Goldberg, 1972). However, when people are physically ill, a higher threshold is recommended for optimal discrimination, hence a score of 4 or more is recommended to be used to identify ‘cases’ (GL Assessment, 2011). The GHQ-12, is the shortest and most commonly used version, moreover, findings from studies indicate that it is as effective as the longer version in both screening and detecting cases (Wang & Lin, 2011). In this research, the GHQ-12 (i.e. 12 items) was utilised (see Appendix 4), and when identifying ‘cases’ a cut off score of 4 was implemented.

3.5.2.2.3 General Physical health

To capture improvements in individual’s physical health there are over a hundred generic and condition specific outcome measures that could be used (Nelson et al., 2015; Suk, Hanson, Norvell, & Helfet, 2005). As the outcome measure is within a study considering work outcomes, it is appropriate to focus on physical function outcome measures. A previous systematic review identified 12 outcome measures capturing physical function (Barten, Pisters, Huisman, Takken, & Veenhof, 2012), of which nine were different versions of the Patient Specific Function Scale (PSFS) (Stratford, Gill, Westaway, & Binkley, 1995). The PSFS is a subjective scale that allows for measured change in identified functional limitations or goals in relation to work and life settings. The patient identifies up to five activities, including work related activities, that they have difficulties completing due to their condition and then the patient rates the functional limitation of these (Stratford et al., 1995) (see Appendix 4). The PSFS is a valid and reliable outcome measure with MSDs such as neck pain, lower back pain, and knee pain (Kowalchuk

et al., 2012; Fields, 2002; Cleland, Fritz, Whitman, & Palmer, 2006; Pengel, Refshauge, and Maher, 2004; Chatman et al., 1997). It is user-friendly, averaging four minutes to complete compared to other functional scales which take between eight and forty minutes (Nicholas, Hefford & Tumilty, 2012). Moreover, out of the twelve outcome measures identified by Barten et al., (2012), the PSFS was ranked the highest for construct validity, reliability and responsiveness. However, this result was based on Cleland et al.'s (2006) study, which only included 38 participants, questioning its generalisability. Considering the working population, Gross, Battie and Asante's (2008) results provided 'construct and predicative validity evidence for the PSFS as an indicator of functional limitation in workers' compensations' (p. 1294). Supporting the use of the PSFS to explore work outcomes in research.

3.5.2.2.4 Job Satisfaction Scale

The Job Satisfaction Scale (JSS) (Warr, Cook, & Wall, 1979) (see Appendix 4), is a self-report scale to identify satisfaction at work, widely used in organisational psychology research and practice (Heritage, Pollocks and Roberts, 2015). The items are rated on a seven-point Likert-type scale, with a high score indicating high job satisfaction (Rout & Rourt, 1997). It is a valid and reliable outcome measure for organisational research (Fields, 2002).

3.5.2.2.5 Summary of outcome measures to be utilised in the study

In summary, following a review of the literature on benefit outcome measurement tools the following outcome measures are used within this research:

1) Economic benefit outcome measures:

- Sickness absence, both from organisational data and self-reported, using the Work Limitations Questionnaire Work Absence/Time loss Module (Lerner et al., 2001).
- Presenteeism/productivity, using the Work Limitations Questionnaire (Lerner et al., 2001).
- Turnover

2) Non-economic benefit outcome measures

- Quality of life, using EQ-5D-5L (Oemar & Janssen, 2013).
- Psychological distress, using the General Health Questionnaire (GHQ-12) (Goldberg, 1972).
- Patient Specific Function Scale (PSFS) (Stratford et al., 1995).
- Job Satisfaction Scale (JSS) (Warr et al., 1979).

The outcomes used for the two organisations differed. Table 5 summarises the outcomes considered for each organisation, the outcome measurement tools used, where the data was gathered from, whether the outcome data was used within the new CBA tool or as part of the wider VR service evaluation, and the justification for the use or exclusion of considered outcomes.

Table 5: Summary of outcomes considered and used within this research for organisation 1 and 2

Outcome	Used or considered for use?	Outcome measurement tools used.	Where the data was obtained from?	Was the data used within the CBA tool or as part of the wider service evaluation?	Justification for use or exclusion.
Organisation 1					
Costs					
Cost of the VR Service	Used	n/a	Organisation 1	CBA tool	
Benefits					
Economic benefits					
Sickness absence due to musculoskeletal disorders	Used	Electronic sickness absence records	Organisation 1	CBA tool	Common method of collecting sickness absence. Sickness absence is commonly used as a proxy for productivity (van Dogen et al., 2014; Krol et al., 2013; Zhang et al., 2011; van Oostrom et al., 2010).
Sickness absence due to mental health	Used	Electronic sickness absence records	Organisation 1	CBA tool	Common method of collecting sickness absence. Sickness absence is commonly used as a proxy for productivity (van Dogen et al., 2014; Krol et al., 2013; Zhang et al., 2011; van Oostrom et al., 2010).
Sickness absence due to other causes	Considered	Electronic sickness absence records	Organisation 1	n/a	At the start of the research project MSDs and mental health conditions were the two most common causes of sickness absence (CIPD, 2014a; ONS, 2014). Thus, these conditions were focused on.
Turnover	Considered	Organisational turnover data	n/a	n/a	The organisation was undergoing major restructuring, resulting in a high number of redundancies during the project. The turnover rate would not be a true reflection
Hidden costs	Considered	n/a	n/a	n/a	Although multipliers are used in some instances to estimate hidden costs, these have been varied and it is recommended that organisations calculate their own hidden costs (Oxenburgh &

					Marlow, 2005). No appropriate data was supplied by the organisation to allow for this.
Non-economic benefits					
Job satisfaction	Used	Job Satisfaction Scale (Warr et al., 1979)	Participants	Service evaluation	It is a widely used (Heritage et al., 2015), valid and reliable outcome measure for organisational research (Fields, 2002).
General mental health	Used	General Health Questionnaire (Goldberg, 1972)	Participants	Service evaluation	It is commonly used in OH settings (Guidi et al., 2012; Jackson, 2007). It has good validity and reliability (Stride et al, 2007; Wang & Lin, 2011). It enables the identification of participants with psychological distress (Weinberg & Creed, 2000; Goldberg, 1972).
General physical health	Used	Patient Specific Function Scale (Stratford, Gill, Westaway, & Binkley, 1995)	Participants	Service evaluation	User friendly (Nicholas et al., 2012) and has high construct validity, reliability and responsiveness when compared to other similar measures (Barten et al., 2012).
Organisation 2					
Costs					
Specific costs of the VR service	Considered	n/a	VR service	n/a	The costs provided were incomplete. The costs provided were just under the annual budget supplied for the organisation so it was decided to use the annual budget.
Annual budget of the VR service	Used	n/a	Organisation 2	CBA tool	
Benefits					
Economic benefits					
Sickness absence due to musculoskeletal disorders and mental health conditions	Used	Electronic sickness absence records	Organisation 2	CBA tool	Common method of collecting sickness absence. Sickness absence is commonly used as a proxy for productivity (van Dogen et al., 2014; Krol et al., 2013; Zhang et al., 2011; van Oostrom et al., 2010).
	Used	Work limitations questionnaire work absence	Participants	n/a due to low number of participants (n=3)	Some VR services may not have access to the organisations sickness absence data. This

		module (Lerner et al, 2001)			outcome measurement tool would allow them to collect sickness absence data.
Sickness absence due to other causes	Considered	Electronic sickness absence records	Organisation 2	n/a	At the start of the research project MSDs and mental health conditions were the two most common causes of sickness absence (CIPD, 2014a; ONS, 2014). Thus, these conditions were focused on.
Turnover	Used	Organisations electronic records	Organisation 2	CBA tool	
Presenteeism	Used	Work limitations questionnaire (Lerner et al, 2001)	Participants	n/a due to low number of participants (n=3)	It has strong evidence for content validity (Noben et al., 2014) and is validated in occupational groups (Munir, 2008; Tamminga, Verbeek, Frings-Dresen & de Boer, 2014; Lerner et al., 2017). It considers unproductive time at work and explores work limitations due to participants health condition (Mattke et al., 2007). It allows for presenteeism to be quantified as time, which enables presenteeism to be translated into a monetary value and used within an economic evaluation (Beaton et al., 2010)
Hidden costs	Considered	n/a	n/a	n/a	Although multipliers are used in some instances to estimate hidden costs, these have been varied and it is recommended that organisations calculate their own hidden costs (Oxenburgh & Marlow, 2005). No appropriate data was supplied by the organisation to allow for this.
Non-economic benefits					
Quality of life	Used	Quality of life, using EQ-5D-5L (Oemar & Janssen, 2013).	Participants	n/a due to low number of participants (n=3)	Validated in 8 conditions and across 6 countries (Oemar & Janssen, 2013). It is advocated to be used and widely used within the UK (CSP, 2014). It can be converted to a monetary value and used within a cost-utility evaluation (Joore et al., 2007; Cocker et al., 2014). In this research it was not considered as an economic benefit so as to ensure that the measurement of productivity was not duplicated (Krol et al, 2013).

3.5.3 Methodology for determining the reference case, the intervention case and the net effectiveness percentage for each outcome

In order to add the outcomes/benefits, of relevance to organisations purchasing or providing VR, to the GM new economy model namely: sickness absence due to musculoskeletal disorders, sickness absence due to mental ill-health, presenteeism and turnover; the intervention case (i.e. what happens when the intervention is put in place), the reference case (i.e. what would happen without the intervention been in place), the deadweight estimation (i.e. what percentage outcome would have occurred without the intervention), and unit cost for each outcome of interest, need to be calculated (McPherson & Inglis, 2008; HM Treasury, 2011; Cox et al., 2011). The HM Treasury Green Book (2011) defines deadweight as:

‘Outcomes which would have occurred without the intervention. Its scale can be estimated by assessing what would have happened in the ‘do minimum’ case, ensuring that due allowance is made for other impacts which impact on the net additionality’ (p.57).

The methodologies for identifying the reference and intervention case, deadweight, and unit costs will be discussed in turn.

The reference and intervention case are calculated from data extracted from current literature. There are a number of methodologies that could be used to identify the relevant data, such as meta-analysis ‘a formal statistical framework with which we can rigorously combine and compare the results of these experiments’ (Harrison, 2011, p.1), a review of the published literature, a review of the grey literature and expert opinion (Cox et al., 2011; Henrichson & Rinaldi, 2014). The gold standard when developing CBA models is to use the data from RCTs (Henrichson & Rinaldi, 2014; Glick, Polsky, & Shulman, 2001; Johnston, Buxton, Jones & Fitzpatrick, 1999). However, in cases where it is not possible to evaluate an investment with an RCT, such as in the organisations presented in this research, or where there are data or resource limitations, the values of benefits, deadweight, impact and lag can be difficult to source (CEEU, 2011; Cox et al., 2011). The CEEU (2011) suggest that reference values may be found in sector specific models, previously conducted research studies and Value for Money reviews. Cox et al. (2011) support this view, additionally suggesting consultation with experts in cases where no values can be found. Research in any discipline is rarely uniform, with a variety of research designs, outcomes and participant variabilities present, rendering the synthesis of the results to confirm or refute a hypothesis difficult (Cochrane, no date; Harrison, 2011). Moreover, as

discussed in the literature review (see section 2) the evidence-base for VR is not homogenous in terms of interventions, and the quality of the evidence is limited. Although a meta-analysis is one of the recommended procedures, it is not an appropriate methodology for this study as it relies on the underpinning studies been homogenous, valid and robust (Cooper, 2009). For this research, a review/synthesis of the published literature was conducted, the results analysed and general trends were identified in order to identify the reference and intervention case and subsequently deadweight. The limitations of using the evidence-base to develop outcomes are that suitable studies may not be found/published, studies may not have the same dependent variable, and different studies may not be comparable (Liberati et al., 2009). To account for any limitations in the data used to identify the reference and intervention case, and subsequently deadweight, optimism bias corrections was applied to the data (as discussed in section 3.3 and 3.4). Moreover, to further address the limitations mentioned, sensitivity and scenario analysis will be performed (as discussed in section 3.4).

For this research, the following framework and definitions of terms were used. Firstly, the baseline, which is defined as a starting point within economic evaluations, needs to be clarified (Dritsaki, Achana, Mason & Petrou, 2017; McPherson & Inglis, 2008; National Centre for Environmental Economics Office of Policy U.S., 2010). In this research, the starting point is a set time period prior to the employee's first appointment with the VR service. In addition, it is necessary to specify the end point (National Centre for Environmental Economics Office of Policy U.S., 2010), which for this scenario is one year later. When evaluating health outcomes, it is important to note that the individual's health will most likely change from the baseline measurement with or without an intervention. The intervention and the reference case need to be determined in order to calculate the deadweight (McPherson & Inglis, 2008) (Refer to Figure 7).

Moreover, it is necessary to clearly outline the assumptions underlying the reference and intervention cases for each outcome (National Centre for Environmental Economics Office of Policy U.S., 2010), refer to Table 6 for the assumptions underpinning each outcome.

Table 6: Assumptions underpinning the reference and intervention case for each outcome

Assumptions common to all outcomes (i.e. sickness absence due to MSDs, sickness absence due to mental health conditions, presenteeism and turnover):			
<ul style="list-style-type: none"> - 100% of the impact of the intervention will be realised within one year. - Usual care has similar influences on all outcomes across the different studies and countries. - The outcome (i.e. number of sickness absence days per MSDs and per mental health condition, presenteeism levels and turnover rates) is similar across different countries. - The starting point of the reference case and intervention case is a set time period prior to the intervention, and the end point in this scenario is one year later. 			
Assumptions specific to individual outcomes:			
Sickness absence due to MSDs	Sickness absence due to mental health conditions	Presenteeism	Turnover
The mean number of sickness absence days per year is a true representation of sickness absence for employees accessing usual care, and accounts for relapses employees may experience.	The mean number of sickness absence days per year is a true representation of sickness absence for employees accessing usual care.	The mean percentage of presenteeism per year is a true representation of presenteeism for employees accessing usual care	The turnover rate per year, up until the implementation of the VR service, is a true representation of turnover for employees accessing usual care.

Table 6 outlines the assumptions made by the researcher. These assumptions guide the researcher in identifying the reference and intervention. Outlining these assumptions provides clarity and transparency to the analysis (National Centre for Environmental Economics Office of Policy U.S., 2010). In addition, outlining the assumptions provides detail on whether adjustments, such as compounding, discounting, or inflation are necessary. As the VR intervention is introduced over a short period and the CBA model assumes that 100% of the impact of the intervention will be realised within one year, no adjustments such as compounding, discounting or inflation are necessary (Cowen & Katten, 2009).

A unique aspect of this research project is that in order to determine the reference case, intervention case and deadweight, the usual CBA model (refer to Figure 7) has been flipped (refer to Figure 8), in other words a mirror image of a usual CBA model has been created. This flipped model was created to illustrate that the intervention outcome i.e. sickness absence from an organisational perspective has a finite benefit, once the employee is healthy and back in work the benefit of the intervention ceases. This differs from a typical CBA intervention benefit for example getting people back into work from a societal perspective where one may expect benefits to continue infinitely due to an individual starting in the job market (refer to Figure 7).

Figure 7: Graphical representation of deadweight (calculating additionality) (employment example) (adapted from Source: Adapted from European Commission (2003) The Evaluation of Socio-Economic Development, The Guide, December European Commission, Directorate General for Regional Policy: Brussels, cited in McPherson & Inglis (2008))

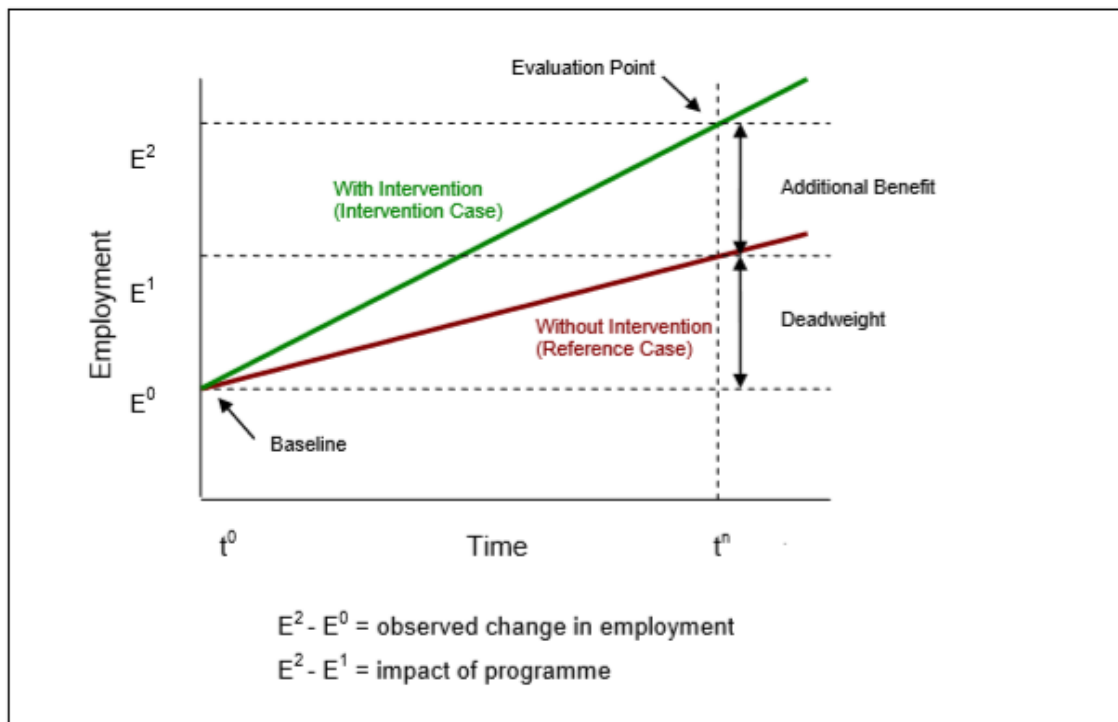
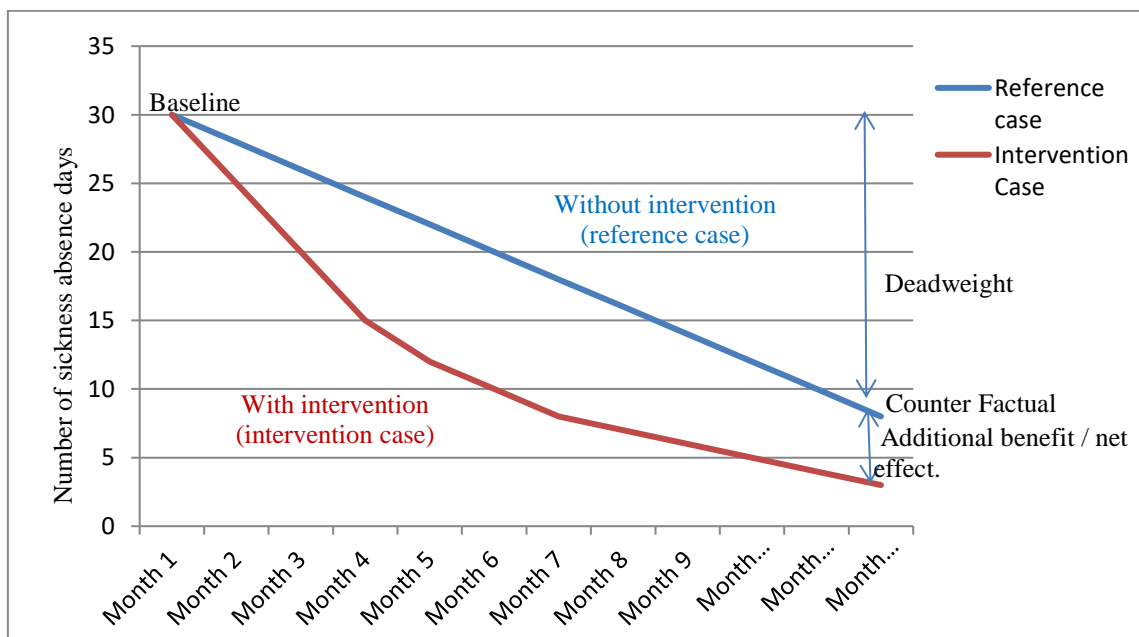


Figure 8: Graphical representation of deadweight (sickness absence example) (adapted from Source: Adapted from European Commission (2003) The Evaluation of Socio-Economic Development, The Guide, December European Commission, Directorate General for Regional Policy: Brussels, cited in McPherson & Inglis (2008))



To further explain Figure 8, and define the key terms underpinning this model, the downward sloping red and blue lines illustrate a percentage reduction in sickness absence days, from the baseline/starting point (total number of sickness absence days prior to the intervention) to the outcome (total number of sickness absence days post the intervention). If the intervention resulted in no (zero) sickness absence days, there would be a 100% reduction in sickness absence. The blue line (the reference case) indicates what would happen if there was no intervention and the red line (the intervention case) indicates what would happen if there was an intervention. The reference case (blue line) is not observed during the research and thus needs to be estimated (see below). The additional benefit/net effect is the difference in the percentage reduction of sickness absence days due to the intervention, compared to percentage reduction of sickness absence days from no intervention (the counter-factual). The net effect is determined by the review of the literature. The counterfactual (the assumed outcome without an intervention) is not known, and thus needs to be calculated. The following calculation will be used to calculate the counterfactual:

$$\text{Counterfactual} = \frac{\text{outcome}}{1 - \text{net effect \%}}$$

For example, if the intervention outcome is 10 and the consensus within the literature is that the net effect of an intervention is 20%. Then the counterfactual is $1/(1-0.2) = 12.5$. Without the intervention, the estimated outcome (reference case) is 12.5 and so the intervention outcome is 20% lower.

Once the counterfactual is calculated, the deadweight percentage can be determined using the following calculation:

$$\text{Deadweight \%} = \frac{\text{starting point} - \text{counterfactual}}{\text{starting point}}$$

As the CBA model for this research has been flipped (see Figure 7 and 8), the definition of deadweight changes. It is no longer what percentage of the outcome that would have occurred without the intervention, but what percentage of the employee's recovery would have occurred without the intervention.

To summarise, in order to add the outcomes/benefits to the GM new economy model, the reference case, intervention case, deadweight and cost need to be determined. The intervention case, the starting point and the outcome are determined from the organisations sickness absence data provided in phase 2 of this research, the reference case and deadweight are determined by calculating the counterfactual based on the estimated net effectiveness of the interventions (which is determined by a review of the literature, see section 3.5.4). The methodology for determining the costs is discussed in section 3.5.5.

3.5.4 Literature review search strategy

As discussed in section 3.5.3, a literature review is the first step in determining the reference and intervention case for each outcome. In order to conduct a thorough literature, a search strategy and inclusion and exclusion criteria need to be determined and outlined for each outcome (Greenhalgh, 1997; Staples & Niazi, 2007; Egger, Smith & Phillips, 1997). In order to determine a reference case, it is necessary for the outcome data (in this case sickness absence data), to be presented in a consistent, comparable manner, enabling the extraction of a mean difference; moreover, a homogenous intervention and population group enable comparison (Stroup et al., 2000; Egger et al., 1997). Too stringent inclusion and exclusion criteria, restricting heterogeneity may lead to selection bias (Stroup et al., 2000). Conversely, when heterogeneity is too great, a single summary measure may not be appropriate (Stroup et al., 2000). As a single summary measure is needed to determine a reference case, the inclusion and exclusion criteria need to ensure homogeneity of the included articles. In order to ensure homogeneity of the outcome data, inclusion and exclusion criteria were outlined regarding the type of study, the presentation of the data, the age of the data and the population and intervention (see Table 7, below).

Sickness absence is a complex subject, and further consideration is needed when identifying inclusion and exclusion criteria related to this. Examining the sickness absence data over a year allows for the impact on reoccurrence of sickness absence to be included. This is particularly pertinent when considering mental health conditions. It is widely known that employees absent from work with common mental health conditions have an increased risk of reoccurrence (Knudsen, Harvey, Mykletun, & Overland, 2012; Koopmans, Bultman, Roelen, Hoedeman, van der Klink & Groothoff, 2011; Nielsen et al., 2010; Roelen, Koopmans, Anema & van der Beek,

2010). In fact, Koopmans et al. (2011) looked at 9,904 employees with first time sickness absence due to mental health conditions, and found that 19% of employees had a reoccurrence of sickness absence, and 90% of these were within the first 3 years. Considering the known reoccurrence rate, it would be appropriate to use ‘mean annual sickness absence days’ per year as an outcome, as opposed to ‘time to RTW’ which is commonly used an outcome within research into mental health and sickness absence (Fleten & Johnsen, 2006; Lander, Friche, Tornemand, Andersen, & Kirkeskov, 2009; Dewa, Hoch, Carmen, Guscott, & Anderson, 2009; Sogaard & Bech, 2009). The use of the outcome ‘time to RTW’ may be due to the fact that sickness absence due to mental health disorders is commonly long-term (Nielsen et al., 2010), and consequently this outcome is of importance when considering the efficacy of interventions. Moreover, considering 90% of reoccurrences happen within the first 3 years following the initial episode (Koopmans et al., 2011), there is limited long-term research as is evidenced by NICE (2009b) ‘Workplace health: long-term sickness absence and incapacity to work guidelines’, which recommend that evaluations ensure a long-term follow-up enabling all work outcomes to be adequately evaluated. These guidelines were reviewed in 2014 and no changes to this recommendation were implemented.

Outlining a search strategy prior to conducting research helps reduce the bias that surrounds literature reviews, such as citation bias (only including studies that are supportive of the published results), database bias (using common databases which may have limited publications from developing countries) and biased inclusion criteria (authors selecting papers that support their viewpoint) (Stroup et al., 2000; Egger & Smith, 1998). Literature reviews are also at risk of publication bias, as it has been found that the chances of publishing are three times higher if the results are significant (Duval & Tweedie, 2000; Easterbrook, Berlin, Gopalan & Matthews, 1991), thus it is good practice to explore the grey literature. The literature search and data extraction were conducted by the researcher, which may have introduced error, as it is best practice to have two blinded researchers to complete this element of the research process (Egger et al., 1997). See Table 7 for an outline of the inclusion/exclusion criteria in the search strategy, the databases searched, key terms, and limitations. The date limitations vary, as the searches for different outcomes were conducted at different stages of the research process.

Table 7: Methodology for determining the reference and intervention case for each economic outcome

Outcome	Sickness absence due to MSDs	Sickness absence due to mental health conditions	Presenteeism	Turnover
Search Strategy: As the evidence-base for VR is an emerging field, workplace interventions were used as a proxy for VR				
Databases searched	Cinahl, Medline (EBSCO, OVID, Web of Science (WoS)), Cochrane and Business Source Premium (BSP). In addition, citation tracking was utilised.	EBSCO host: including Medline, Business Source Premium, Academic Search Premier, Sports Discuss and Cinahl; Web of Science (core database), OVID host: including Psychinfo, HMIC, Ovid Medline; Cochrane. In addition, citation tracking was utilised.	Cinahl, Medline (EBSCO, OVID, Web of Science (WoS)), Cochrane and Business Source Premium (BSP). In addition, citation tracking was utilised.	Cinahl; EBSCO host: including Medline, Business Source Premium, Academic Search Premier, Sports Discuss; Web of Science (core database), OVID host: including Psychinfo, HMIC; Cochrane. In addition, citation tracking was utilised.
Limitations	2000 - 2015 Academic journal article.	2007 – 2017 Academic journal article.	2000 – 2015, RCT's, English language, Academic journal article.	2007 – 2017 Academic journal article.
Key terms	See Appendix 5.1 for search terms.	See Appendix 5.2 for search terms.	See Appendix 5.5 for search terms.	See Appendix 5.4 for search terms.
Inclusion/Exclusion criteria	<ul style="list-style-type: none"> - Employed individuals who are off work due to MSDs. - The inclusion of a control or comparator group. - The data on sickness absence days presented as a mean over a year. - The sickness absence data is less than 20 years old. 	<ul style="list-style-type: none"> - Employed individuals who are off work due to mental health conditions. - The inclusion of a control or comparator group. - The data on sickness absence days presented as a mean over a year. - The sickness absence data is less than 20 years old. 	<ul style="list-style-type: none"> - Employed individuals. - The inclusion of a control or comparator group. - The data on presenteeism presented as a mean change between pre and post. - The presenteeism data is less than 20 years old. 	<ul style="list-style-type: none"> - Employed individuals who are off work due to mental health conditions or MSDs. - The inclusion of a control or comparator group. - The data presented as turnover rates. - The turnover data is less than 20 years old.
Last searched	21 March 2015	18 April 2017.	21 March 2015	25 March 2017

3.5.5 Calculating costs to be used in the CBA tool

3.5.5.1 Sickness absence costs (MSDs and Mental ill-health)

When looking at the sickness absence data, the methods used to calculate the cost of sickness absence needs to be clearly stated, as do the inclusion and exclusion criteria. Currently, there is inconsistency within the literature, with economic evaluations using various methods of calculating sickness absence (Kigozi, Jowett, Lewis, Barton, & Coast, 2016; Krol et al., 2013; Uegaki et al., 2011). For the purposes of this study, absence due to maternity/paternity leave, compassionate leave, bereavement and ‘no-reason provided’ are excluded. In organisation 1, the VR intervention (described in section 1.4.1) was aimed at MSDs, hence only sickness absence due to MSDs was included. In organisation 2, the VR intervention (described in section 1.4.2), was aimed at all sickness absence causes, thus, all reasons of sickness absence are included, but separated into different conditions, mental health disorder, MSD and other, to allow for sickness absence due to MSDs and mental health disorder to be further explored in the CBA. Additionally, absence was separated into less than and > 6-months. This is due to the fact that when individuals are off work for longer than 6-months the RTW rate drops with Squires et al.’s (2012) synthesis suggesting that the RTW percentage in this group may be as low as 2.3. With regards to calculating the cost, in organisation 1, the cumulative net work days lost (including part and whole) were converted into work hours, based on the average work week consisting of 37.5 hours, i.e. 7.5 hours per day. This was based on information provided by the organisations as to the average number of hours worked per week. In terms of part days, it was assumed that participants were 100% productive during work hours. The same procedure and assumptions are applied to the data from organisation 2.

There is a debate in the literature around which methods are most appropriate to measure productivity, with no consensus within existing national guidelines (Kigozi et al., 2016). It is commonly accepted that sickness absence is a measure of productivity (Kigozi et al., 2016; Uegaki et al., 2011; Krol et al., 2013). However, when calculating the costs of sickness absence, there is a debate within the economic health field as to whether one should use the human capita (HC) or friction costs (FC) approach, discussed in more detail below (Kigozi et al., 2016; van Dongen et al., 2014; Krol et al., 2013, Rost, Meng, & Xu, 2014). The most commonly used approach is the human capita approach (Kigozi et al., 2016; Stromberg, Aboagye, Hagberg, Bergstrom, Lohela-

Karlsson, 2017; Rost et al., 2014). The HC approach estimates the loss of production due to absence, and the expected or potential earnings lost (Rost et al., 2014; van Asselt, Dirksen, Arnt, & Severns, 2008). The cost of sickness absence is calculated using the following calculation:

Time lost units (full time equivalent work days) * price weight per time unit (population mean)
(Gold, Siegel, Russel, & Weinstein, 1996).

The WHO (2009) cautions against the reliance on the HC approach as ‘it is unrealistic in most settings (where a pool of underemployed or unemployed labour exists)’ (p. 97). In addition, it is unclear as to whether this approach under or over-estimates the cost of absence, as it does not take into account the impact of sickness absence on production, nor the work that the colleagues, agency staff or newly hired staff may do to compensate for their absence (van Dongen et al., 2014; Jo, 2014; Rost et al., 2014). The FC approach assumes that costs of sickness absence are ‘limited to a friction period (i.e. the time it takes to find a replacement), and that the decrease in productivity is less than 100% of the time lost at work (i.e. elasticity)’ (Koopmanschap et al., 1995 cited in: Spekle et al., 2010, p. 4). The FC approach attempts to quantify actual loss of production, and varies according to the wider labour market, as the labour market determines how long it takes to find a replacement (Kigozi et al., 2016; Jo, 2014; van Asselt et al., 2008). Additionally, FC includes costs such as recruitment and training (Kigozi, et al., 2016; Jo, 2014; van Asselt et al., 2008). However, the FC is rarely used, outside of the Netherlands (Kigozi et al., 2016), as it requires a large amount of data to accurately calculate the friction period, and when organisations use their own labour supply through mechanisms such as over-time, it is harder to accurately capture and quantify, compared to the HC approach which requires a simple wage calculation as a proxy for employee productivity (Jo, 2014; Lensberg, Drummond, Danchenko, Despiegel, & Francois, 2013). To my knowledge, there is no UK national database with a friction period for sickness absence. The disruption correction or multiplier effect considers that the cost of sickness absence may be underestimated as the disruption on productivity is not accounted for (Rost et al., 2014; Lensberg et al., 2013).

Rost et al. (2014) explored the results of a return on investment analysis using these different methods of calculating costs of absence and presenteeism. Upward adjustments (disruption correction) were used to compensate for under estimating costs and friction downward adjustments

were used to compensate for co-workers and replacement workers compensating for the absence, as well as, in the case of presenteeism, co-workers or the employee (when feeling better) completing the workload assigned to them. Rost et al. (2014) concluded that when conducting a return on investment, three methods of calculating the cost of absence are utilised to provide a range of estimates. In addition, from the employer's perspective it is recommended that when labour substitutions are regularly used the FC method is utilised. Within this research project, the three methods identified by Rost et al. (2014), namely: HC approach; disruption correction, which is adjusting the HC result to account for co-worker disruption; and the FC which accounts for labour substitution, were considered, but due to the lack of data collected by the organisations, both the FC and disruption cost could not be calculated. Thus, productivity in organisation 1 and 2 was calculated using the HC approach.

Hours of absence were used as a proxy for productivity loss in organisation 1. In organisation 2, hours of absence are also used as a proxy for productivity loss and the following costs relating to sickness absence are included; Occupational Sick Pay (OSP) and National Insurance (NI) contributions.

3.5.5.2 Presenteeism costs

The overall costs of presenteeism to the economy, organisations and society are discussed in section 1.1.2 and 2.2.2. This section considers the cost of presenteeism per employee. There is currently no established and validated method of determining the costs of presenteeism, and there are a wide range of assumptions surrounding costing presenteeism (Hampson et al., 2017; Garrow, 2016). There are two commonly used methods to determine the costs of presenteeism, the first method is to apply an absenteeism-presenteeism multiplier. The costs of presenteeism have been estimated at between 1.8 and 10 times the cost of absenteeism (Virgin Pulse, 2017, cited in Hampson et al., 2017; Brown et al., 2014; Sainsbury Centre for Mental Health, 2007). The choice of the multiplier will influence the results either towards higher or lower costs. The second approach considers the number of presenteeism days and calculating a cost of this considering the industry and absence cost (Hampson et al., 2017). Sainsbury Centre for Mental Health (2007), using data from US research, calculated, for the UK, the cost of presenteeism per employee is £605

per year. At the time of populating the CBA tool for organisation 1, these were the figures available, and it was recommended that if an organisation does not have data to estimate productivity loss due to ill-health within the workplace that the figure of £605 per employee is used as a national estimate (CIPD, 2008).

In organisation 2, the Work Limitation Questionnaire (WLQ) (Lerner et al., 2001) (discussed in section 3.4.1.1.2) is used as a measure of presenteeism. The productivity loss score from this questionnaire is derived from weighting the score from the four scales; time management, physical, mental-interpersonal, and output. This score represents a percentage reduction in productivity in the 2-weeks prior to answering the questionnaire compared to normal productivity (Lensberg et al., 2013). Using the HC approach, this percentage, is then converted into a percentage loss of average weekly hours worked, and the cost is the hourly wage of an individual. However, Schultz et al. (2009) raise the question as to whether those individuals are 0% productive during those hours. Currently, there is no consensus of how to calculate presenteeism using a FC approach, and according to Kigozi et al. (2016), of the 46 studies they found that used the FC method of calculating productivity loss only one study included presenteeism costs. Thus, presenteeism costs were planned to be calculated from the WLQ scores, using the HC approach. However, as there was insufficient data collected in this research project to facilitate this, the CIPD recommendation of a cost of £605 per employee was utilised within the CBA tool.

3.5.5.3 Turnover costs

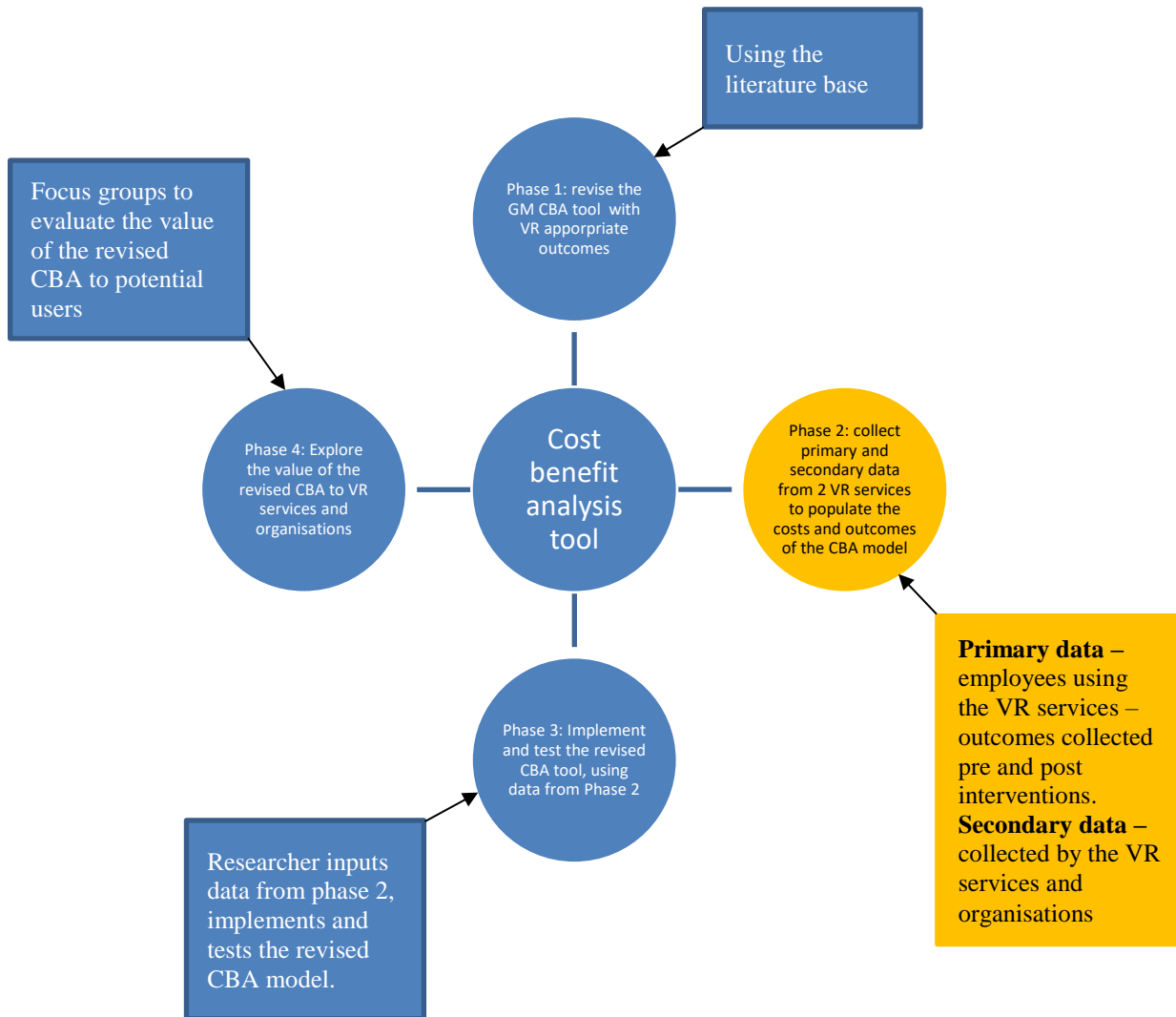
When considering costs of sickness absence, it is important to consider the indirect costs of ill health, which extend beyond the lost productivity of the individual (Pugner, Scott, Holmes, & Hieke, 2000). Indirect costs include agency costs/over-time costs, turnover rates and costs, loss of working skills of individuals, business reputation, cost of care lost earnings and lost opportunities of earnings of family members (Cagno et al., 2013; WHO, 2003; Scottish Intercollegiate Guidelines Network (SIGN), 2000) (see section 3.5.1). These costs are difficult to quantify (Cagno et al., 2013). It is acceptable practice to use a multiplier, which is dependent on the direct costs, to estimate the indirect costs (Cagno et al., 2013; Uegaki et al., 2010). However, in a review of publications using this method, it was found that the multiplier varied between and 2 and 50 (most common was 3x and 4x), indicating difficulties in choosing the multiplier number (Barra, 2010,

cited in Cagno et al., 2013). Oxenburgh and Marlow (2005) propose deriving the hidden costs for each organisation, as opposed to applying a blind multiplier. Ideally, indirect costs such as turnover costs would be included (van Asselt et al., 2008; Pilgrim, Carroll, Rick, Jagger, & Hillage, 2008). These costs are included in organisation 2, however, organisation 1 (see section 1.4.1) had major organisational restructuring during the time of data collection, with high levels of staff redundancies and turnover, rendering the inclusion of turnover inappropriate.

According to the CIPD (2014b) the majority of employers do not record or calculate the costs of absence such as turnover. For the purposes of the CBA tool, providing a benchmark turnover cost is necessary. The CIPD (2013; 2014b) calculated the average costs of turnover and recruitment to be £7750 per employee. The Sainsbury Centre for Mental Health (2007) calculated an average cost of turnover, recruitment and training per employee as £11,625, 40% of the average salary. This is significantly higher than the CIPD estimate, Levy et al. (2014) concluded that the CIPD figure seems to be a low estimate when comparing “to the US evidence which puts the full cost of staff turnover at 50% of the salary” (p. 27). Interestingly, a national study by Oxford Economics in 2014, cited in ERS Research and Consultancy (2016), estimated the average cost of replacing an employee as £30,614. This figure was based on the logistical costs of finding a new employee as well as the wage costs until the new employee is working at full productivity (ERS Research and Consultancy, 2016). It is seen from these three sources cited that there is a large variability in the estimates of the costs of turnover. This may be explained by considering the variability in the costs to organisations of different sizes, the differences across business sectors and the poor data keeping/monitoring of costs by organisations within the UK (Black & Frost, 2011). For the purposes of this model, if organisations do not have turnover costs, the average between the three estimates was used, i.e. £16,663.

3.6 Methodology Phase 2:

Figure 9: Diagrammatic representation of the 4 phases of this research project highlighting phase 2



This section firstly outlines the research design used for both organisations (described in section 1.4), describing its strengths and limitations. And then provides further details on the research methods specific to each of the two organisations, illustrating the differences between these for both organisations, such as the aims, data collection methods, outcome measures used and populations.

In order to meet the objective for phase 2, namely;

3. To collect the relevant data required to populate the revised practical CBA tool from two VR Services and the organisations to which VR is provided.

The research design used for both organisations is a pre-experimental, single factor (one way) repeated-measures, within-group (time series) (pre-intervention, post-intervention and 3-6-month post-intervention), i.e. participants are measured on more than one occasion, the independent variable is ordinal (e.g. repeated observations over a time period) and the dependent variable is interval and continuous (Frost, 2015; Jupp, 2014; Ellis, 1999). The simplest version of this is a pre – post-test (Ellis, 1999), and this design is used for this project.

Although using control groups is considered methodologically robust when looking for casual inference (Grant & Wall, 2009; Shadish, Cook & Campbell, 2002), this is not always practical or possible. The difficulties in including a control group within studies in organisations are well documented (Edmondson & McManus, 2007; Mitchie & Williams, 2003). In this research, in both organisations the VR service is offered to all employees, and therefore it is not possible to include a control group. To overcome the lack of a control group the repeated-measures time series design was used. The strength of the time series design is that it allows for the identification of shifts over time in participants knowledge, attitudes or behaviour that are influenced by the intervention (Colosi & Dunifon, 2006; Sutton, Baum & Johnston, 2005; Coyle, Boruch & Turner, 1991). However, the pragmatic use of one group, with no control/comparator group, limits the external validity/generalisability of the research, as well as the ability to determine causality (Shadish et al., 2002; Mitchie & Williams, 2003). Additionally, a weakness of this study design is the risk of participant bias, specifically, response shift bias, i.e. a ‘change in the participant’s metric for answering questions from the pre-test to the post-test due to a new understanding of a concept being taught’ (Klatt & Taylor-Powell, 2005, cited in Colosi & Dunifon, 2006, p. 2).

To overcome the limitations of no comparator group, the GM CBA model outlined in the literature review incorporates a deadweight figure i.e. what would have happened had the intervention not been in place, allowing the intervention to be compared to the standard/norm. This value will be identified in phase 1. Additionally, normative data from the organisation has been collected, i.e.

overall sickness absence data trends, attrition rate etc. By including the follow-up time periods of 3-months (in organisation 2) and 6-months (in organisation 1), this will allow for the sustainability of the change to be explored, i.e. the extent to which the health benefits are maintained after the support from the VR service has been removed (Stirman, et al., 2012). According to Breakwell et al. (2012) it is unlikely that changes will be maintained if the treatment does not have an effect, however, this is not entirely accurate, as it could be argued that extraneous variables influenced the results in the follow-up, even though the initial intervention had been effective (Stirman et al., 2012). All results need to be interpreted bearing these limitations in mind.

3.6.1 Organisation 1

Organisation 1 (as described in section 1.4.1) is an in-house VR service for employees with MSDs within a NHS Primary Care Trust. This section outlines the specific methodology used for the evaluation of organisation 1.

3.6.1.1 Aims:

The overall research project aims are:

1. To develop economic outcomes, to be used within an existing CBA model, in order to ascertain the efficacy of a practical CBA tool in evaluating the costs and benefits of VR interventions and services.
2. To implement and explore the practical application of the revised CBA tool, including the developed outcomes, using data from two VR services.

In order to achieve this relevant data need to be collected to populate the revised CBA tool (Phase 2: collect primary and secondary data from 2 VR services to populate the costs and outcomes of the CBA tool). This data was collected through conducting evaluations of two VR organisations/services. Each evaluation had specific aims to ensure that the relevant data was collected.

Looking at organisation 1's aims (the focus of this section) these were:

- a) To assess the impact of the VR service on the health of employees with MSDs.

- b) To assess the impact of the VR service on employees with MSDs sickness absence and the associated costs.
- c) To determine the costs and benefits of the VR service.

3.6.1.2 Methodology:

The methodology reported here, relates to the quantitative section of the mixed methodology approach (see section 3.2 for further discussion). The evaluation was a pre-experimental repeated-measures within-group (time series) (pre-intervention, post-intervention, 3 and 6-month post-intervention follow-up (see section 3.6 for further discussion).

When deciding on a service evaluation model, a common question is whether to use an internal (using an individual or group directly involved with the service) or external model (using an external evaluator who is independent to the model) (Menestrel, Walahoski, & Mielke, 2014; Owen & Rogers, 1999, cited in Conley-Tyler, 2005). There are a number of key factors which influence the choice of model. Considering the benefits of an internal evaluation model, it may be cheaper, depending on the time utilisation of the internal evaluator, the internal evaluator may be more readily available than an external evaluator, and the internal evaluator will have an inherent knowledge of the programme, operations and context (Volkov & Baron, 2011; Conley-Tyler, 2005). By implication, the reverse of these benefits are the weaknesses of the external evaluation model. Likewise, the benefits of an external evaluator models such as the evaluator having expert skills and expertise, perceived objectivity, willingness to criticise and ability to collect information from participants, are the weaknesses of an internal model (Volkov & Baron, 2011; Conley-Tyler, 2005). These strengths and limitations of internal and external evaluators are debated, for example although external evaluators are seen to be unbiased, all individuals bring their own bias/personal values (Conley-Tyler, 2005; Menestrel et al., 2014). It has been proposed to overcome the inherent weaknesses in both models, a third/hybrid model may be utilised, creating a functional relationship between internal and external evaluators (Menestrel et al., 2014; Conley-Tyler, 2005; Patton, 1987; Shapiro & Blackwell, 1987). In this model the evaluators' role and tasks are divided, this lowers the cost and allows for the transfer of skills from the external evaluator to the internal evaluator (Conley-Tyler, 2005). Due to the practical implications of collecting data, an internal evaluation

team was needed with an in-depth knowledge of the processes, as well as availability to collect the data. And an external evaluation team was needed to provide the research knowledge and skills. Thus, an internal/external evaluation model was used, with an external evaluation team responsible for analysing the quantitative data, and an internal evaluation team responsible for collecting the quantitative data via questionnaires, extracting the sickness absence records, and providing the costs of the VR service.

3.6.1.3 Ethical approval

Prior to commencing the study ethical approval was gained from the University of Salford Ethics Committee (Ref no: REP 10/039. 7/4/2010 & 20/07/2011. See Appendix 7.1). In addition, the appropriate NHS Research and Development office was contacted to enquire whether NHS Research ethics was needed. The NHS Research and Development office informed the research team that as this case study was a service evaluation, NHS ethical clearance was not required (Health Research Authority NHS, 2014) (see Appendix 7.1). Prior to participating all participants were provided with an invitation and participant information sheet, which clearly outlined the reason for the research, any potential benefits or risks of participation, data handling and storage, dissemination of findings, the voluntary nature of the study and the right to withdraw at any point. Contact details were provided for the lead investigator should any potential participants require additional information or wish to lodge a complaint.

3.6.1.4 Sampling technique:

When randomisation of the participants is not required for the research design, non-probability sampling is commonly used (Etikan, Musa & Alkassim, 2016; Doloros & Tonco, 2007). Non-probability sampling is convenient, especially when there are limited resources, however, due to the subjective nature of choosing participants, and not giving all participants the equal chance of being included the research loses its generalisability to the wider population (Etikan et al., 2016). There are two common non-probability sampling methods, convenience and purposive (Etikan et al., 2016, Laerd Dissertation, 2012). Convenience sampling is where participants who meet the practical criteria such as easily accessible, available at a given time, willingness to partake, are included for the purpose of the study (Etikan et al., 2016; Suri, 2011; Laerd Dissertation, 2012).

Convenience sampling can be used for both quantitative and qualitative research; however, it is most commonly used in quantitative research (Etikan et al., 2016). With convenience sampling although participants may be selected on the basis of ease of access, the samples used are rarely convenient to draw and this method is more often referred to, to distinguish them from random samples (Price, 2013). The advantages of convenience sampling are that it is easy to identify the sample, it is less time consuming, and it may be the only practical form of sampling when working with organisations and needing access to formal lists of employees for probability sampling techniques (Etikan et al., 2016). However, this form of sampling has limitations, such as it may result in a biased sample limiting the generalisability of the results; it is not possible from this non-probabilistic sampling technique to describe the relationship between the sample and the population of interest; it is not possible to understand why some people agreed to participate whilst others did not; and statistical inference is not possible (Etikan et al., 2016; Price, 2013; Suri, 2011; Laerd Dissertation, 2012). With purposive sampling or judgement sampling participants are chosen based on pre-determined characteristics or criteria to increase the probability of the research question being answered (Etikan et al., 2016; Doloros & Tonco, 2007; Laerd Dissertation, 2012). Purposive sampling is commonly used in qualitative research (Laerd Dissertation, 2012; Doloros & Tonco, 2007). This method of sampling best enables the researcher to answer the question, increasing internal validity, but limiting the generalisability of the results (Doloros & Tonco, 2007). The nature and type of research guide the choice of sampling method (Etikan et al., 2016). In this phase of the research, for organisation 1, convenience sampling was used as the methodology is quantitative and the subjects were selected due to their accessibility and willingness to take part. All clients who had their first appointment with the VR service during the time period of recruitment were invited to take part.

3.6.1.5 Procedure primary data collection.

The case manager/physiotherapist, as part of the internal evaluation team was responsible for recruiting participants, gaining informed consent and collecting the pre-data and post data, at the patients first and last appointment. A follow-up questionnaire (3 and 6-months) was sent to the participants via the internal evaluation team administrative assistance, with a stamped addressed

return envelope. A reminder was sent to participants one week later if they did not return their follow-up questionnaire.

3.6.1.6 Primary data outcome measures

The following reliable and valid outcome measures were used to evaluate the impact of the service on the health of the staff (see section 3.4 and 3.4.1 for further information on the outcome measures):

- 1) The General Health Questionnaire (GHQ-12) (Goldberg, 1972), a self-report of general health to identify psychological distress.
- 2) The Job Satisfaction Scale (JSS) (Warr et al., 1979), a self-report to identify satisfaction at work.
- 3) Patient Specific Function Scale (PSFS) (Stratford et al., 1995), a subjective scale which allows for measured change in identified functional limitations or goals in relation to work and life settings.

3.6.1.7 Procedure secondary data collection

Sickness absence within the Primary Care Trust was recorded on an Electronic Staff Record. 12 months pre and post-intervention sickness absence data, of employees attending the VR service, was extracted and anonymised by the Primary Care Trust. This data, along with the costs of sickness absence and of the VR service, were provided to the evaluation team.

3.6.1.8 Data analysis

SPSS 16 (SPSS Inc., Chicago IL) was used to conduct the statistical analysis. Non-parametric analysis was used to analyse the primary data, as the data failed to satisfy the criteria for parametric analysis, due to: the data not having a normal distribution; the outcome measures consisting of Likert scales with subjective wording; and convenience sampling being used (Hicks, 2004). Friedman's test was used to identify significant differences between the groups, at the three

different time points, and Wilcoxon's test was then used to highlight where these differences occurred, i.e. compare the different time points (Rumsey, 2011).

GHQ-12 was scored using both the Likert and Binary method. The Binary method was used to identify 'cases', a score greater than 4, subjects showing minor psychological distress (Goldberg, 1972) (see section 3.4.1.2.2).

A paired-samples t-test was conducted to evaluate the impact of the VR service on the number of sickness absence days taken by staff during this time period. A paired-samples T-test determines whether the average (i.e. mean) score for the pre-sickness absence data significantly differs from the average score of the post-sickness absence data (Rumsey, 2011).

3.6.2 Organisation 2

Organisation 2 (as described in section 1.4.2) is an in-house VR service for employees with physical or mental ill-health within a public organisation in the UK. This section outlines the specific methodology used for the evaluation of organisation 2.

3.6.2.1 Aims:

In order to achieved the overarching research aims i.e. develop and implement a practical CBA tool, relevant data to populate the CBA tool needs to be collected (Phase 2: collect primary and secondary data from 2 VR services to populate the costs and outcomes of the CBA tool). This data was collected through conducting evaluations of two VR organisations/services. Each evaluation had specific aims to ensure that the relevant data was collected.

Organisation 2 aims:

- a) To assess the impact of the VR service on the sickness absence levels, presenteeism levels and quality of life of employees attending the service.
- b) To assess the impact of the VR service on employees attending the service and the associated costs.

c) To determine the costs and benefits of the VR service.

3.6.2.2 Methodology:

The study was a pre-experimental repeated-measures within-group (time series) (pre-intervention, 2-weeks post-intervention, 3-months and 6-months post - intervention) (see section 3.6.1.2 for further discussion).

3.6.2.3 Ethical approval

The same ethical procedure as was conducted with organisation 1 was undertaken with organisation 2 (see section 3.6.1.3 above). University of Salford Ethics Committee (Ref no. HSCR14/79. Ethical approval granted 9/10/2014. Amendment approved 12/12/2014. See Appendix 7.2).

3.6.2.4 Sampling technique:

Convenience sampling was used, all clients who have their first appointment with the VR service during the time period of recruitment (October 2014 – October 2015), were invited (See section 3.6.1.4 for further discussion on convenience sampling).

3.6.2.5 Procedure primary data collection.

The VR case managers (VRCM) informed the potential participants about the research project. If the participants agreed to receiving information about the project, they were telephoned by the lead investigator to explain the project, and emailed an invitation and information sheet. On verbally consenting to take part, participants were emailed a consent form and the questionnaire. Participants were requested to complete both and return via email to the lead investigator. At 2-weeks post their first appointment at the VR service, participants were emailed their 2-week follow-up questionnaire, which they were requested to complete and return via email, and the same at 3-months and 6-months post. If the participant did not return the questionnaires a reminder email was sent one week later. All participants were able to receive or return the forms electronically or via the postal system if they wished.

3.6.2.6 Primary data outcome measures:

The following outcome measures were collected to evaluate the impact of the VR service on the employees in terms of sickness absence, productivity/presenteeism and quality of life (see section 3.4 and 3.4.1 for further information on the outcome measures):

- Sickness absence using the Work Limitations Questionnaire Work Absence Module (WLQ-work absence module) (Lerner et al., 2001).
- Presenteeism/productivity questionnaire using the Work Limitations Questionnaire (WLQ) (Lerner et al., 2001).
- Quality of life, using the EQ-5D-5L (EuroQol group, 2009).

In addition, sickness absence within the organisation was recorded electronically; 3 months pre-intervention and 3-month post intervention data was extracted and anonymised by the organisation, prior to sending to the researcher.

3.6.2.7 Procedure secondary data collection

The secondary data was provided by the VR service provider and the host organisation. All data provided was anonymised and aggregated. The VR service provider and organisation provided sickness absence data, average salary, annual turnover, VR service data such as number of referrals, and an overall budget for the VR service with a breakdown of the service costs.

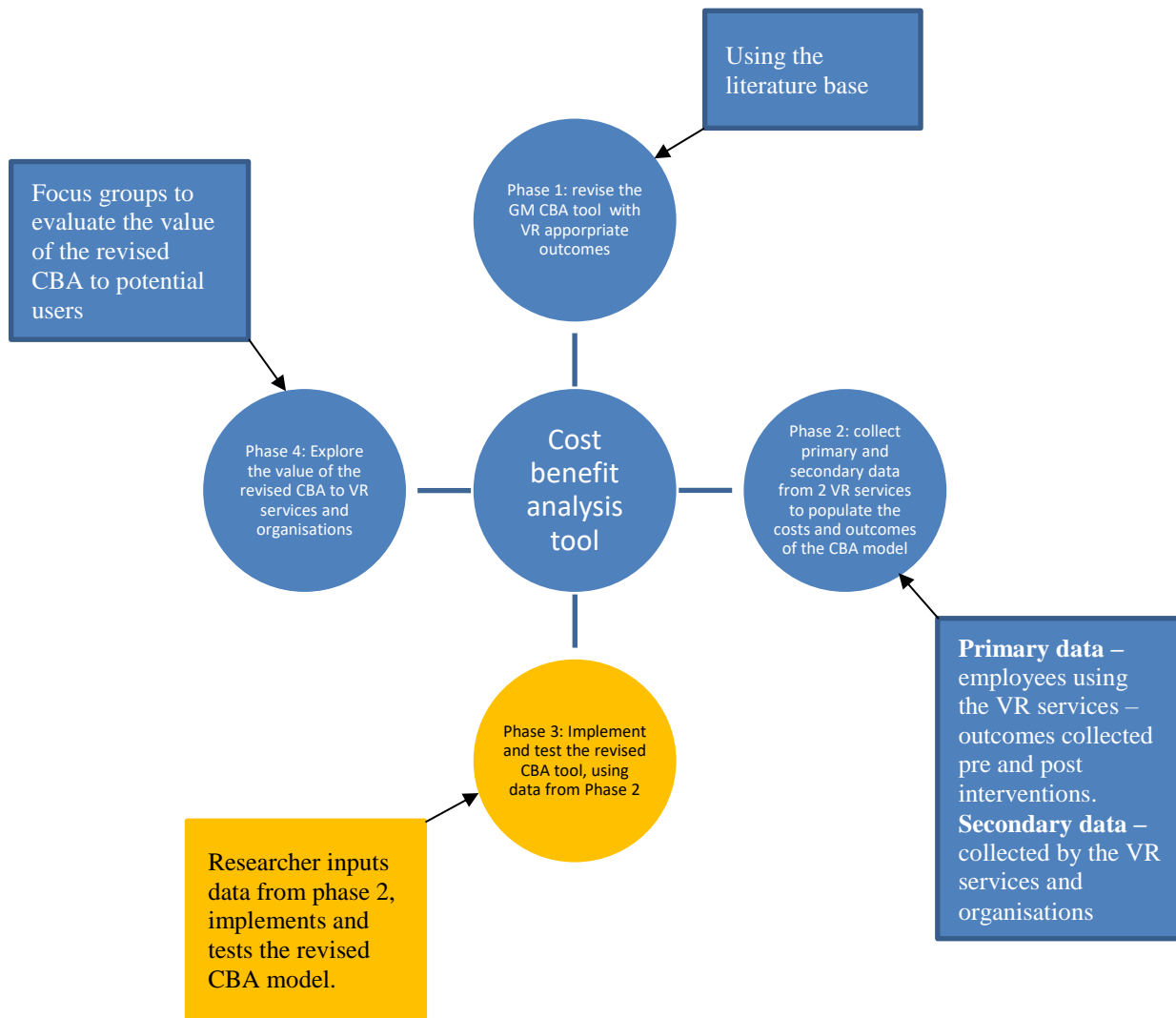
3.6.2.8 Data analysis

The sample sizes were small ($n = 3$), thus no statistical analysis could be conducted. Should the data have been sufficient it was planned that SPSS 22 (SPSS Inc., Chicago IL) would be used to analyse the data. The questionnaire data would have been analysed using either the one-way repeated ANOVA if the data had met the underlying assumptions of parametric data, i.e. it was normally distributed, the groups were independent and the variances of the group were equal, or the Friedman and Wilcoxon tests would have been used to detect whether there was a difference

between the groups, at the three different time points, and to compare the results at two different time points (Rumsey, 2011).

3.7 Methodology Phase 3

Figure 10: Diagrammatic representation of the 4 phases of this research project highlighting phase 3



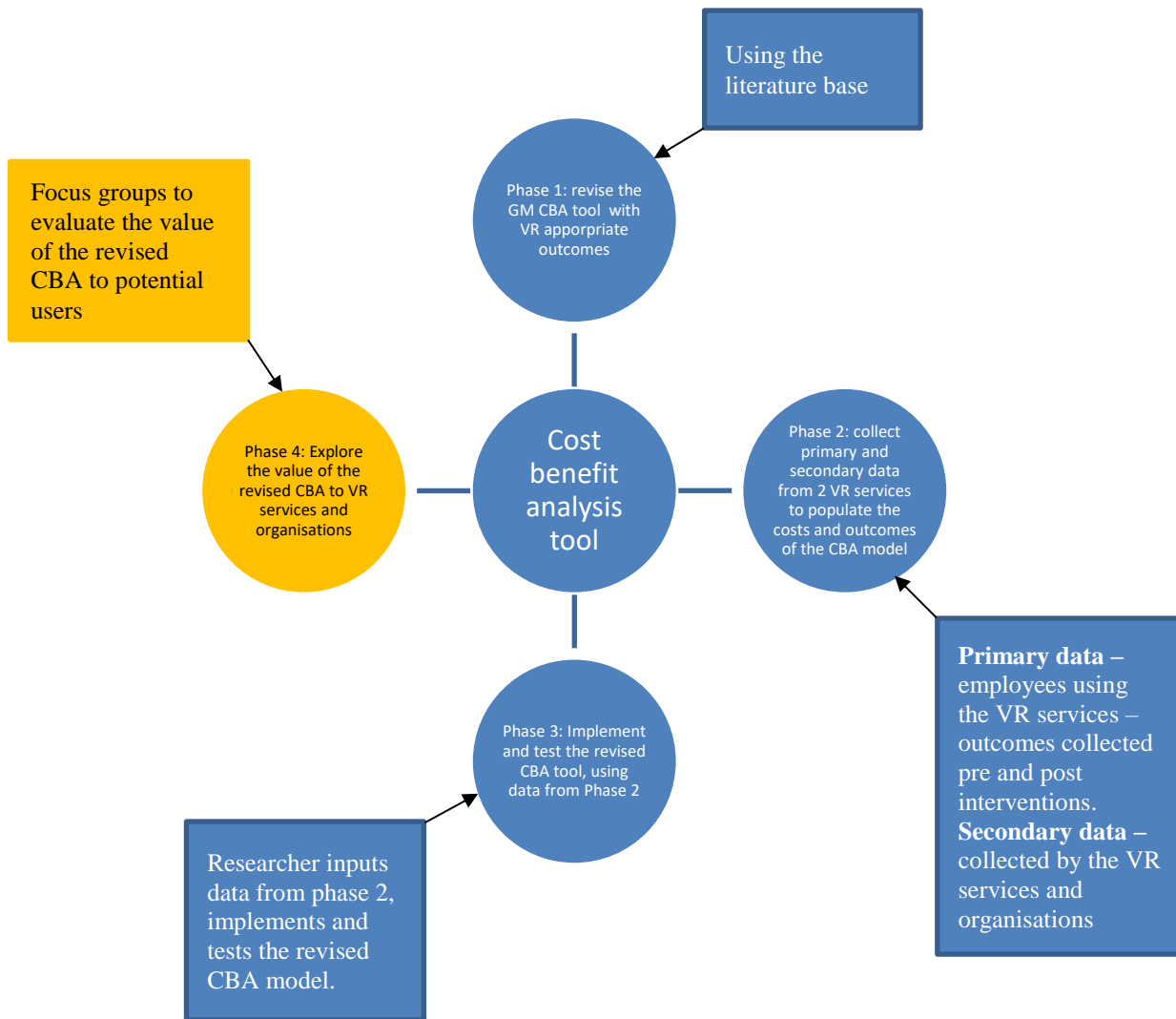
In order to meet the objectives of phase 3, namely;

4. To implement and test the revised practical CBA tool incorporating the developed outcomes to identify the cost-benefits of the VR interventions and services in a real-world setting.

The data from phase 2 was used to populate the revised CBA tool (revised in phase 1). The CBA tool was implemented, producing the following outputs: Benefits Cost Ratio, Net Present Value and Return on Investment. The inherent limitation of using a CBA is the uncertainty and risks with estimating the values to be used within the CBA tool and the structural uncertainty of the CBA tool i.e. the assumptions and decisions that you based the CBA tool on (Salling & Banister, 2010; Keating & Keating, 2014; Snell, 2011; Sculpher et al., 2006). To account for these limitations an optimism bias correction factor was inputted into the CBA tool. After applying optimism bias, a probabilistic sensitivity analysis and scenario analysis was conducted as outlined in section 3.4. In addition, a break-even scenario was added to the CBA tool, providing information on what the changes would be to the key variables to allow for the NPV (Benefits) to exactly equal the NPV (Costs) (CEEU, 2011).

3.8 Methodology Phase 4

Figure 11: Diagrammatic representation of the 4 phases of this research project highlighting phase 4



In order to meet the objective of phase 4, namely;

5. To appraise the value of the revised practical CBA tool to the VR provider and the organisation to which VR is provided.

This methodology is the qualitative element of the mixed methodology approach used in this research project (see section 3.5 for further discussion). A focus group was used as a standalone qualitative method to explore the value of the revised CBA tool to the VR provider and the organisation. A focus group is structured group of selected participants, facilitated by a moderator that allows a combination of interviewing, participant observation and data collection through group interactions, with a specific topic focus (Massey, 2010; Litosseliti, 2003; Morgan, 1997). One reason focus groups are used is to generate information on individuals' perceptions and attitudes on particular topics (Massey, 2010; Litosseliti, 2003). The choice in this methodology is due to the strength of focus groups in that the group dynamics may result in the elicitation of more detailed information than would be possible in one-to-one interviews (Smith, 2008; Litosseliti, 2003; Morgan, 1996; Kitzinger, 1999; Merton et al., 1990 cited in McLafferty, 2004). Statements may be 'challenged, extended, developed, undermined or qualified in ways that generate rich data for the researcher' (Willig, 2001, p.29; Litosseliti, 2003). It is important to be aware of this phenomenon when conducting focus groups to ensure that it does not evolve into a group interview, diminishing the group interaction (Liamputtong, 2011; Morgan, 1996). However, these group dynamics can also be a limitation as members may censor their speech, and have their opinions influenced or moderated in a group setting i.e. false consensus (Smith, 2008; Parker & Tritter, 2006; Litosseliti, 2003). Moreover, it is important to consider the ethical concerns, as confidentiality from the other participants cannot be assured in these scenarios (Parker & Tritter, 2006). Further limitations of focus groups include possible bias through the researcher guiding participants to say what the researcher wants to hear, difficulties in distinguishing between the group view and individuals' views, and the inability to generalise the results due to small sample groups and the inability to ensure the sample is representative of the wider population (Litosseliti, 2003; Morgan, 1997). A number of these limitations, such as confidentiality can be moderated through the setting of ground rules at the beginning of the focus group, as well as awareness of the moderator of the potential pitfalls (Smith, 2008; Litosseliti, 2003).

3.8.1 Sampling

Purposive sampling (discussed in section 3.6.1.4) was used in this phase of the research. The researcher identified the major stakeholders who were directly involved or affected by the research

(Given, 2008), thus increasing the probability of the research question being answered (Etikan et al., 2016; Doloros & Tonco, 2007; Laerd Dissertation, 2012). In this study, it is the individuals from the organisations who were responsible for collecting the secondary data, and the individuals reading the CBA reports and making decisions with the aid of the CBA reports, i.e. those who can provide insight into the value of the CBA tool, who were invited by email to take part in the study. The email invite, including information sheet, was sent from the main contact within the VR service on behalf of the researcher.

3.8.2 Sample size

Sample size is a contentious issue with focus groups, there is little consensus in the literature as to the ideal number of participants, with authors (Howard, et al., 1989; Twin, 1998, both cited in McLafferty, 2004; Kitzinger, 1999) recommending between four and twenty (Massey, 2010; Litosseliti, 2003; McLafferty, 2004). The key consideration is to ensure that the group is not too large to prevent adequate interaction from all participants, nor too small that it fails to provide sufficient breadth (Merton et al., 1990, cited in McLafferty, 1990). In this research, there was one focus group with four participants due to the small number of potential participants.

3.8.3 Focus group procedure

Prior to the focus group, the researcher conducted a brief presentation explaining the CBA model, and the participants had the chance to input data into the new CBA tool to generate cost/benefits results (see Appendix 9), using a case study as an example and a glossary page (see Appendix 9). The in-person focus group was audio recorded. A spare recorder was taken in case of a fault with the primary recorder. An audio recorder rather than a video recorder was used, as it is often more acceptable to participants, although they may still censor their responses knowing they are being recorded (McLafferty, 2004; Newcomer, Hatry & Wholey; 2015). A limitation of an audio recorder is that it cannot record non-verbal communication (McLafferty, 2004). Ground rules were developed to address the potential risks of lack of confidentiality (Smith, 2008; Parker & Tritter, 2006), and the process was provided in writing and articulated to the participants. Written consent was obtained from the participants prior to the focus group, participants were informed that they could withdraw at any stage from the research (see Appendix 10). They were informed of the

purpose of the research, the handling and storage of their data. The focus group took place in a private room on the organisations premises. The researcher facilitated the discussion based around a series of questions. These questions were designed, based on the aims of the research project, to prompt the participants to expand on their views on using the CBA tool; it's perceived use within their organisation and the limitations or areas of development within the CBA tool (Litosseliti, 2003). These questions were open questions with probing questions to elicit further information if needed (Liamputtong, 2011; Litosseliti, 2003) (see Appendix 6). Although the facilitator is meant to be neutral in the focus group, merely keeping the groups focused (Newcomer et al., 2015; Litosseliti, 2003), due to the nature of this focus group following a presentation and a practical session applying the CBA tool to a case study scenario, questions were directed at the researcher, drawing the researcher into the conversation.

3.8.4 Focus group analysis

The audio recordings of the focus groups were transcribed. When analysing focus group data it is important to bear in mind that the outcome is as a result of the interaction between the agenda, the facilitator and with and between the members of the focus group (Merton & Kendall, 1956, cited in Parker & Tritter, 2006; Litosseliti, 2003). Difficulties in analysing focus group data arise as they provide both individual and group level data, which can be hard to differentiate between (Massey, 2010; Hyden & Bulow, 2003, cited in Parker & Tritter, 2006; Litosseliti, 2003). Members of focus groups may shift their perceptions or change their mind through the focus group, highlighting the unpredictability of the group dynamics, as well as the risk of false consensus (Parker & Tritter, 2006; Litosseliti, 2003). It is suggested that to overcome the group dynamics that 'researchers should pay particular attention to the more 'sensitive moments' in focus group interaction' (Kitzinger & Farquhar, 1999, cited in Parker & Tritter, 2006, p. 32).

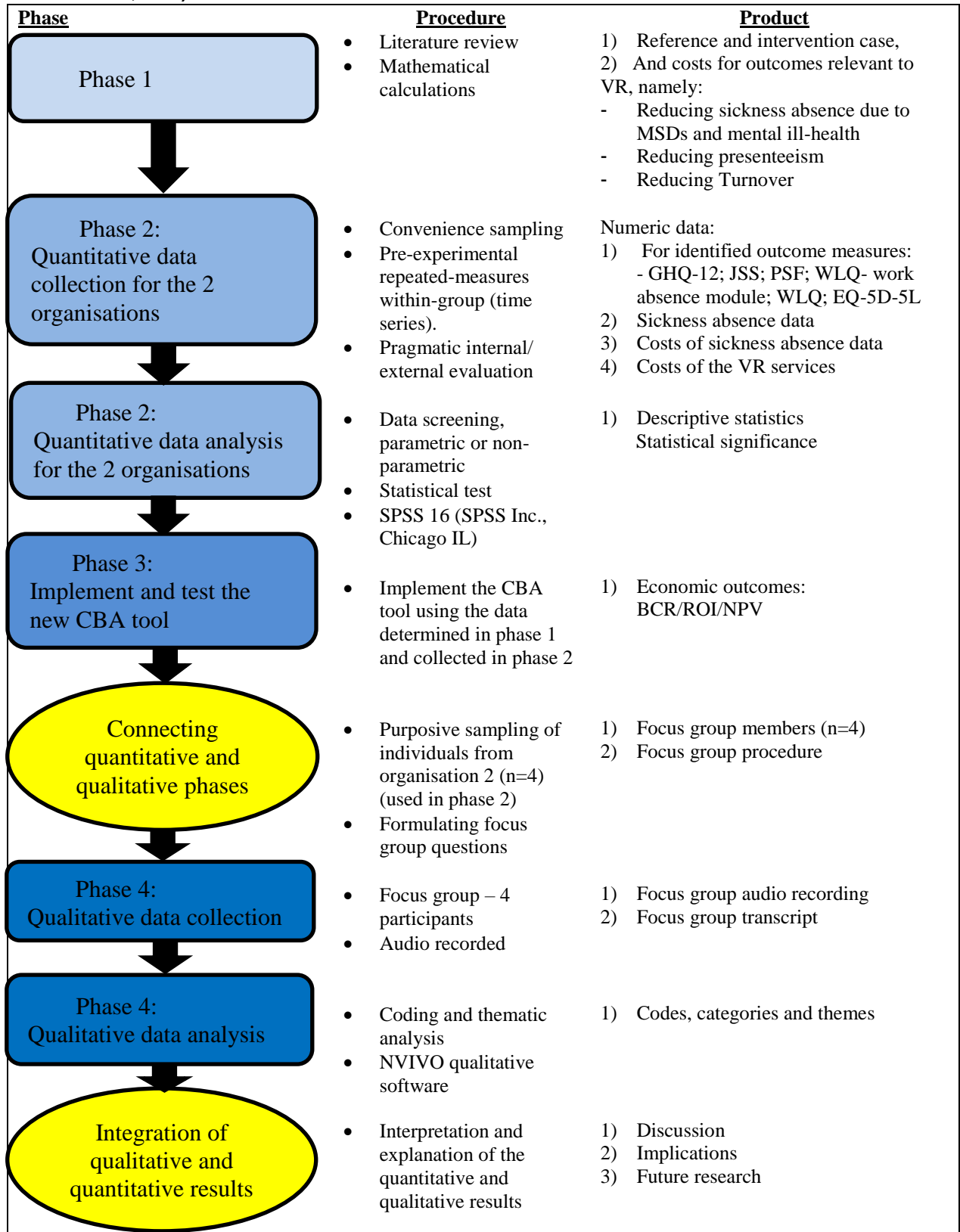
A common critique of focus groups is that the analysis process is poorly defined (Flores & Alonso, 1995; Hurwoth, 2003; Myers & McNaghten, 2001; Webb & Kerven, 2001; all cited in Massey, 2010). The reasons for this are debated with some authors proposing that the analysis can vary according to the topic and purpose, others argue that the methods are not scientific enough and rest solely on the researcher's choice (Massey, 2010). This has led to three general methods of analysis

that are loosely defined, without any limitations proffered, namely: grounded theory, phenomenological approaches and thematic analysis (Massey, 2010). Grounded theory is 'inductive and iterative with analysis occurring with reflexive data collection for the purpose of theory generation' (Bernard & Ryan, 2010; Charmaz, 2008; Dick, no date, cited in Massey, 2010, p.22; Cho & Lee, 2014). When using phenomenological analysis, the participants are viewed as co-researchers as they 'search for essential meaning found in their shared experiences' (Bernard & Ryan, 2010; Creswell, 2007; Wilkinson, 1998, cited in Massey, 2010, p.22). The last analysis methodology, thematic/content analysis aims to identify common themes and categories such as individuals' attitudes, opinions and beliefs, under which to group the written or oral data (Cho & Lee, 2014; Massey, 2010). The purpose underpinning content analysis is to gain an understanding of the impact or process of the topic of interest (Massey, 2010). This purpose most closely aligns with the aim of the focus group. Moreover, Parker & Tritter (2006) recommend content analysis for focus groups as it takes the nature of the group and context into account. The transcripts were analysed using thematic/content analysis. There are limited descriptions on how to conduct qualitative content analysis, it often merely involves grouping comments under categories, and then linking these to core themes (Cho & Lee, 2014; Elo et al., 2014; Massey, 2010). This lack of standardised process impacts on the validity, reliability and trustworthiness of content analysis (Elo et al., 2014). Following the basic outlined steps of content analysis (Cho & Lee, 2004; Massey, 2010; Elo et al., 2014) the following procedure was followed. NVIVO was used to organise the data. The complete transcript was retained to ensure the context was not lost. The transcript was read for general impressions, it was then coded, identifying substantive parts in the transcription relating to the research question, and these were then categorised (Litosseliti, 2003). From the categories overarching themes were identified. Due to the looseness of the analysis methodology bias is a risk at this stage, and constant awareness of this by the researcher was necessary (Litosseliti, 2003).

3.9 Summary of the research methodology used in each phase

The following visual model (Figure 12) for mixed-methods sequential explanatory design procedures, adapted from Ivankova et al. (2006), summarises the research methodologies used across the different phases, as well as illustrating the overarching mixed methods methodology.

Figure 12: Visual model for mixed-methods sequential explanatory design procedures. (Adapted from Ivankova et al., 2006)



4. Results

4.1 Introduction

This chapter presents the results for the objectives of each phase of this study, namely:

Phase 1:

1. To identify from the published literature the outcomes of VR interventions for organisations and employed individuals.
2. To revise the GM New Economy CBA model to ensure that the practical CBA tool developed is capable of analysing the costs and benefits of VR interventions.

Phase 2:

3. To collect the relevant data required to populate the revised practical CBA tool from two VR Services and the organisations to which VR is provided.

Phase 3:

4. To implement and test the revised practical CBA tool incorporating the developed outcomes to identify the cost-benefits of the VR interventions and services in a real-world setting.

Phase 4:

5. To appraise the value of the revised practical CBA tool to the VR provider and the organisation to which VR is provided.

The results for each phase are discussed sequentially, as each phase is dependent on the completion of the previous phase.

4.2 Phase 1 results

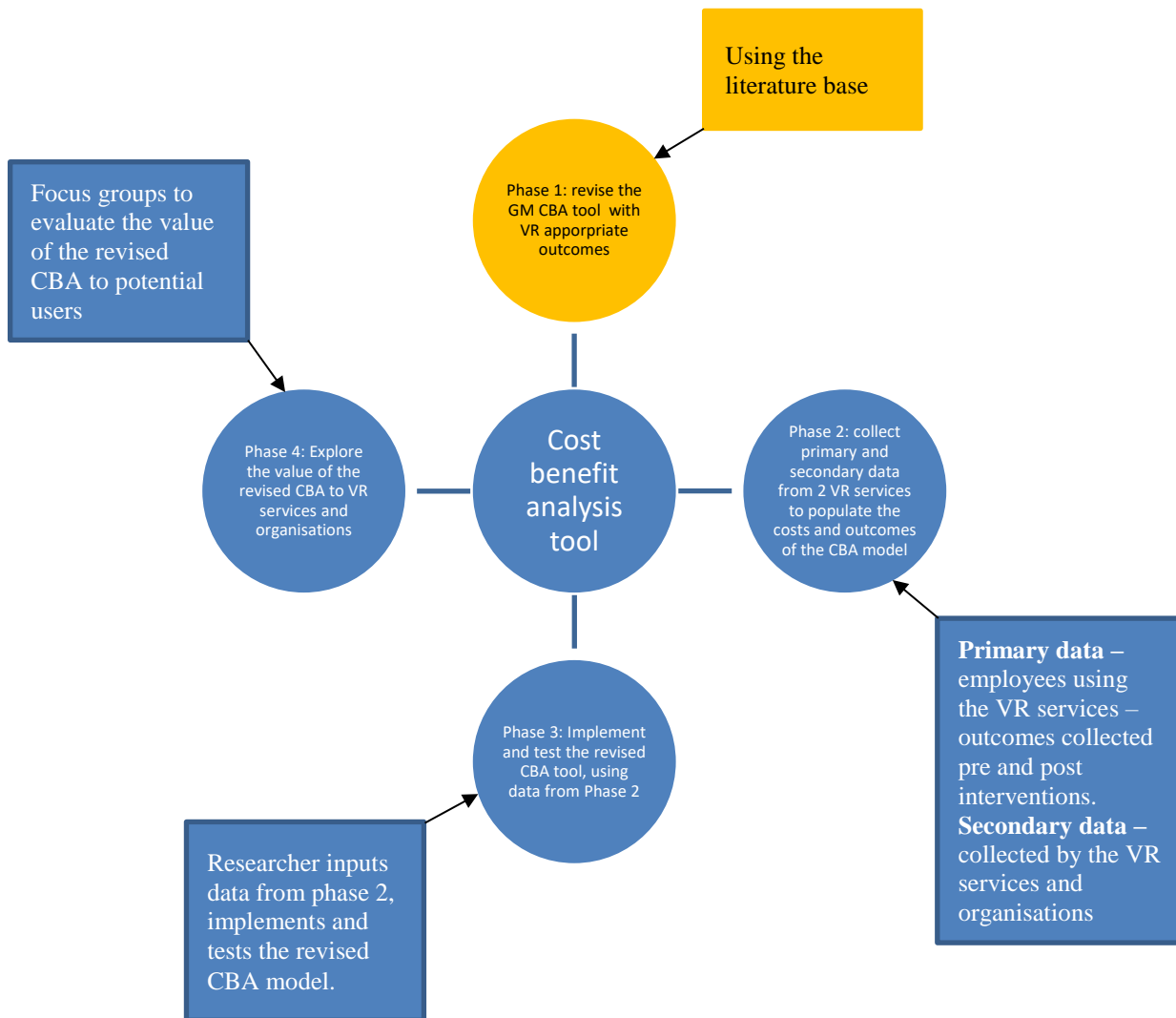


Figure 13: Diagrammatic representation of the 4 phases of this research project highlighting phase 1

This chapter outlines the results from phase 1 they are described separately for each outcome. Firstly, the results addressing Phase 1, objective 1, are presented.

1. To identify from the published literature the outcomes of VR interventions for organisations and employed individuals.

To meet this objective for each outcome the reference and intervention cases have been determined, allowing the calculation of the deadweight and the estimated 'net effectiveness percentage' i.e. the

percentage improvement between the two cases. To determine the reference and intervention cases, a systematic literature search was conducted and the results for each outcome are presented below, to include:

- a summary of the articles included in the identification of the deadweight and the estimated net effectiveness calculation,
- a review of the included literature, outlining the assumptions of the CBA tool,
- and a calculation the deadweight to be used within the revised GM New Economy CBA.

Secondly, the results addressing Phase 1, objective 2, are outlined.

2. To revise the GM New Economy CBA model to ensure that the practical CBA tool developed is capable of analysing the costs and benefits of VR interventions.

To meet this objective, the unit costs, i.e. the cost of the benefit such as the cost of sickness absence per employee per day, for each outcome are also presented in turn.

4.2.1 Identifying the reference and intervention cases in order to determine the deadweight and estimated net effectiveness percentage of each outcome to be used within the practical CBA tool

As outlined in section 3.5.3 and 3.5.4 a systematic literature search was conducted to determine the reference and intervention case. The purpose of the literature search is to identify the reference and intervention cases, allowing for the determination of the net effectiveness of VR interventions. Consequently, the key element of included articles is the inclusion of a control or comparator group.

4.2.1.1 Sickness absence due to MSDs: reference and intervention case results

The inclusion and exclusion criteria for this literature search are:

- Employed individuals who are off work due to MSDs.
- The inclusion of a control or comparator group.
- The data on sickness absence days presented as a mean over a year.
- The sickness absence data is less than 20 years old.

Refer to section 3.5.4 for a detailed search strategy.

Figure 14: Flow chart of study selection process

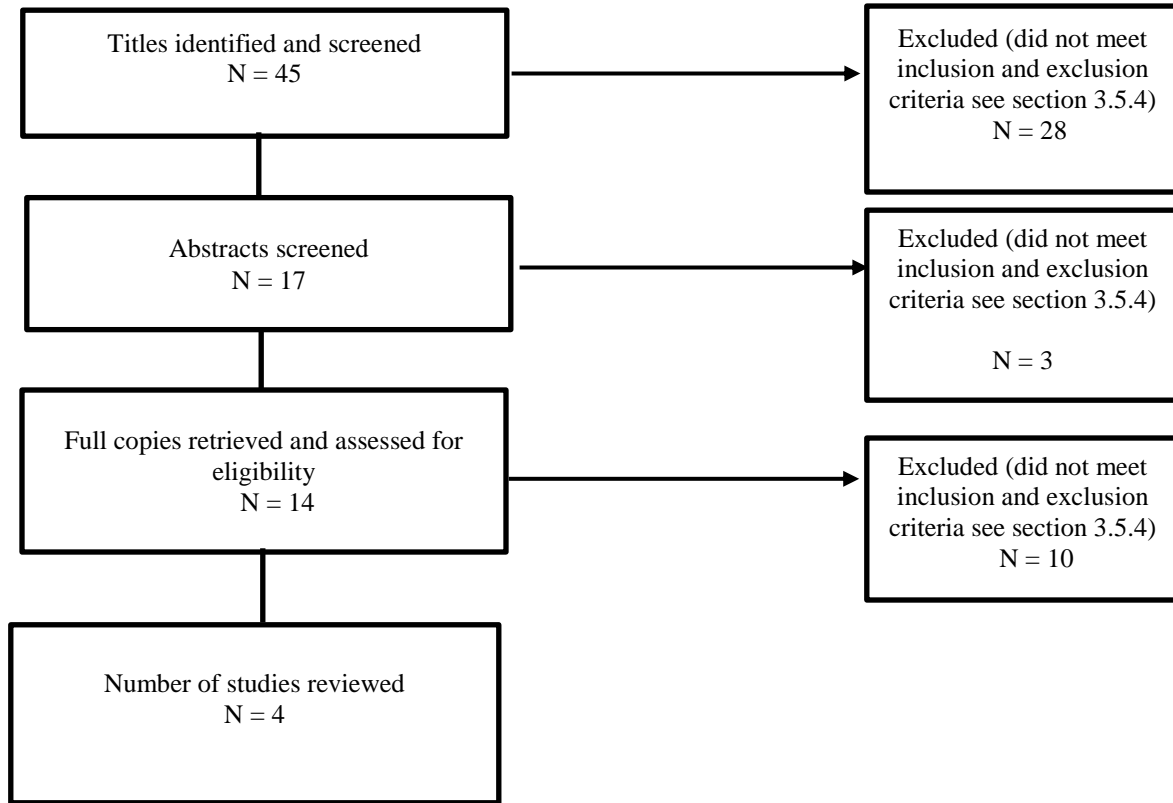


Table 8: Summary of included articles, with sickness absence findings reported in terms of days sick leave per year or percentage difference over a year.

Authors & Country	Research study	Population (including condition)	Intervention (n = x)	Usual care (n = x)	Total mean no. of sickness absence days (intervention group)	Total mean no. of sickness absence (control group)	Difference between intervention and control means	Significance	Percentage difference between intervention and control V1 = intervention V2 = control (net additional benefit) ((V1-V2)/V1 *100)
Arnetz et al. (2003) Sweden	Prospective controlled trial	Patients with physician diagnosed MSDs. Selected from a roster of all sick leave cases at the Swedish National Insurance agency. All cases are referred by employees between 4 and 8 weeks sick leave.	N = 65 Proactive insurance case managers combined with workplace ergonomic interventions	N = 72 Traditional case management	Total mean number of sick days (from the 1 st day of absence): 0-6-months = 110 (6.5 SEM; 52.4 SD) 6-12 months = 95.8 (13.1 SEM; 105.6 SD) 0-12 months = 144.9 (11.8 SEM; 95.14 SD)	Total mean number of sick days (from the 1 st day of absence): 0-6-months = 131.1 (5.9 SEM; 50.06 SD) 6-12 months = 150.3 (8.8 SEM; 74.70 SD) 0-12 months = 197.9 (14.0 SEM; 118.8 SD).	0-6 months = -21.1 6-12 months = -54.5 0-12 months = -53	0-6-months p <0.05 6-12 months p <0.01 0-12 months p <0.01	0-6-months 19% 6-12 months 56.89% 0-12 months 27%
Du Bois & Donceel (2012) Belgium	Single blinded RCT	Claimants with LBP. Claiming for allowances following minimum 1 month sickness absence.	N = 252. Proactive service aimed at quick RTW. Provided counselling, information and advice	N = 257. Disability evaluation	Total mean number of days of sick leave per year: 63.9 (54.8–73.0)	Total mean number of days of sick leave per year: 75.9 (65.4–86.56)	-12	P = 0.16 This is not significant.	16%

			and disability evaluation						
Karjalainen et al. (2003) Finland	RCT	Sub-acute lower back pain. Employees had LBP which made working difficult for more than 4 weeks but less than 3 months.	a) N = 55 – mini intervention with a physician and a physiotherapist b) N = 46 – same as a) + a work site visit	N = 51. Treated in municipal primary health care	Total mean number of days of sick leave: a) 19 (median = 0 days) b) 28 (median = 1)	Total mean number of days of sick leave: 41 (median = 7)	a)-22 b)-13	a) vs control P = 0.019 b) vs control P = 0.071	a) 54% b) 32%
Bultman et al. (2009) Denmark	RCT	Employees on sick leave between 4-12 weeks due to MSDs	N = 68 Co-ordinated and tailored work rehabilitation. This consists of a work disability screening by an interdisciplinary team, identification of barriers to RTW and a collaborative development of a RTW plan.	N = 51 Traditional case management	Total mean numbers of hours sickness absence (mean days calculated as 7.5 hours per day): 0-3 months 278.3 (SD 165.9; median 262) 3-6-months 187.6 (SD 183.1; median 134) 6-12 months 190.4 (SD 312.1; median 2.5) 0-6-months 190.4 (SD 319.3; median 419) 0-12 months 656.6 (SD 565.2; median 476) = 87.6 days	Total mean numbers of hours sickness absence (mean days calculated as 7.5 hours per day): 0-3 months 331.1 (SD 152.9; median 335) 3-6-months 254.5 (SD 199; median 234) 6-12 months 411.7 (SD 423.1; median 254) 0-6-months 585.6 (SD 322.6; median 537) 0-12 months 997.3 (SD 668.8; median 892) (using a 7.5 hour day) = 133 days	0-3months = -52.8 3-6 months = -66.9 6-12 months = -221.3 0-6-months = -395.2 0-12 months = -340.7	0-3months P = 0.060 3-6 months P = 0.096 6-12 months P = 0.009 0-6-months P = 0.034 0-12 months P = 0.006	34%

Through reviewing the included articles it was noted that the reporting of the impact on sickness absence was not consistent, with some studies reporting the mean number of days per sickness absence episode (Lindstrom et al., 1992; Abasolo et al., 2005; Fleten & Johnsen, 2006; Leon et al., 2009; Nystuen & Hagen, 2003; Lambeek et al., 2010; Meyer, Fransen, Huwiler, Uebelhart, & Klipstein, 2005) or the mean number of sickness absence days over a year (Du Bois & Donceel, 2012; Arnetz et al., 2003; Hultberg, Lonroth, Allebeck, Hensing, 2006; Jorgensen, Faber, Hansen, Holtermann, & Sogaard, 2011; Bultman et al., 2009; Karjalainen et al., 2003), whereas others reported only the median for number of sickness absence days per episode or per year (Staal et al., 2004; Lindstrom et al., 1992), or the percentage returning to work over a year (Norrefalk, Ekholm, Linder, Borg, & Ekholm, 2008; Meyer et al., 2005). Additionally, the inclusion and exclusion criteria described within the articles clearly distinguished between long-term sickness absence (Loisel et al., 1997; Lambeek et al., 2010; Bultman et al., 2009; Meyer et al., 2005; Nystuen & Hagen, 2003), with the minimum long-term sickness absence being defined as longer than 28 days, and short-term sickness absence, less than 28 days (Du Bois & Donceel, 2012; Steenstra et al., 2006; Lindstrom et al., 1992; Karjalainen et al., 2003; Staal et al., 2004; Abasolo et al., 2005; Fleten & Johnse, 2006; Arnetz et al., 2003; Hultberg et al., 2006; Jorgensen et al., 2011; Leon et al., 2009; Norrefalk et al., 2008).

Considering the inclusion criteria outlined in the methodology, a total of 4 articles were included to determine the reference and intervention case (Arnetz et al., 2003; Bultman et al., 2009; Du Bois & Doncell, 2012; Karjalainen et al., 2003). Looking at the reference and intervention case in the identified studies, the percentage improvement between the two cases (the net additional benefit/net effectiveness) for short-term sickness absence was on average 32.6%, with percentage changes ranging from 16% - 54% (See Table 8).

It is also important to consider sickness absence that lasts longer than 6-months. No studies meeting the inclusion criteria considered employees referred to the service post 6-months sickness absence. Considering the grey literature, Linaker, Harris, Cooper, Coggon, & Palmer's (2011) review of the sickness absence figures for MSDs within the UK concluded that the UK national figures for MSDs are incomplete and inconsistent, thus it was not possible to calculate an accurate UK reference case for long-term sickness absence due to MSDs. The only cautious conclusion that can be made is that

previous literature has not demonstrated an effect on long-term sickness absence. Thus, in this study, for long-term sickness absence due to MSDs deadweight will equal the impact of the intervention.

4.2.1.2 Sickness absence due to mental health conditions: reference and intervention case results

The inclusion and exclusion criteria for this literature search are:

- Employed individuals who are off work due to mental health conditions.
- The inclusion of a control or comparator group.
- The data on sickness absence days presented as a mean over a year.
- The sickness absence data is less than 20 years old.

Refer to section 3.5.4 for a detailed search strategy.

Figure 15: Flow chart of study selection process

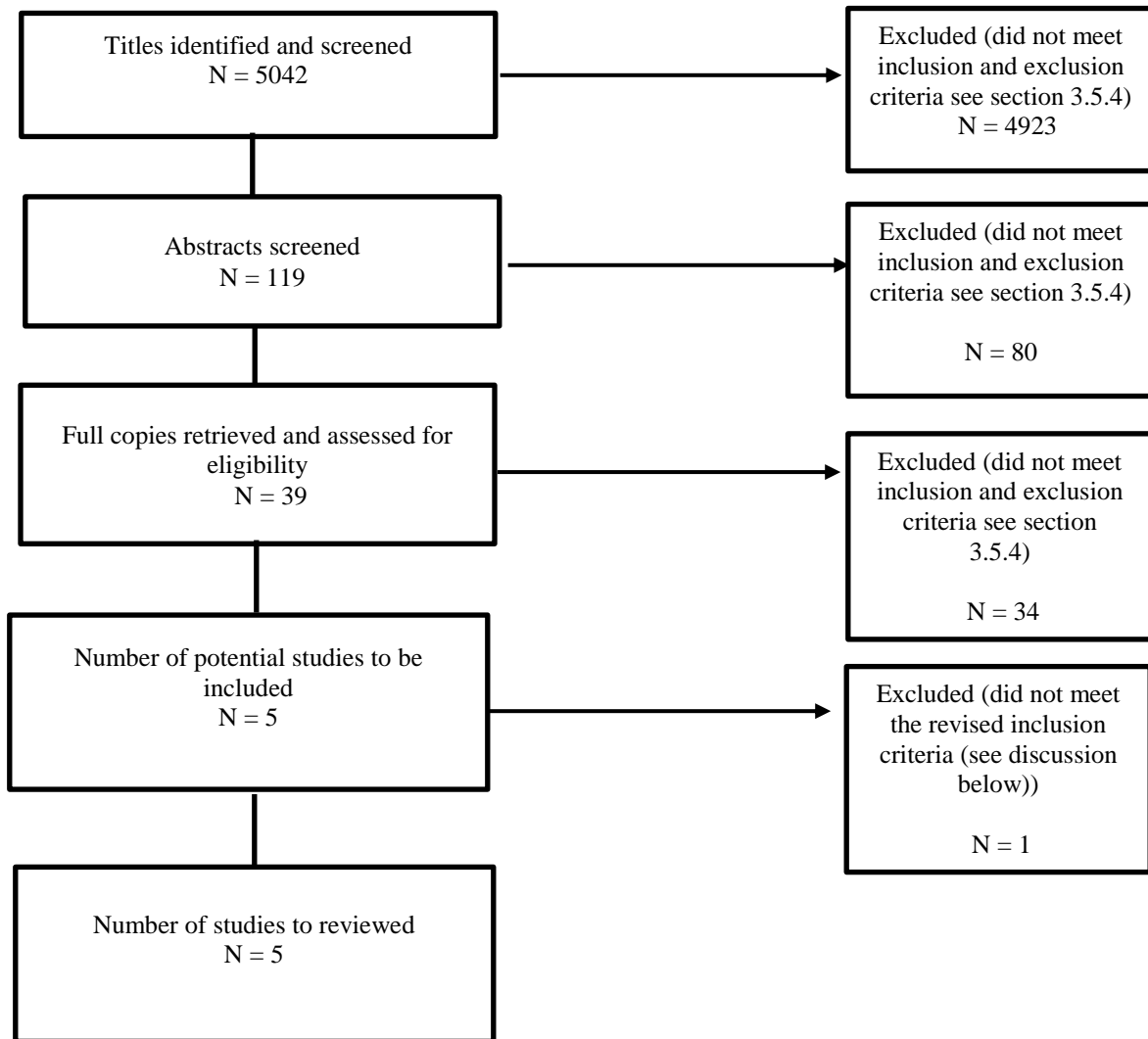


Table 9: Summary of included articles for mental ill-health, with sickness absence findings reported in terms of mean number of days to full return to work.

Authors & Country	Research study	Population (including condition)	Intervention (n = x)	Usual care (n = x)	Total mean no. of sickness absence days (intervention group)	Total mean no. of sickness absence days (control group)	Difference between intervention and control means	Significance	Percentage difference between intervention and control V1 = intervention V2 = control (net additional benefit) ((V2-V1)/V2 *100)
Rebergen et al. (2009) Netherlands	Economic evaluation (from societal and employers perspective) alongside a RCT	Police workers on sick leave due to mental health conditions	N = 125 Trained occupational physicians providing guideline based care	N = 115 Easy access to counselling	Net sick leave over a year Human Capital Approach (HCA) 113 (Standard deviation (SD) = 83 Gross sick leave HCA 151 (SD = 97);	Net sick leave over a year HCA 114 (SD = 87); Gross sick leave HCA 146 (SD = 103)	Net sick leave = - 1 Gross sick leave = 5	No significant differences in days of sick leave	N/a as not included in the deadweight calculations.
Van Oostrom et al. (2010) Netherlands	Economic evaluation from a societal and employer perspective, alongside a RCT	Employees of three large Dutch organisations on sick leave with distress	N = 73 Treatment by an Occupational Physician and a workplace intervention. Workplace intervention consisted of a stepwise communication process to identify and overcome barriers to RTW, liaising	N = 72 Treatment by an Occupational Physician	Mean duration of sick leave until lasting RTW 133 (SD 109) days	Mean duration of sick leave until lasting RTW 134 (SD 108) days	-1	No significant differences between groups (no p value provided in the article)	0.75%

			between RTW co-ordinator, supervisor and employee						
Noordik et al. 2013 Netherlands	Cluster RCT	Employees off work due to common mental disorders	N = 75 Exposure based RTW intervention	N = 85 Care as usual	Medium time to RTW = 209 days The mean number of recurrences of sick leave within a one-year follow-up did not differ between both interventions (P = 0.96). The mean time-to-full RTW was 277 (95% CI 222–332) days.	Medium time to RTW = 153 The mean time-to-full RTW was 191 (95% CI 151–230)	86	Median time to-full RTW differed significantly between the groups (P = 0.02). More likely to RTW with care as usual.	- 45%
Schene et al. (2007) Netherlands	RCT	Adults with major depression, with a work reduction of at least 50% due to their mental health disorder	N = 30 Outpatient psychiatric treatment + Occupational Therapy - diagnostic phase with occupational history and work reintegration plan, and (ii) therapeutic phase with individual sessions and group sessions	N = 32 Outpatient psychiatric treatment	Calculated total work hours worked in 6-months. Medians presented; Month 1-6: 20.45 Month 7-12: 261.75 For patients off work – calculated time to RTW. Mean = 207 days	Calculated total work hours worked in 6-months. Medians presented; Month 1-6: 0 Month 7-12: 0.85 For pts off work – calculated time to RTW. Mean = 299 days	-92	Month 1-6 p = 0.022 Month 7-12 p = 0.042	30.77%
Blonk et al. (2006) Netherlands	RCT	Self-employed individuals insured for work disability	<u>2 groups:</u> N = 35 Combined intervention	N = 34 no treatment	Mean number of days to RTW (full) CI = 177	Mean number of days to RTW (full)	CI = -75 CBT = -2	Significant difference: P<0.1, CI group had	29.76% improvement

		at a private insurance company. Participants were unable to work due to psychological complaints.	(CI) – individual and work focused CBT, conducted by a labour expert N = 36 CBT		CBT group = 256	= 252		significantly lower number of days until RTW than the CBT and control group	
--	--	---	---	--	-----------------	-------	--	---	--

Through reviewing the included articles, it was noted that the reporting of the impact on sickness absence for mental health conditions was not consistent. From the studies reviewed, only one study (Rebergen et al., 2009) met all the inclusion criteria. Four studies (van Oostrom et al., 2010; Hees, de Vries, Koeter, & Schene, 2013; Noordick et al., 2013 and Schene, Koeter, Kikkert, Swinkels, & McCrone, 2007) met all the inclusion criteria, except the criterion that annual mean sickness absence days were reported. In order to address this, the authors van Oostrom, Noordick and Schene were emailed and the raw data or the data presented as a mean over a year was requested. The author Hees was not emailed as no email address could be found. The author Noordick responded to the email and provided raw data, enabling the calculation of the average days to RTW. Van Oostrom et al. (2010) and Schene et al. (2007) presented their sickness absence data as the mean time to full RTW. Thus, in order to form an evidence-based conclusion for the reference and intervention case, the inclusion criteria “the data on sickness absence days presented as a mean over a year” was changed to “the data on sickness absence days presented as the mean time to full RTW”. It is acknowledged that this may introduce limitations to the CBA tool, as it does not account for sustainability of the intervention on sickness absence. However, considering that Noordik et al. (2013) reported that the number of reoccurrences did not differ between the group ($p = 0.96$), and Rebergen et al. (2009) concluded no significant differences in the mean sickness absence over one year between groups, this provides support for the validity of mean time to full RTW as an outcome measure. Considering this adaptation, a total of 4 articles were included to determine the reference and intervention case, namely: van Oostrom et al., 2010; Noordick et al., 2013; Schene et al., 2007; Blonk, Brenninkmeijer, Lagerveld, & Houtman, 2006. All four studies were conducted in the Netherlands, raising questions as to the generalisability of their findings to the United Kingdom.

When considering the results of the studies, two studies concluded that there was no significant decrease in sickness absence due to mental health conditions with the introduction of a workplace intervention, (Van Oostrom et al., 2010; Noordik et al., 2013). Interestingly, Noordik et al. (2013) reported a significant difference ($p = 0.02$) between the control and intervention group, in favour of the control group, with there been a 45% improvement in the control group. The other two included studies (Blonk et al., 2006; Schene et al., 2007) found a significant difference in the mean number of days till RTW in the intervention group compared to the control group. From the results in these studies no firm conclusion on the impact of workplace health interventions on sickness absence due to mental health conditions can be made.

Studies not included to inform the reference and intervention case, due to way in which they presented the data, again demonstrate this inconsistency in results. Kroger et al. (2013) found significant decreases in the days of incapacity in the intervention group, whereas, Rebergen et al. (2009) and Hees et al. (2013), indicated no significant difference between the control and intervention group. Again, these studies are not based in the UK, and have limitations such as small sample numbers. These findings are supported by a Cochrane review (Van Vilsteren et al., 2015) exploring workplace health interventions and sickness absence, with the inclusion of subgroups, one being mental health. Van Vilsteren et al. (2015) concluded that although workplace interventions may reduce the length of the first episode of sickness absence due to mental health conditions, the sustainability of RTW is variable, and there is “no evidence of a considerable effect of workplace interventions on time to RTW in workers with mental health problems (p.2)”. Van Vilsteren et al. (2015) concluded that the quality of evidence on the effectiveness of workplace interventions for workers with mental health disorders is low, and currently do not indicate that workplace interventions have an effect on employees with mental health conditions. Van Vilsteren et al. (2015) advised that further high-quality research is needed into a range of conditions.

This highlighted need for further research into a range of conditions may explain why Van Vilsteren et al.’s (2015) review at first glance appears to contradict Nieuwenhuijsen et al.’s (2014) Cochrane review: ‘Interventions to improve RTW in depressed people’. This review concluded that there is moderate evidence that the addition of a workplace intervention alongside a clinical intervention improved work outcomes, reducing sickness absence in a specific sub category of mental health condition i.e. depression. Thus, indicating that when sub-categorising mental health conditions this may result in different conclusions, further highlighting a need to further differentiate between the different mental health conditions when evaluating the impact of workplace interventions.

Moreover, the results may be inconclusive as a variety of workplace interventions are considered in the various reviews. Considering a specific workplace intervention, Vogel et al.’s (2017) Cochrane review explored the effectiveness of RTW coordination programmes, which are a key component of many VR interventions. The review included three studies that looked at sickness absence due to mental health conditions. Vogel et al. (2017) found no significant difference in work outcomes, either in the short-term, long-term or very long-term. However,

the evidence included was of very low quality, with small sample numbers, and thus further high-quality research may change the current findings.

Wagner et al.'s (2016) synthesis of systematic reviews concluded that there is moderate evidence that workplace health interventions for mental health conditions improve work outcomes, however, the evidence-base is limited and they recommend further research including outcomes seldom included in mental health intervention literature such as sickness absence, presenteeism, costs and productivity.

From this it may be hypothesised that due to the variety of mental health conditions, and possible work place interventions, the current evidence-base does not allow for a conclusive answer to be drawn as to whether workplace interventions, and in effect, VR, decrease sickness absence due to mental health conditions. Thus, highlighting the need for a structured approach in researching/evaluating VR as discussed in section (2.2.1.1).

Considering the reference and intervention case, it is acknowledged that the effectiveness of VR in reducing sickness absence due to mental health conditions is inconclusive, thus the only cautious conclusion that can be made for the purpose of the CBA tool being developed is that the intervention will not have an effect. Thus, deadweight will equal the impact of the intervention.

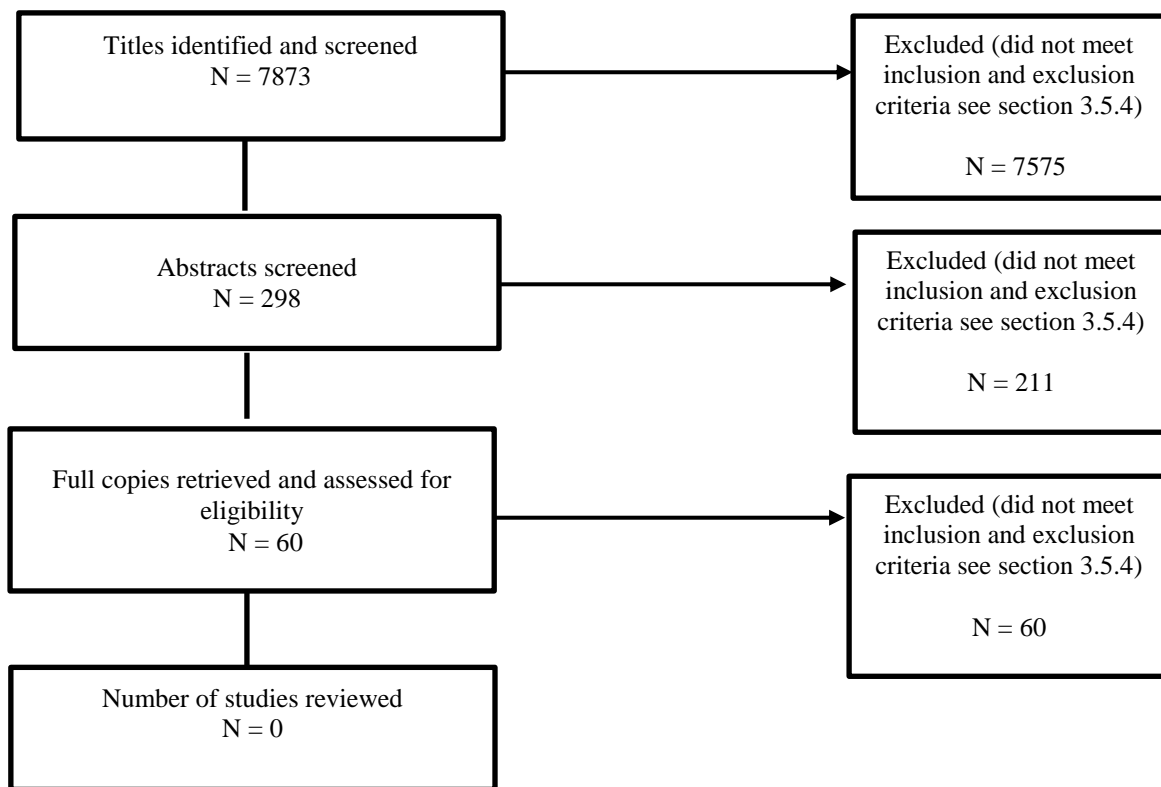
4.2.1.3 Turnover reference and intervention case results

The inclusion and exclusion criteria for this literature search are:

- Employed individuals who are off work due to mental health conditions or MSDs,
- The inclusion of a control or comparator group,
- The data presented as turnover rates
- The turnover data is less than 20 years old.

Refer to section 3.5.4 for a detailed search strategy.

Figure 16: Flow chart of study selection process



On screening the articles, none met the inclusion criteria. When considering the evidence-base for VR impacting on turnover, there is a consensus that workplace interventions aimed at individual's health may lead to a decrease in turnover rates/job loss (Alexander et al., 2017; Black & Frost, 2011; Boorman, 2009; Cancelliere et al., 2011; Knapp et al., 2011). However, the underpinning evidence-base is of a low quality, due to the limited number of studies and small sample sizes, therefore further research is needed to form a robust conclusion (Oakman, Keegel, Kinsman, & Briggs, 2016; Palmer et al., 2012). From reviewing the articles identified in the search, it is found that there is limited evidence on turnover rates following VR and workplace health interventions. This finding is supported by a literature review conducted by Baxter et al. (2015) during the development of the Workplace Health Savings calculator, an adaptation of the NICE (2008) model. Baxter et al. (2015) concluded that in light of the large variability in both estimates and methodological quality of the evidence-base on turnover rates, the Price Waterhouse Coopera (PwC) review was the most appropriate for their needs. Additionally, the Health at Work: Economic Evidence Report 2016 (ERS Research and Consultancy, 2016), used the PwC 2008 review as a basis for their conclusions on the impact of wellness programmes on turnover. It is widely recognised that there is a need for further high-quality studies to be conducted on work directed interventions and the impacts such as

turnover/job retention (Dewa, Loong, Bonato, & Joosen, 2015; van Vilsteren et al., 2015; Nieuwenhuijsen et al., 2014; Schaafsma et al., 2013). ERS Research and Consultancy (2016) state that when considering mental health in the workplace the research suggests that interventions to “improve the management of mental wellbeing in the workplace should enable employers to save at least 30% of lost production and staff turnover” (p. 11). However, no evidence was referenced against this statement, questioning the reliability of the conclusion.

When considering the reference and intervention case, it is seen in papers exploring turnover, that it is implicitly assumed that without the interventions there will be no change to the turnover rate (PwC, 2008). Therefore, for the purposes of this CBA tool, the assumption will be made that any changes in the turnover rates are due to the VR intervention. The deadweight that will be used for turnover is 0%. In other words, all changes to the turnover rate are assumed to be due to the implementation of the VR service. This may introduce bias, as contextual factors are known to influence employee turnover (Horn & Griffith, 1995, cited in Ahuja, Chudoba, Kacmar, McKnight, & George, 2007). A few examples of contextual factors influencing turnover behaviour include, workplace attributes (Oldham & Rotchford, 1983), perceived organisational and supervisor support (Maertz, Griffeth, Campbell, & Allen, 2007), and job satisfaction (Egan, Yang, & Bartlett, 2004), and the wider labour market conditions (CIPD, 2014). Due to an awareness of a potential bias being introduced with a deadweight of 0%, a sensitivity analysis has been conducted on turnover rates following the implementation of the CBA tool (see section 4.6.7).

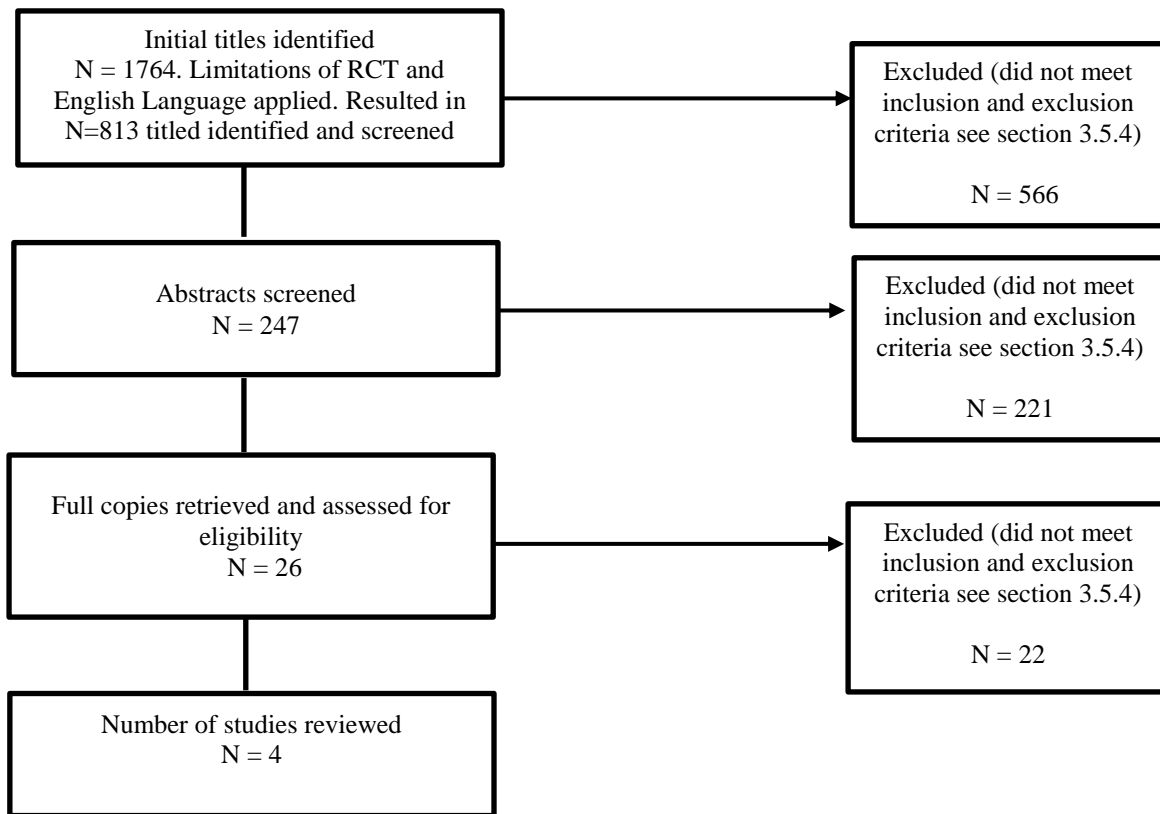
4.2.1.4 Presenteeism reference and intervention case results

The inclusion and exclusion criteria for this literature search are:

- Employed individuals,
- The inclusion of a control or comparator group,
- The data on presenteeism presented as a mean change between pre and post
- The presenteeism data is less than 20 years old.

Refer to section 3.5.4 for a detailed search strategy.

Figure 17: Flow chart of study selection process



Presenteeism is closely linked to sickness absence and ill-health. The evidence-base for presenteeism is recent; however emerging findings indicate that workplace interventions and elements of VR may reduce presenteeism levels and increase productivity (Cancelliere et al., 2011; Knapp et al., 2011) (see section 2.2.2). With a key element of VR being early intervention and accommodating workplaces, allowing for early RTW, it runs the risk of displacing the costs of sickness absence rather than reducing these costs. It is imperative that the costs of presenteeism are accounted for, both within individuals who do not take sickness absence and those that do.

Due to the emerging field of literature on VR, workplace interventions were used as a proxy for VR. On screening the articles, 3 RCT's (IJzelenberg et al., 2007; Nurminen et al., 2002; Von Thiele, Lindfors, & Lundberg, 2008) and a systematic review (Cancelliere et al. 2011), exploring presenteeism in the workplace were identified. However, the data produced in the results was insufficient for the purposes of identifying a reference and intervention case, the presenteeism outcomes were not heterogeneous, limiting comparability; the studies primary

aims were mainly to promote health as opposed to reducing presenteeism; workability, work performance and working role function were interpreted as a measure of presenteeism (Baker & Aas, 2012); and results were presented as a combination of lost time due to absenteeism and presenteeism, limiting the ability to distinguish presenteeism levels in the control and intervention groups. These limitations are partly due to the fact that presenteeism is a relatively new concept (Baker & Aas, 2012) as well as the fact that there is presently no consensus on the best way to measure presenteeism (Krol et al., 2013; Brooks et al., 2010; Terry & Min, 2010).

Bearing the measurement and emerging field limitations in mind, the prevalence of presenteeism, using self-reports as measurement, is well supported, with 30% - 53% of the Swedish workforce and more than 70% of the Danish workforce reporting presenteeism (Jarpsten, 1998; Vingard et al., 2004; Aronsson & Gustafsson, 2005; Hansen & Anderson; all cited in Claes, 2011). Additionally, research in New Zealand and Canada report evidence of the prevalence of presenteeism (Keefe & Small, 2005; Caverly, et al., 2007; all cited in Claes, 2011).

The impacts of presenteeism, have been linked both to decreased productivity within work hours, as well as future sickness absence (Bergstrom et al., 2009; Caverly et al., 2007; Hansen & Andersen, 2009; Hansson et al., 2006; Kivimaki et al., 2005; Schultz, Chen, & Edington, 2009; Schultz & Edington, 2007; all cited in Claus, 2011). These impacts are more pronounced when comorbidities are present (Holden et al., 2011). Bergstrom et al.'s (2009) research, comprising of a sample of 3757 employees from the public sector and 2485 employees from the private sector in Sweden, indicated that if individuals had 5 or more episodes of presenteeism within a year they were more likely subsequently to have sickness absence of more than 30 days. This result stayed consistent even with adjustments for confounding variables, such as previous episodes of absence, reported health status, and work factors. De Graaf et al. (2012) using a face-to-face survey and the WHO Disability Assessment Schedule (n = 6646) in the Netherlands, estimated the number of days lost to sickness absence and sickness presenteeism associated with common mental and physical disorders. De Graaf et al. (2012) concluded that in addition to sickness absence, on average, an individual with a mental health disorder would have an additional 8.0 days of reduced-qualitative functioning, and those with physical disorders an additional 3.5 days of reduced-qualitative functioning. These days of reduced-qualitative functioning, could then be costed on hourly wages, and is a method of quantifying presenteeism that is commonly used, however, Schultz et al. (2009) raises the

question as to whether those individuals are 0% productive during those hours. Additionally, Vingard et al. (2004), cautions the conclusion that presenteeism is necessarily negative for employees and employers, stating that there is insufficient evidence to demonstrate decreased work performance. Additionally, presenteeism may be preferable to the employee and employer, as the structure of the workplace has been shown to assist recovery from certain ill-health conditions (Cocker et al., 2014).

From reviewing the literature related to presenteeism, there is limited evidence to enable robust conclusions to be made on reference and intervention cases. Thus, no conclusion can be drawn, and the only cautious conclusion that can be made is that the intervention will not have an effect. Deadweight will equal the impact of the intervention, i.e. it can be assumed that as the intervention has no effect. This assumption will be utilised and explored within the sensitivity analysis.

Having identified the reference and intervention cases, and subsequently the net effectiveness of the VR interventions for the different outcomes, deadweight can now be calculated.

4.2.1.5 Deadweight calculations based on the net effectiveness of the interventions determined from the literature searches

In order to calculate the deadweight for each outcome (which is necessary to ensure that the benefits of the VR intervention are not over estimated) the following information is needed for each outcome for each organisation:

- Starting point (number of sickness absence days pre)
- Outcome (number of sickness absence days post)
- Net effectiveness (percentage calculated from the literature)

This data can then be inputted into the following formula to calculate the deadweight (see section 3.5.3 for explanation):

$$\text{Counterfactual} = \text{outcome} / (1 - \text{net effect})$$

$$\text{Deadweight \%} = (\text{Starting point} - \text{Counterfactual}) / \text{starting point}$$

4.2.2 Unit costs to be used in the CBA mode

Unit costs are the costs of the benefit/outcome e.g. the cost of sickness absence per employee per day. These are used within the CBA tool to calculate the financial benefits of each outcome.

4.2.2.1 Sickness absence due to MSDs and Mental ill-health: unit costs

The following tables outline the sickness absence costs that will be used in the CBA tool for organisation 1 and 2.

Table 10: Sickness absence costs for organisation 1 (NHS employer, year 2010 – 2011, average salary £71.18 per day, £25,980.70 per annum).

	Average cost per person	Source
Weekly salary	£499.63	Sickness absence costs provided by organisation
Wage cost to employer during first 6-months of sickness absence (within this organisation the length of sick pay is determined by the length of service e.g. 1 year service = 1 month full pay and 2 months half pay, 6 years of service = 6-months full pay and 6-months half pay). This data was not provided, nor the length of episodes of sickness absence. Therefore, it is assumed that sickness absence that was < 6-months was paid in full.	£71.18 per day	Sickness absence data provided by organisation
Wage cost to employer during 6-12 months of sickness absence. For the reasons mentioned above this will be assumed to be half of full pay for the time post 6-months.	£35.59 per day	Sickness absence data provided by organisation
Cost of employers' national insurance contribution for first 6-months of occupational sick pay (OSP) per day	£9.82 per day (13.8% of 6-months full salary)	Gov.UK website (2015)
Cost of employers' national insurance contribution for 6-12 months of OSP per day	£4.91 per day (13.8% of 6-months half salary)	Gov.UK website (2015)

Table 11: Sickness absence costs for organisation 2 (Public organisation employer, year 2014 – 2015; average salary £22,942.75.00 per annum).

	Average cost per person	Source
Weekly salary	£441.21	Provided by the organisation
Cost of OSP to employer during first 6-months of sickness absence	£88.24	Provided by the organisation
Cost of OSP to employer during 6-12 months of sickness absence. For the reasons mentioned above this will be assumed to be half of full pay for the time post 6-months.	£44.12	Provided by the organisation
Cost of employers' national insurance contribution for first 6-months of OSP	£12.18 (13.8%)	Gov.UK website (2015)
Cost of employers' national insurance contribution for 6-12 months of OSP	£6.09 (13.8%)	Gov.UK website (2015)

4.2.2.2 Presenteeism: unit costs

Presenteeism costs will be estimated at £605 per employee attending the VR service (see section 3.5.5.2).

4.2.2.3 Turnover: unit costs

Turnover costs will be estimated at £16,663 per employee (see section 3.5.5.3).

4.2.2.4 Benefits/outcomes of VR service that are not in the CBA tool but could be added if data was available

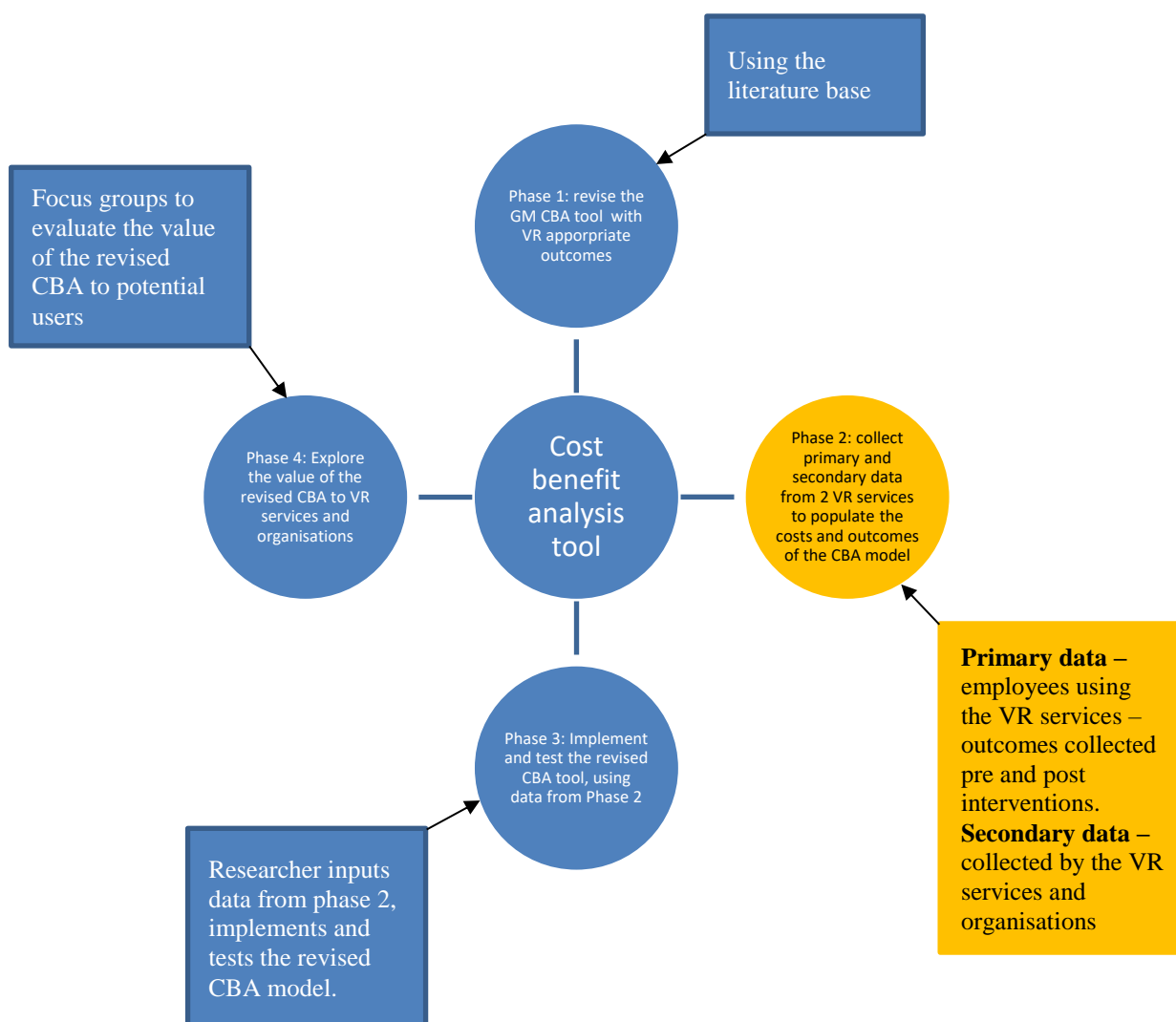
To ensure that a CBA tool is user-friendly it needed to incorporate information that is easily accessible by organisations using the CBA tool. Ideally, to get a complete picture of the economic impact of an intervention one would want to include the indirect costs and benefits such as:

- a. Co-worker overtime
- b. Salary cost of replacement workers
- c. Light duties cost, if these were not in the original role of the employee
- d. Reimbursement for sickness absence to the organisation, via their insurance.
- e. Increased work load and pressure on co-workers
- f. Decreased productivity of co-workers
- g. Time spent facilitating the RTW of the chronically ill employee
- h. Attrition and turnover costs (Rail Safety and Standards Board, 2014; Uegaki, de Bruijne, van Tulder, & van Mechelen, 2007).

However, organisations 1 and 2 were unable to provide this information, thus these costs and benefits are not included in the study. However, organisations need to be aware of these additional indirect costs and benefits when using the CBA tool as a decision-making tool.

4.3 Phase 2 results

Figure 18: Diagrammatic representation of the 4 phases of this research project highlighting phase 2



The objective of phase 2 was to collect the relevant data required to populate the practical CBA tool from two VR Services and the organisations to which VR is provided. This chapter presents the data collected for organisation 1 and 2 as part of the evaluation of their VR services.

4.4 Organisation 1

This section presents the data collected for organisation 1 (see 1.4.1) as part of an evaluation of their VR service. In organisation 1 an in-house VR service for employees with MSDs within an NHS organisation in the North-West England, UK was evaluated.

The aims of organisation 1's evaluation were:

- a) To assess the impact of the VR service on the health of employees with MSDs.
- b) To assess the impact of the VR service on employees with MSDs sickness absence and the associated costs.
- c) To determine the costs and benefits of the VR service.

Primary and secondary data was collected. Primary data was collected from the service users' pre-intervention, post intervention and 3 and 6-months post intervention. The primary data was collected to assess the impact of the VR service on job satisfaction levels, mental health status, and the physical function of employees attending the service i.e. aim a) of organisation 1 evaluation. The secondary data was collated by the organisation, with the aim to evaluate the impact of the VR service on sickness absence levels and costs within the organisation i.e. aim b) of organisation 1 evaluation. Both the secondary and primary data collected was used to populate the revised CBA tool, to determine the costs and benefits of the VR service i.e. aim c) of organisation 1's evaluation.

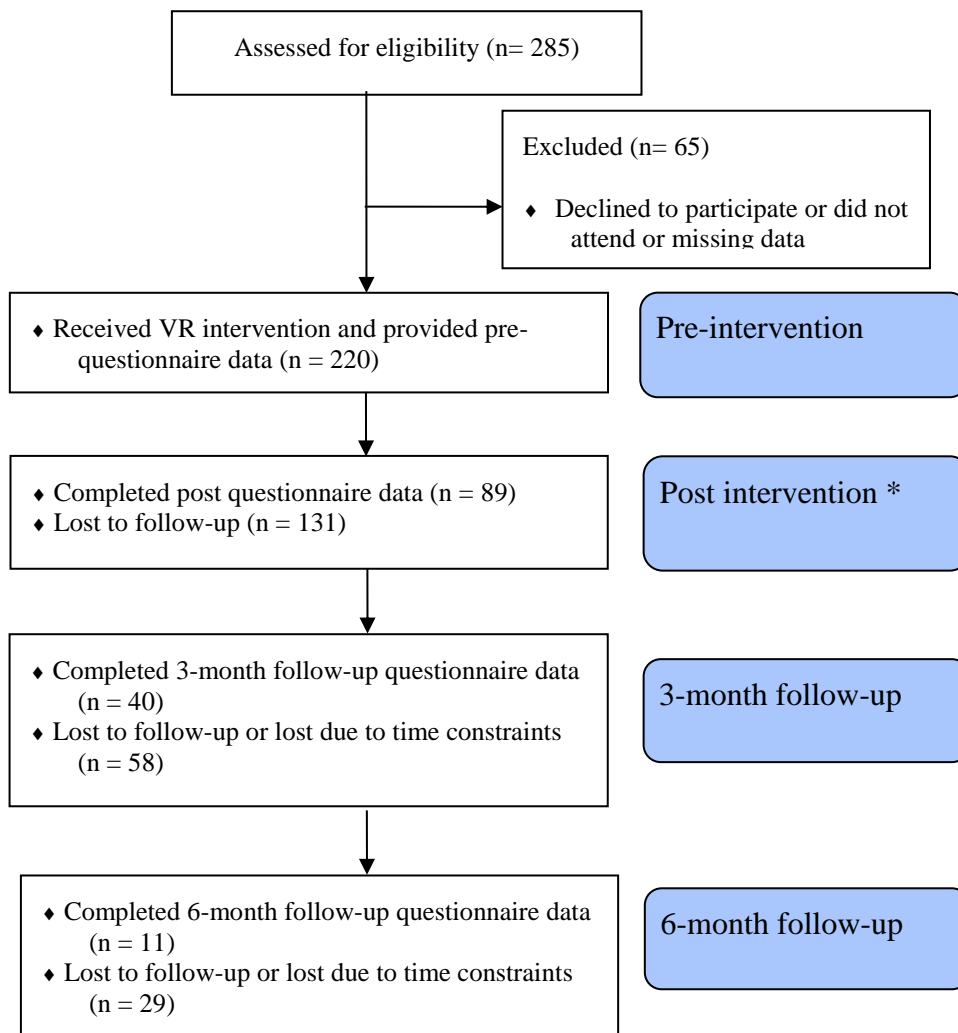
This section will firstly present the results of the primary data, which has not been used to populate the CBA tool. Then the secondary data, which is used within the CBA tool, will also be presented. These results will then be used to populate the CBA model and the results of the populated CBA tool will be presented in chapter 4.6 (Phase 3 results).

4.4.1 Participants: organisation 1

304 employees were referred to the VR service from 1st March 2010 to 31st January 2011. Of these 285 employees attended the service and were assessed for eligibility. No participants were excluded, however 65 employees declined to partake in the research. Pre-questionnaire data was collected for 220 employees. 89 data observations were collected post intervention, with 131 data observations lost to follow-up. As the duration of the intervention varied in length, according to patients needs and the time limitation of the study being restricted to 12 months, the 3-month (n = 40) and 6-month (n = 11) post data observations collected were limited (See Figure 19). In addition, participants had missing data at a number of points, as they did not all complete the full questionnaire pack. Although loss to follow-up/attrition is common, it may introduce bias and limit the statistical power (Kristman, Manno, & Cote, 2004). A common rule of thumb is that less than 5% loss to follow-up results in minimal bias, whilst above 20% brings

the validity of the results into question (Dettori, 2011; Dumville, Torgerson, & Hewitt, 2006). However, this threshold is not universally accepted, as rates of loss to follow-up vary widely (Guyatt et al, 2011) and differ between different study types, for example in cohort studies it is acceptable to have a loss of 60%-80% (Kristman et al., 2004). As a general rule of thumb, the higher the proportion of loss to follow-up the greater the risk of bias (Guyatt et al., 2011). This risk increases when the loss of follow-up can be associated with the likelihood of the outcome of events for example, the patient may fail to return to their physiotherapy appointment because of a deterioration in their medical condition (Akl et al, 2012). To assist in determining the risk of attrition bias, it is recommended that the baseline characteristics of the groups are compared and should the characteristics substantially change this indicates a higher level of risk (Dumville et al., 2006). This evaluation had a large pre-post loss to follow-up (68%), and the nature of the intervention may mean that the loss to follow-up is associated with the outcome of events, therefore indicating a high likelihood of bias. This will be explored further through the comparison of the baseline characteristics.

Figure 19: Patient Cohort organisation 1



*The duration of the intervention was not standardised, it varied according to patient needs.

4.4.2 Primary data and results: organisation 1:

Socio-demographic data of the participants (n=219) was collected pre-intervention, 1 participant did not complete the demographic data. As there was a large loss to follow-up, the baseline characteristics of the participants lost to follow-up from pre- to post-VR intervention were compared (see Table 12). This provides a clearer picture of the sub-sample lost to follow-up and may provide an indication of attrition bias (Dumville et al., 2006).

Table 12: Baseline socio-demographic data of all participants in organisation 1, those lost to follow-up and those remaining in the trial at post- and 3-months post-VR intervention measurement

		All participants No of patients (percentage) (n = 219)	Participants lost to follow-up at post- VR intervention (n = 130)	Remaining participants at post-VR intervention (n = 89)	Remaining participants at 3-months post- VR intervention (n = 35)
Gender	Male	37 (16.9%)	24 (18.5%)	12 (13.5%)	4 (11.4%)
	Female	181 (82.6%)	105 (80.8%)	77 (86.5%)	31 (88.6%)
	No response	1 (0.5%)	1 (0.8%)		
Age	16-25 years	10 (4.6%)	6 (4.6%)	4 (4.5%)	2 (5.7%)
	26-35 years	47 (21.4%)	32 (24.6%)	15 (16.9%)	5 (14.3%)
	36-45 years	59 (26.8%)	32 (24.6%)	36 (29.2%)	10 (28.6%)
	46-55 years	73 (33.2%)	39 (30%)	34 (38.2%)	15 (42.9%)
	56-65 years	27 (12.3%)	18 (13.8%)	9 (10.1%)	3 (8.6%)
	No response	4 (1.8%)	3 (2.3%)	1 (1.1%)	
Patients employment status:	At work	201 (91.8%)	118 (90.8%)	83 (93.3%)	33 (94.3%)
	Off sick	15 (6.8%)	9 (6.9%)	6 (6.7%)	2 (5.7%)
	No response	3 (1.4%)	3 (2.3%)		
Work hours:	Full-time	176 (80.4%)	98 (75.4%)	78 (87.6%)	31 (88.6%)
	Part-time	42 (19.2%)	23.8 (31%)	11 (12.4%)	4 (11.4%)
	No response	1 (0.8%)	1 (0.8%)		
Staff group	Administrative	75 (34.2%)	41 (31.5%)	35 (39.3%)	15 (42.9%)
	Allied Health	63 (28.8)	39 (30%)	23 (25.8%)	9 (25.7%)
	Professional				
	Nursing	51 (23.3%)	30 (23.1%)	21 (23.6%)	7 (20%)
	Estates	5 (2.3%)	5 (3.8%)	0 (0%)	0 (0%)
	Senior	14 (6.4%)	8 (6.2%)	6 (6.7%)	2 (5.7%)
	Management				
	Medical	2 (0.9%)	1 (0.8%)	1 (1.1%)	0 (0%)
Other	4 (1.8%)	3 (2.3%)	1 (1.1%)	1 (2.9%)	
No response	5 (2.3%)	3 (2.3%)	2 (2.2%)	1 (2.9%)	
NHS Staff Grade	1	1 (0.5%)	1 (0.8%)	0 (0%)	0 (0%)
	2	13 (5.9%)	8 (6.2%)	5 (5.6%)	2 (5.7%)
	3	22 (10%)	11 (8.5%)	11 (12.4%)	6 (17.1%)
	4	20 (9.1%)	13 (10%)	8 (9%)	4 (11.4%)
	5	27 (12.3%)	17 (13.1%)	10 (11.2%)	3 (8.6%)
	6	27 (12.3%)	17 (13.1%)	10 (11.2%)	3 (8.6%)
	7	33 (15.1%)	15 (11.5%)	18 (20.2%)	9 (25.7%)
	8	24 (11%)	13 (10%)	11 (12.4%)	3 (8.6%)
	No response	52 (23.7%)	35 (26.9%)	16 (18%)	5 (14.3%)
Ethnic group	White	208 (95%)	123 (94.6%)	85 (95.5%)	34 (97.1%)
	Black	1 (0.5%)	0 (0%)	1 (1.1%)	1 (2.9%)
	Asian	4 (1.8%)	2 (1.5%)	2 (2.2%)	
	Mixed	1 (0.5%)	1 (0.8%)	0 (0%)	
	Other	1 (0.5%)	0 (0%)	1 (1.1%)	
	No response	4 (1.8%)	4 (3.1%)		

As is seen in Table 12, the baseline characteristics of the three groups i.e. lost to follow-up, remaining participants at post- and 3-months post-VR intervention are largely similar. The only characteristic with a difference of more than 10% was the work hours, the participant group post and post-3 months had a larger percentage of full time workers (87.6% and 88.6% respectively) compared to the lost to follow-up group (75.4%). Although there is a similarity

in the baseline characteristics noted between these three groups, when looking at the 3-months post-VR intervention data observations there is a further loss to follow-up of 86%. This is a very high loss to follow-up and introduces a high risk of bias and decreased validity of the results. Therefore, the primary data results must be interpreted with this risk in mind.

4.4.2.1 Primary outcome data analysis: organisation 1

The pre-intervention, post intervention and 3-month post intervention data observations were analysed. To detect whether there was a difference between the same group, at the three different time points, and to compare the results of the same group at two different time points Friedman and Wilcoxon tests were used (Rumsey, 2011). In addition, with regards to the GHQ-12, it can be analysed used a binary score, where participants scoring greater than 4 are purported to be subjects showing minor psychological distress (Goldberg, 1972) (see Section 3.5.2.2.2). For individuals who are physically ill, it is recommended that a higher threshold cut-off score of 4 is needed for optimal discrimination (GL Assessment, 2011). The 6-month ‘post intervention’ data set (n = 11) was excluded from the analysis, as it was too small. A number of participants did not complete all the questionnaires within the questionnaire pack, resulting in different data observation numbers for the different questionnaires.

4.4.2.2 Primary outcome data results: organisation 1

Table 13: Initial Outcome Descriptive Statistics pre-VR intervention

Scores pre-VR intervention	N	Mean
GHQ-12 pre (Likert scale)	209	1.0750
Job Satisfaction Scale (JSS) pre	211	5.0559
Patient Specific Function Scale (PSFS) pre	187	5.3681

The benchmark scores for NHS General Mental Health (Likert scoring method) are: mean = 1.01; standard deviation (s.d.) = 0.46; n = 20549 (Stride et al., 2007). Thus, for GHQ-12 pre-intervention, the employees in organisation 1 displayed a marginally higher GHQ-12 score, with a mean of 1.08.

The benchmark scores for NHS hospital staff in respect of job satisfaction are: mean = 4.51; s.d. = 0.86; n = 20694 (Stride et al., 2007). Thus, pre-intervention the employees in organisation 1 displayed higher levels of job satisfaction than the norm (mean = 5.06).

On searching the literature no published norms on the PSFS were found.

Table 14, provides a summary of the JSS scores for 34 participants, pre-VR intervention, at discharge and at 3-months. Out of the 211 participants providing pre-VR JSS scores (see Table 12) only 34 participants provided JSS scores at both discharge and 3-months post discharge.

Table 14: Job Satisfaction Scale (Warr et al., 1979) pre-VR intervention, at discharge and at 3-months post discharge

Scores pre- VR intervention, discharge and 3-months post intervention	N	Mean
JSS Pre	34	5.1074
JSS at discharge	34	5.3100
JSS 3 months post discharge	34	5.2621

Using Friedman test the results (Table 14) indicate that there is no significant difference in the JSS scores across three points in time, pre, at discharge and 3-months post discharge, $\chi^2(2, n = 34) = 0.582, p < 0.005$. However, there is a significant increase in the JSS score between pre-intervention and discharge in the predicted direction (Wilcoxon, $n = 88, z = -2.302$, two-tailed $p = 0.021$). There is no significant difference in the JSS score between discharge and 3-months post discharge (Wilcoxon, $n = 34, z = -0.832$, two-tailed $p = 0.405$).

Tables 15, 16 and 17 present the results for the GHQ-12 scores. At pre-intervention 62 participants scored greater than 4 on the GHQ-12 and were identified as ‘cases’ i.e. showing minor psychological distress (Goldberg, 1972). Table 15 presents the pre-GHQ-12 scores on a binary scale. This allows the exploration of the percentage of participants scoring the varied results.

Table 15: GHQ-12 Pre-VR intervention – Binary Scale

Score pre-VR intervention (Binary scale)	Frequency (number of individuals scoring the corresponding score on the GHQ-12)	Cumulative percent
0	54	25.8
1	45	47.4
2	30	61.7
3	18	70.3
4	17	78.5
5	8	82.3
6	10	87.1
7	5	89.5
8	10	94.3
9	4	96.2
10	4	98.1
11	2	99.0
12	2	100
Total :	209	

Table 15 illustrates that 29.7% (n = 62) of participants showed signs of minor psychological distress (i.e. a GHQ-12 score of 4 or above) pre-VR intervention.

Table 16 reports the pre and post GHQ-12 scores of the participants identified as ‘cases’. At pre-intervention 62 ‘cases’ were identified. At post-intervention 19 ‘cases’ were identified. The 62 participants who scored 4 or above on the GHQ-12 at pre-intervention all completed post-intervention questionnaires and were explored further as a subgroup within the 89 participants who completed the post-questionnaires. This sub-groups (62 participants identified as ‘cases’ pre-intervention) mean pre- and post GHQ-12 scores are presented in Table 16.

Table 16: GHQ-12 pre-VR and at discharge mean scores for the ‘Cases’ identified pre-VR intervention

Scores pre-VR intervention and at discharge for participants identified as ‘cases’	N	Mean GHQ-12 score
GHQ-12 pre	62	6.5323
GHQ-12 at discharge	62	2.6316

There is a significant reduction in the mean scores of the 62 participants identified as ‘cases’ between pre and discharge (Wilcoxon, n = 19, z = -3.380, two-tailed $p = 0.001$).

Table 17 below, provides a summary of the GHQ-12 scores for 35 participants, pre-VR intervention, at discharge and at 3-months. Out of the 209 participants providing pre-VR GHQ-

12 scores (see Table 13) only 35 participants provided GHQ-12 scores at both discharge and 3-months post discharge.

Table 17: GHQ-12 (Likert Scale) (Goldberg, 1972) pre-VR intervention, at discharge and at 3-months post discharge

Scores pre-VR intervention, discharge and 3-months post intervention (Likert scale)	N	Mean
GHQ-12 pre	35	1.0400
GHQ-12 at discharge	35	0.7814
GHQ-12 3 months post discharge	35	0.8189

Using a Friedman test, the results indicated that there was a significant reduction in the GHQ-12 scores (indicating better mental health) across two points in time, pre- (Md = 2.53) and discharge (Md = 1.69), although at 3-months post discharge the GHQ-12 score had increased slightly (Md = 1.79), $\chi^2(2, n = 35) = 16.894, p < 0.005$. There was a significant reduction in the GHQ-12 score between pre- and discharge (Wilcoxon, $n = 88, z = -3.280$, two-tailed $p = 0.001$). There was no significant difference in the GHQ-12 score between discharge and 3-month post discharge (Wilcoxon, $n = 35, z = -0.884$, two-tailed $p = 0.377$).

Table 18, provides a summary of the PSFS scores for 27 participants, pre-VR intervention, at discharge and at 3-months. Out of the 187 participants providing pre-VR PSFS scores (see Table 13) only 27 participants provided PSFS scores at both discharge and 3-months post discharge.

Table 18: Patient Specific Function Scale (Stratford et al., 1995) pre-VR intervention, at discharge and at 3-months post discharge

Scores pre- VR intervention, discharge and 3-months post intervention	N	Mean
PSFS Pre	27	5.5644
PSFS at discharge	27	8.1770
PSFS 3 months post discharge	27	8.3148

Using Friedman test the results indicated that there was a significant increase in the PSFS scores (indicating improved function) across three points in time, pre- (Md = 1.09), at discharge (Md = 2.33) and 3-months post discharge (Md = 2.57), $\chi^2(2, n = 27) = 38.800, p < 0.005$. There was

a significant increase in the PSFS score between pre and discharge (Wilcoxon, $n = 78$, $z = -7.090$, two-tailed $p = 0.000$). There was no significant difference in the PSFS score between discharge and 3-months post discharge (Wilcoxon, $n = 27$, $z = -0.961$, two-tailed $p = 0.337$).

In summary:

These results indicate that participants who attended the VR service showed a reduction in sickness absence; an improvement of mental health, job satisfaction and identified functional limitations. These results were sustained over three months. However, due to the large loss to follow-up these results have a high risk of bias, which may impact on their validity. While these findings inform the VR service evaluation, they are not used within the CBA tool

4.4.3 Secondary data results: organisation 1:

4.4.3.1 Sickness absence results: organisation 1

The secondary data in respect of sickness absence was provided by organisation 1. This data is used to populate the CBA tool in phase 3. 12-month pre and post sickness absence data on 127 staff members who had attended the VR service and agreed to participate in the research study was provided (see Table 19). In addition, the salary costs of each employee's sickness absence were provided. During the research study the PCT was integrated into a wider hospital trust, this resulted in a number of redundancies. Due to this integration, a number of employees who had consented to taking part in the study were longer working for the PCT. Thus, sickness absence data with 12-months pre and post was only available for 127 employees from the original cohort of 220. As the data was randomly missing, i.e. it is likely that the missing data is not due to participants' referral to the VR service, this decreases bias (Kristman et al., 2004; Soley-Bori, 2003). When missing data is missing at random it is acceptable to ignore this in your estimations (Soley-Bori, 2003). Thus, this data is assumed to be representative of the wider population.

Table 19: Total cost of sickness absence 12 months pre and post VR intervention

Individual sickness absence for participants (n= 127)	Total sickness absence cost	MSD sickness absence cost
12 months pre	£139,344.80	£40,223.13 (28.87% of total sickness absence cost pre)
12 months post	£113,897.55	£6,453.88 (5.67% of total sickness absence cost post)
Difference in cost pre and post	£25,447.25	£33,769.25

A paired-samples t-test was conducted to evaluate the impact of the VR service on the number of sickness absence days taken by staff during this time period. The mean number of sickness absence days, 12 months pre-intervention (mean = 17.0546, s.d. = 29.95369) and 12 months post intervention (mean = 10.9578, s.d. = 26.05643) did not differ significantly ($t = 1.841$, $df = 126$, one-tailed $p = 0.68$). However, the mean number of MSD sickness absence days, 12 months pre-intervention (mean = 6.3890, s.d. = 24.29677) and 12 months post intervention (mean = 0.6016, s.d. = 2.69008) differed significantly in the predicted direction ($t = 2.654$, $df = 126$, one-tailed $p = 0.009$).

Table 20 outlines the number of sickness absence days, the mean and the standard deviation, 12 months pre and post discharge from the intervention, for both sickness absence due to all conditions and MSDs.

Table 20: 12-month pre and post VR intervention sickness absence data

Individual sickness absence (n=127)	No. of days	Mean	Standard deviation
Sickness absence in days (all conditions)			
12 months pre	2166	17.0546	29.95369
12 months post discharge	1391.64	10.9578	26.05643
Sickness absence in days (MSDs)			
12 months pre	811.4	6.3890	24.29677
12 months post discharge	76.4	0.6016	2.69008

Table 20, shows a decrease in general sickness absence 12 months post attending the VR service, although not statistically significant. In organisation 1 the mean number of sickness absence days, 12 months pre-VR intervention (mean = 17.0546, s.d. = 29.95369) and 12 months post-VR intervention (mean = 10.9578, s.d. = 26.05643) did not differ significantly ($t = 1.841$, $df = 126$, one-tailed $p = 0.68$). However, the mean number of MSD absence days, 12 months pre- VR intervention (mean = 6.3890, s.d. = 24.29677) and 12 months post-VR intervention

(mean = 0.6016, s.d. = 2.69008) differed significantly in the predicted direction ($t = 2.654$, $df = 126$, one-tailed $p = 0.009$).

Table 21 depicts the sickness absence data pre and post-VR intervention for employees with sickness absence < and > 6-months.

Table 21: Sickness absence data pre- and post-VR intervention for employees with sickness absence < and > 6-months

Individual sickness absence 12 months pre-referral to the VR service (n=127)	No of employees	No. of days	Mean
Sickness absence < 6-months Pre	125	615.4	4.92
Sickness absence < 6-months Post discharge	125	76.4	0.61
Sickness absence > 6-months Pre	1	196	196
Sickness absence > 6-months Post discharge	1	0	0

Using the sickness absence data and costs provided, it was possible to work out an average cost of sickness absence per day, as follows:

Total cost of sickness absence 12 months pre and post = £ 253,242.35

Total number of sickness absence days 12 months pre and post = 3557.64

= £71.18 per day

4.4.3.2 Turnover: organisation 1

Organisation 1 had major organisational restructuring during the times of data collection, with high levels of staff redundancies and turnovers, rendering the inclusion of organisation 1 turnover rates inappropriate.

4.4.3.3 Costs: organisation 1

Table 22: Costs of the VR service provided by the NHS Primary Care Trust.

Type of cost	Spend(total) £
Marketing and Advertising of Project	1,000.00
Dedicated time to lead and undertake the project	66,940.00
Clinical involvement, as appropriate	333.00
Supply of technical skills	10,000.00
Travel	485.00
*Workplace assessments	-7,800.00
Total	70,958.00

*Prior to the implementation of the VR service, workplace assessments were purchased from an external company. The money spent on workplace assessments for the year prior to VR service was £7,800. This figure was provided by finance procurement, following an audit trail. With the advent of an in-house VR service, the workplace assessments were incorporated into the service, replacing the external companies.

The total cost of the VR service for employees attending the service with MSDs conditions (n = 285) was £70,958.00.

In summary:

The costs of the VR service are £70,958.00. The sickness absence figures provided indicate that sickness absence due to MSDs decreased significantly 12 months post attending the VR service, with an associated reduction in costs. The costs and sickness absence data in this section will be used within the CBA tool (see section 4.6).

4.5 Organisation 2

This section presents the data collected for organisation 2 (see section 1.4.2) as part of an evaluation of their VR service. In organisation 2 (a UK public organisation) an in-house VR service for employees with physical or mental ill-health was evaluated.

The aims of organisation 2's evaluation were:

- a) To assess the impact of the VR service on the sickness absence levels, presenteeism levels and quality of life of employees attending the service, and the associated costs.
- b) To determine the costs and benefits of the VR service.

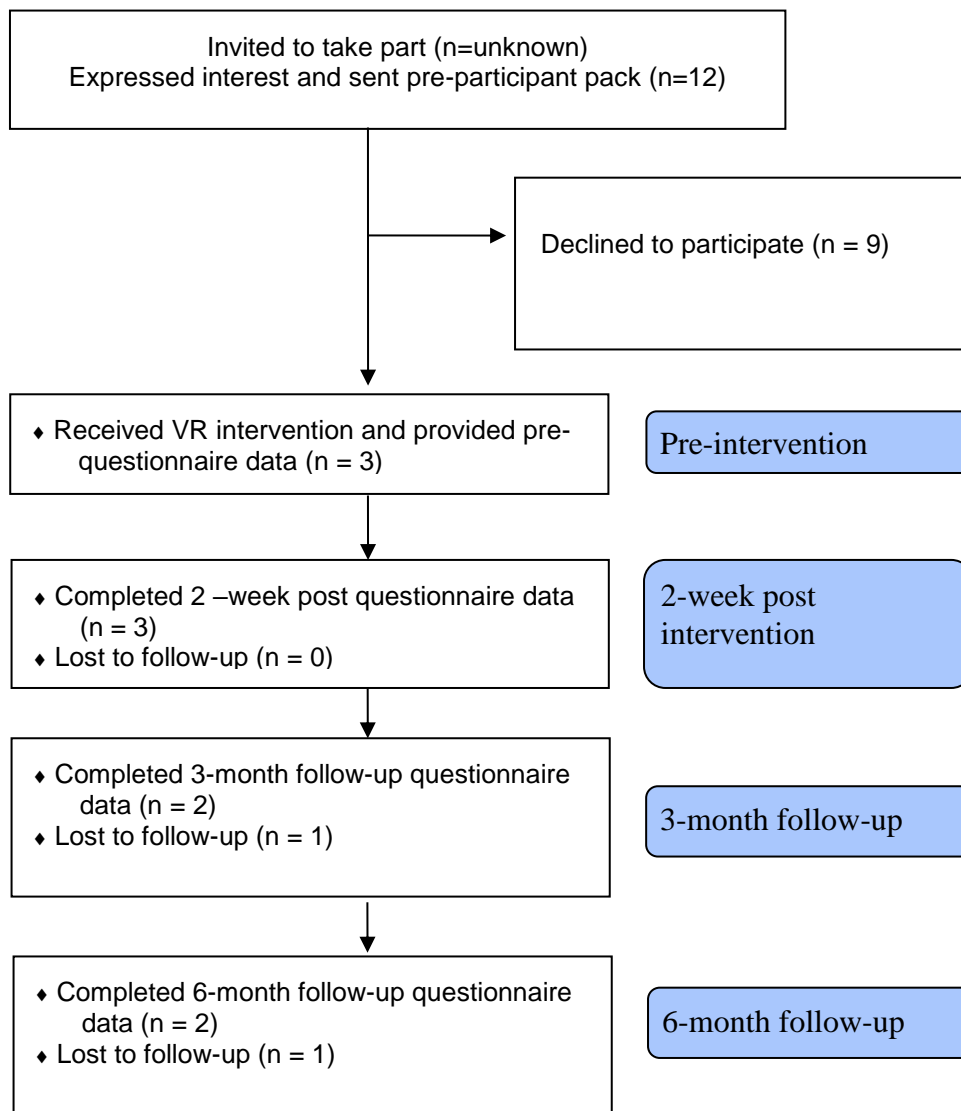
Primary and secondary data was collected. Primary data was collected from the service users' pre-intervention, 2-weeks post intervention and 3 and 6-months post intervention. The primary data was collected to assess the impact of the VR service on self-reported sickness absence levels, presenteeism levels and quality of life of employees attending the service i.e. aim a) of organisation 2 evaluation. The secondary data was collated by the organisation to evaluate the impact of the VR service on sickness absence and turnover levels within the organisation i.e. aim a) of organisation 2's evaluation. The secondary data collected was used to populate the revised CBA tool, to determine the costs and benefits of the VR service i.e. aim b) of organisation 2's evaluation.

This section will firstly present the results of analysis of the primary data. Analysis of the secondary data to be used within the CBA tool will then be examined. These results will then be used to populate the CBA tool and the results of the populated CBA tool will be presented in chapter 4.6 (Phase 3 results).

4.5.1 Participants: organisation 2

To preserve client confidentiality, participants were recruited through the VR service. Although requested, no data was provided on the number of individuals invited to take part in the intervention. 12 participants consented to having information sent to them. No participants were excluded, however 9 employees declined to partake in the research. As a result, pre-questionnaire data and 2-week post intervention data was collected for 3 participants only. 1 participant was lost to follow-up; thus 3-month and 6-month follow-up data was collected for 2 participants only (See Figure 20). Due to the small sample no statistical analysis of the data was conducted.

Figure 20: Patient Cohort organisation 2



4.5.2 Primary data and results: organisation 2

4.5.2.1 Primary outcome measure results: organisation 2

There are differences in the outcome measurements used and the data collection timings between the two organisations. The reasons for this are threefold; firstly, the organisations expressed an interest in specific outcome measures. Organisation 1 expressed an interest in job satisfaction and mental health. Moreover, as the VR intervention was focused on MSDs, the PSFS was utilised to explore the effectiveness of the intervention on this further. Organisation 2 expressed an interest on the effect of the VR service on quality of life. Secondly, learnings from the research conducted in organisation 1 were introduced into the evaluation of

organisation 2. Errors noted in the sickness absence data collected during organisation 1's evaluation were addressed by including a self-report of sickness absence outcome measure. Varied discharge dates of participants noted in organisation 1's results, resulted in changing the timings of data collection for organisation 2 from pre, at discharge, 3-months and 6-months (as collected in organisation 1) to pre, 2-weeks post, 3 and 6-months post. Thirdly the development of the CBA tool informed the outcome measures used in organisation 2. As the CBA tool is to be used by VR services, they may not have access to organisations sickness absence data, so an alternative means of collecting this information is needed i.e. self-report. Moreover, as the research on the CBA tool developed a need to measure presenteeism was identified and included in the outcome measures in organisation 2.

The following outcome measures were used in organisation 2:

- Sickness absence using the Work Limitations Questionnaire Work Absence Module (WLQ-4) (Lerner et al., 2001), a self-report of sickness absence.
- Presenteeism/productivity questionnaire using the Work Limitations Questionnaire (WLQ) (Lerner et al., 2001). The questions used in the questionnaire explore the limitations employees are experiencing at work due to their health problems, as well as looking at the productivity loss as a result, allowing for presenteeism to be quantified as a monetary value (Lerner et al., 2003).
- Quality of life, using the EQ-5D-5L (EuroQol Group, 2009). The EQ-5D-5L 'is a standardised measure of health status developed by the EuroQol Group in order to provide a simple, generic measure of health for clinical and economic appraisal' (Oemar & Janssen, 2013, p. 4).

Due to the low number of participants, no statistical analysis was conducted and no summary statistics are presented. The three individuals who did take part in the service reported an improvement in quality of life, pain, presenteeism and levels of sickness absence. However, no conclusions can be drawn from this finding. The quality of life outcome measure was collected to inform the VR service evaluation, whereas presenteeism and self-reported sickness absence were intended to be used within the new CBA tool.

4.5.3 Secondary data results: organisation 2

Secondary data was supplied by the VR provider and the organisation the VR service was situated within. The data was anonymised and aggregated by the organisation. This data has been used in phase 3 to populate the CBA tool. The sickness absence data was for all individuals who attended the VR service (n = 138).

The secondary data comprised of:

- VR service costs
- Sickness absence costs of participants attending the VR service.
- Turnover rates

4.5.3.1 VR service costs: organisation 2

The VR service had a budget of £88,000. As part of the evaluation, a breakdown of costs was calculated (see Table 23). These costs are approximations based on information provided by the organisation both verbally and within documentation. The information provided covered different time periods, thus are used as approximates of annual costs. Moreover, the service provides internal and external contracts, with no data provided on proportioning costs e.g. department overheads, VR platform, car allowance. Thus, the costs are not exact but rather provide an overview of the costs of the VR service. For the purposes of the CBA tool, as no underspending was reported, it is assumed that the full budget was spent and that the budget represents the total cost.

The VR service provided different levels of interventions according to the case needs namely; telephone, intermediate, basic, and complex. In order to calculate the costs of the different levels of interventions (see Table 23 below) an average salary was used. Internal VR case managers have a salary of between £23,000 - £26,000, and associate salaries are approximately £30,000. Therefore, calculations have been worked on the average salary between £23,000 - £30,000 i.e. £26,500. As the VR service provides internal and external services, a cost per case based on the average salary of a VR case manager was calculated. The breakdown for the costs per case was calculated as follows:

- Admin: 20 mins = £4.53
- Travel: 3 hours = £40.77
- Assessment: 1.5 hours = £20.39

- Report writing: 3 hours = £40.77
- Case management 1 hour per week.
 - Basic = 8 weeks case management = £108.72
 - Intermediate = 12 weeks = £163.08
 - Complex = 16 - 26 weeks (average 21 weeks) = £285.39

Total costs per level of intervention:

- Telephone triage = £65.67
- Basic = £215.18
- Intermediate = £269.54
- Complex (taking an average between 16 and 26 weeks case management) = £391.85

Table 23: VR service costs

Type of cost	Cost	Approximate Total Spend per annum
Triage cases	£65.67 (28 telephone triages between 06/01/2014 – 24/11/2014) Therefore: approx. 30.5 per annum	£2002.94
Basic referral cases	£215.18 (51 basic cases between 06/01/2014 – 24/11/2014) Therefore: approx. 56 per annum	£12,050.08
Intermediate referral cases	£269.54 (29 intermediate cases between 06/01/2014 – 24/11/2014) Therefore: approx. 32 per annum	£8625.28
Complex referral cases	£391.85 (30 complex cases between 06/01/2014 – 24/11/2014) Therefore: approx. 33 per annum	£12,931.05
Department overheads	Not provided (internal service not cross charged against entire department)	No data
VR Platform	£2100 per month (Cost covered by internal service although used for external contracts)	£25,200.00
Car allowance	£3300 per year – not all VC's	Further information needed on number of VC's provided with this allowance
Mileage	25-40p per mile	No data
Mobile phones	No data	No data
Account management fee	1 day per week (used average VRC salary to calculate)	£5300.00
EAP (Employee Assistance Programme)	£4189.65 per 6-months (£7.95 per employee per year (PEPY) 1054 employees.)	£8379.30
OH Provider	£300 per referral (approx. 3 a year)	£900.00
GP reports	£125 per report (approx. 4 every 6- months)	£1000.00
POHQ (Post Offer Health Questionnaires)	£45 (approx. 58 every 6-months)	£5220.00
Ad hoc MI information and reports requests	£75 per hour (approx. 4 every 6- months)	£600
Total cost	Not including missing information	£82,208.65
Budget provided / Assumed total cost		£88,000.00

As seen from the above calculations, the fixed budget for the VR service covers the costs provided, however not all costs have been included e.g. department overheads, mileage, and

mobile phone costs. These costs were requested however the organisation did not provide them. Moreover, these calculations do not include the cost of the employees' time for attending the service should they be in work. Therefore, the actual cost of the service may be greater than the fixed budget provided. However, for the purposes of this model the budget will be assumed to be representative of the total cost of the VR service.

Between 06/01/2014 – 24/11/2014 138 employees were referred to VR service, indicating approximately 152 referrals per annum. No data on the number of referrals per sickness absence case was provided. For the purposes of this model, it is assumed that the data provided is representative of the entire cohort. The data to be used in the CBA tool is limited to the individuals whose sickness absence data was provided by the organisation with at least three months pre and post VR referral (n= 68). Moreover, as this model is limited to mental ill-health and musculoskeletal disorders, only employees attending the VR service for a mental health condition (n=34) or musculoskeletal (n=9) condition are included. This limitation in the data is not necessarily random, as the incomplete data was provided by the organisation. Thus, this loss of cases may introduce bias and decrease the validity of the estimations. The annual budget cost of £88,000 can be assumed to be for 152 referrals, thus within the CBA tool a percentage of this cost will be used to represent a cost of the VR for 43 employees. Therefore for 43 employees the service costs £24,894.74. Thus, for the purposes of implementing the CBA considering MSD and mental health conditions only, the total cost that will be used is £24,894.74. When considering different scenario's, the CBA tool will be implemented approximating and differentiating the costs for the different causes of sickness absence, consequently, the cost for MSDS (n= 9) equals £5,210.53 and the cost for mental health disorders (n=34) equals £19,684.21.

4.5.3.2 Sickness absence costs: organisation 2

The organisation provided an overview of sickness absence data for all employees during the time period March 2013 – March 2015 (see Table 24). In addition, they provided sickness absence data for the individuals attending the VR service during the time period 1st September 2014 – 29th March 2015 (n = 81).

Table 24: Sickness absence data for all employees from March 2013 – March 2015

		Number of episodes	duration of days	days per episode
Mental health sickness absence	Long-term	58	1927	33.22
	Short-term	315	2324	7.38
MSDs sickness absence	Long-term	18	789	43.83
	Short-term	199	953	4.79
*OTHER sickness absence	Long-term	69	1928	27.94
	Short-term	1916	5487	2.86

*Other – reasons given = cancer; cold, flu and infections; surgery; ear, eye, nose, mouth and dental; cardiovascular (e.g. stroke); chest and respiratory; stomach, liver, kidney and digestion; genito-urinary or gynaecological; road traffic accident; neurological

Looking at the sickness absence figures in Table 24, it is seen that over a two-year period 45% of sickness absence days due to mental health conditions is from 58 episodes (15% of the total number of episodes). No figures were provided on the number of individuals with the various categories of sickness absence data provided. This is a similar figure when looking at the number of sickness absence days due to MSDs over a two-year period, with 45% of the sickness absence days accounted for in 18 episodes (8% of the total number of episodes). When considering ‘Other’ causes of sickness absence 26% of the sickness absence days are due to long-term sickness over two years (n = 69 episodes - 3% of the total number of episodes).

The data provided by the different sectors of the organisation did not align in respect of dates. Thus, for the purposes of using this secondary data in the CBA tool, it was necessary to make assumptions on the average referral number per annum and set date limitations to ensure sufficient pre and post VR referral sickness absence data was available for employees referred to the service in 1 year.

Between 06/01/2014 – 24/11/2014 138 employees were referred to the VR service. From this it can be assumed that there are approximately 152 referrals per annum. No data on the number of referrals per sickness absence cause was provided. For the purposes of the CBA tool the sickness absence data used will be assumed to be representative of the wider cohort.

From 1/09/2014 – 29/04/2015 there were 101 referrals to the VR service. The organisation provided sickness absence data for 81 of these referred employees. To ensure sufficient data was included the date limits set were 30/05/2014 – 28/07/2015. This allowed for 65 employees' sickness absence data to be included in the CBA tool. For employees' data to be included, 3 months of sickness absence data for MSDs or mental health conditions was needed pre and post VR referral between the dates 30/05/2014 – 28/07/2015. The employees included were all referred to the service within a 1-year time period. This data is presented in Table 25. The cost of sickness absence is calculated using the average salary i.e. average employee salary at 17/07/2015 = £22,942.75, therefore £88.24 daily rate.

Table 25: 3-months pre and post referral sickness absence data of employees attending the VR service n = 65

	Total No of sickness absence days 3-months pre-referral	Total No of sickness absence days 3-months post-referral	Difference in sickness absence days pre and post	Cost of sickness absence pre – referral	Cost of sickness absence 3 months post –referral	Difference in sickness absence cost between pre and post referral
MSD (n= 9)	261 (mean = 28.77)	87 (mean = 9.66)	174	£23,030.64	£7,676.88	£15,353.76
Mental health conditions (n = 34)	406 (mean = 11.94, truncated mean (with 25% trim)*** = 10.84)	521 (mean = 15.32, truncated mean (with 25% trim) = 12.08)	-115 Difference in mean = 3.38 Difference in truncated mean -1.24	£35,825.44	£45,973.04	–£10,147.60
*Other (n= 40)	297	226	71	£26,207.28	£19,942.24	£6,265.04
No reason (n= 7)	10	59	-49	£882.40	£5206.16	–£4,323.76
**All (n = 65)	974	893	81	£85,945.76	£78,798.32	£7,147.44

*Other – reasons given = cancer; cold, flu and infections; surgery; ear, eye, nose, mouth and dental; cardiovascular (e.g. stroke); chest and respiratory; stomach, liver, kidney and digestion; genito-urinary or gynaecological; road traffic accident; neurological.

** N = 65, as some employees had sickness absence for more than one reason.

*** truncated mean with trim = a statistical measure of central tendency i.e. calculating the mean after discarding an equal percentage of the sample at the high and low end (this is explored when data is not normally distributed).

Table 25 indicates that costs in respect of sickness absence, sickness absence due to mental health conditions and ‘no reasons’ were greater following the VR referral than before. Whereas the costs of sickness absence due to MSDs and other health conditions was less post VR referral than before. However, due to the loss of data these results are at risk of bias, which may impact on their validity.

4.5.3.3 Turnover rates: organisation 2

The organisation provided turnover rates for the time period 1st March 2013 to 28th February 2015 (see Table 26). During this time period the organisation was undergoing a restructure, thus not all employees who left were replaced, therefore the percentage provided is a combination of attrition and turnover.

Table 26: Turnover rates

Date from	Date to	Employees at start of year	Leavers over the time period	Turnover/Attrition
01/03/2013	28/02/2014	1115	182	16%
01/03/2014	28/02/2015	1107	249	22%

Looking at the data from 2013 – 2014, only 8 employees were not replaced, indicating that 16% is a turnover rate as opposed to an attrition rate (i.e. number of individuals leaving the organisation and not being replaced). For the purposes of the CBA tool, a turnover rate of 16% will be used.

The turnover rate is not linked to the introduction of VR intervention. The evidence-base on the impact of VR on turnover is limited, as discussed in section 2.2.2.4. There is some evidence that early interventions decrease the length of sickness absence and associated risks of long-term incapacity (Waddell et al., 2008; Coleman et al., 2013; Hammond, 2008), however, it is accepted that further research is needed to enable robust conclusions (Van Vilsteren et al., 2015).

As the data from the organisations render an estimate of the effect of the VR services on turnover impossible to calculate, an estimate from the literature was obtained. This is to be used

in the absence of a pre and post turnover rate. The literature used to estimate the effectiveness of VR on organisational turnover, differs from the literature used to identify the reference case, intervention case and deadweight. The articles identified below do not meet the inclusion and exclusion criteria needed for the identification of the intervention and reference case. However, for the purposes of implementing the CBA tool, an estimate of the impact of VR on turnover, can be inferred through considering the results from the available evidence reviews and studies:

- PwC (2008)
- ERS Research and Consultancy (2016)
- Palmer et al. (2012)
- Van Den Hout, Vlaeyen, Heuts, Zijlema, & Wijnen (2003)

Looking at these in turn, the PwC (2008) report “Building the Case for Wellness” reported a positive reduction in turnover in companies introducing wellness interventions. PwC (2008) addressed the lack of a clear definition for wellness interventions by proposing a conceptual model, which includes the three main types of wellness interventions, namely; health and safety, management of ill health, prevention and promotion. Examining 55 case studies, PwC (2008) reported that 18 of these firms had a reduction in turnover ranging from 10% to 25% with an average around 20-25%. However, these case studies do not include control or comparison groups, and are at risk of bias as there was reliance on self-report (PwC, 2008, cited in Levy et al., 2014). Moreover, the PwC review is focused on musculoskeletal health, limiting the applicability to services addressing mental health conditions. Additionally, the review focuses on workplace health promotion, which differs from VR both in the type of interventions applied, the target population and the realisation of benefits. Workplace health promotion benefits are typically realised within 2-5 years (Baxter et al., 2015), whereas the impact of VR interventions are shorter term. Similarly, the Health at Work economic evidence review (ERS Research and Consultancy, 2016) cited a case study of a health advisor intervention that reduced turnover by 10%. They concluded that investments in the management of mental health of employees may reduce turnover by 30%, although the supporting evidence was not clearly linked to this statement. Palmer et al.’s (2012) review on the effectiveness of community and workplace interventions to reduce sickness absence and job loss for employees with MSDs identified 5 studies (from the 42 included studies) that included job loss as an outcome. On reviewing these studies, Palmer et al. (2012) concluded that there is a small beneficial effect with regards to preventing job loss. Of these 5 studies, none of the interventions were conducted within the workplace and they were all conducted in Scandinavian and European countries, questioning

their generalisability to the UK context and VR interventions. Van den Hout et al.'s (2003) randomised control trial examined whether problem-solving therapy assisted with preventing work disability in patient with lower back pain, they found that the intervention group (n = 44) had 22% less job loss compared to the control group (n = 39). Gard et al. (1999, cited in Palmer et al. 2012) did not provide results on turnover or job loss, Jensen et al. (1998) & Torstensen et al. (1998, cited in Palmer et al., 2012) and Lindh et al. (1997, cited in Palmer et al., 2012) did not include interventions that related to VR.

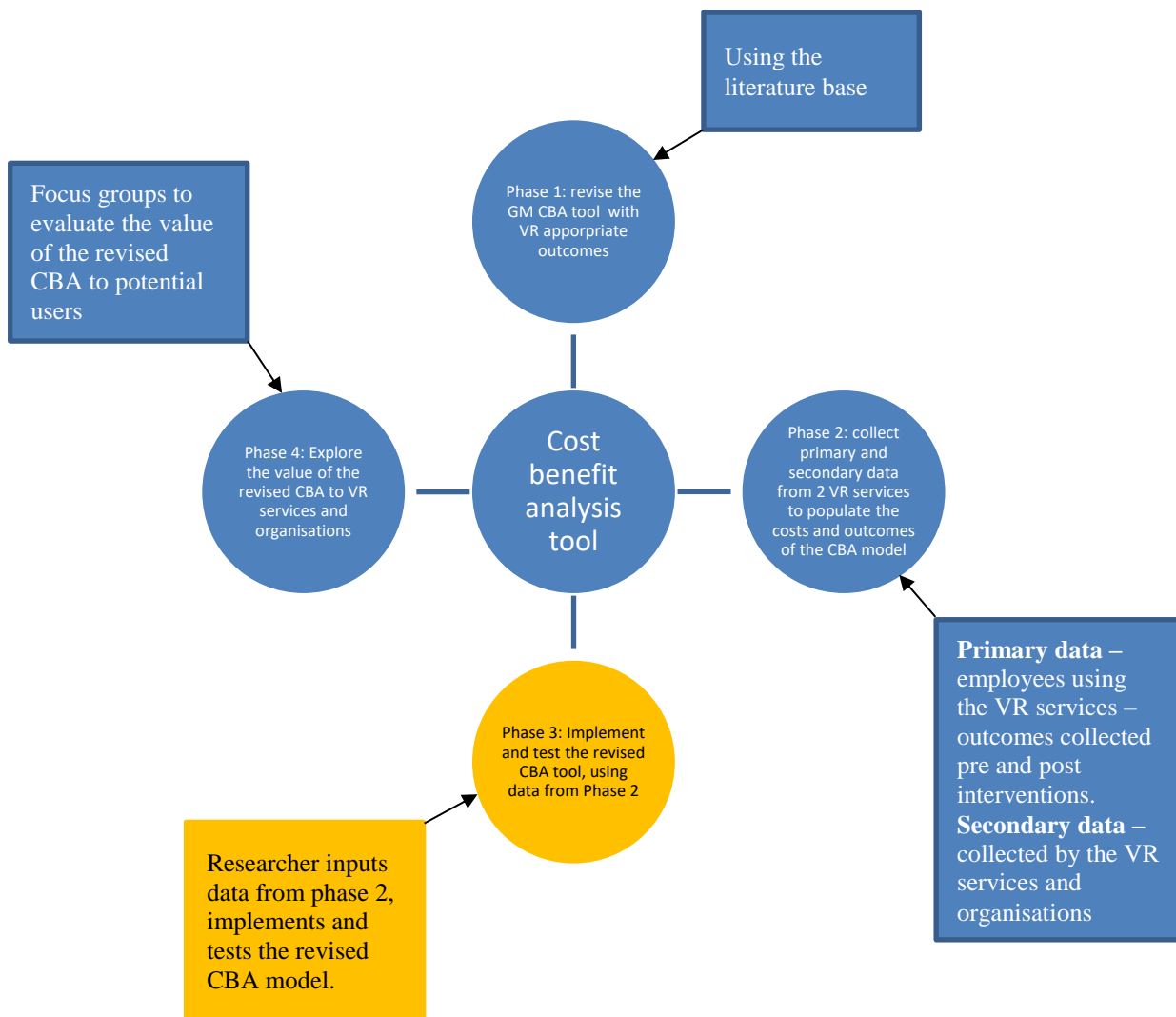
As is seen there is limited evidence on the impact of VR on turnover. Moreover, the generalisability of this research to the UK VR context is limited. However, for the purposes of using and implementing the CBA tool, a conservative estimate based on the studies discussed above will be used as an estimate of the impact of VR on turnover rates for organisation 1 and 2 i.e. a reduction of 20% in turnover will be assumed to be as a result of the VR intervention. This is in line with Baxter et al.'s (2015) estimate of turnover reduction due to workplace health interventions of 10-25%. This estimate will be explored further within the sensitivity and scenario analysis.

In summary:

The approximate costs of the VR service fall within the budget set of £88,000. The sickness absence figures provided indicate that over a two-year period a small number of episodes (MSDs = 18 episodes; mental health conditions = 58 episodes; other = 69 episodes) of long-term sickness absence result in a large proportion of sickness absence days for the different categories of conditions (MSDs = 45%; mental health conditions = 45%; other = 26%). The data provided was limited, restricting the amount of data that could be included in the evaluation (n=65), and possibly introducing bias. Looking at the costs of sickness absence 3 months' pre and post referral, the results indicated that overall the cost of sickness absence was less in the three months post referral. However, mental health conditions had greater sickness absence costs post referral as opposed to pre-referral. A turnover rate of 16% was calculated and will be used in the CBA tool.

4.6 Results Phase 3 results

Figure 21: Diagrammatic representation of the 4 phases of this research project highlighting phase 3



Phase 3's objective was to implement and test the revised practical CBA tool incorporating the developed outcomes to identify the cost-benefits of the VR interventions/services in a real-world setting. In order to implement the CBA tool, the secondary data collected in phases 1 and 2 need to be synthesised. This section pulls together the data that has been collected in phase 1 and 2, and describes where/how the data will be utilised within the CBA tool. It then presents the results from implementing the CBA tool and the sensitivity analysis and scenario analysis for each organisation in turn.

4.6.1 Organisation 1 – synthesis of data to be used in the CBA tool from phase 1 and 2 for the revised outcomes.

4.6.1.1 Organisation 1: costs

The total cost of VR service for employees attending the service with MSDs conditions (n = 285) was £70,958.00. The CBA tool was generated, with the assumption that 100% of the costs would be realised within 1 year. Following the GM New Economy guidelines (HM Treasury et al., 2014) optimism bias was calculated at +25%, because the data source was provided by the service, and was 4-5 years old. The optimism bias that aligns with the lowest confidence grade in any of the criteria is the optimism bias correction used (see Table 27). Thus, when accounting for optimism bias, the total cost to be used within the CBA tool = £88,698.00. See Figure 23 for a screen shot of the costs within the CBA tool.

Table 27: Confidence grade definitions and rationale for selected optimism bias corrections for organisation 1 cost (HM Treasury et al., 2014).





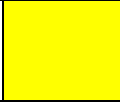

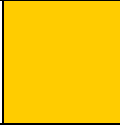



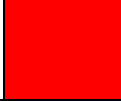

Confidence grade	Colour coding	Data source	Age of data	Known Data error		Optimism bias correction
1		Independently audited cost data	Current Data (<1 year old)	+2%		0%
2		Formal service delivery contract costs	1-2 years old	+5%		+5%
3		Practitioner monitored costs	2-3 years old	+10%		+10%
4		Costs developed from ready reckoners	3-4 years old	+15%		+15%
5			4-5 years old	+20%		+25%
6		Uncorroborated expert judgement	>5 years old	+25%		+40%

Figure 22: Screenshot of CBA tool Costs tab for organisation 1

Costs

Ref	Cost category	Predicted costs (£)	Predicted costs notes/ assumptions	Offset costs/ efficiencies (£)	Offset costs/ efficiencies notes/ assumptions	Who pays?	Capital/ Revenue/ In-kind	Optimism bias correction	Total costs	% Costs Yr1
C1	Project set up	£ -				Organisation	Revenue	25%	£ -	100%
C2	Project delivery	£ 66,940				Organisation	Revenue	25%	£ 83,675	100%
C3	Evaluation	£ 10,000				Organisation	Revenue	25%	£ 12,500	100%
C4	Marketing & Advertising	£ 1,000				Organisation	Revenue	25%	£ 1,250	100%
C5	Clinical involvement	£ 333				Organisation	Revenue	25%	£ 416	100%
C6	Travel	£ 485				Organisation	Revenue	25%	£ 606	100%
C7	Workplace assessment			£ 7,800		Organisation	Revenue	25%	-£ 9,750	100%
C8									£ -	
TOTAL		£ 78,758		£ 7,800					£ 88,698	

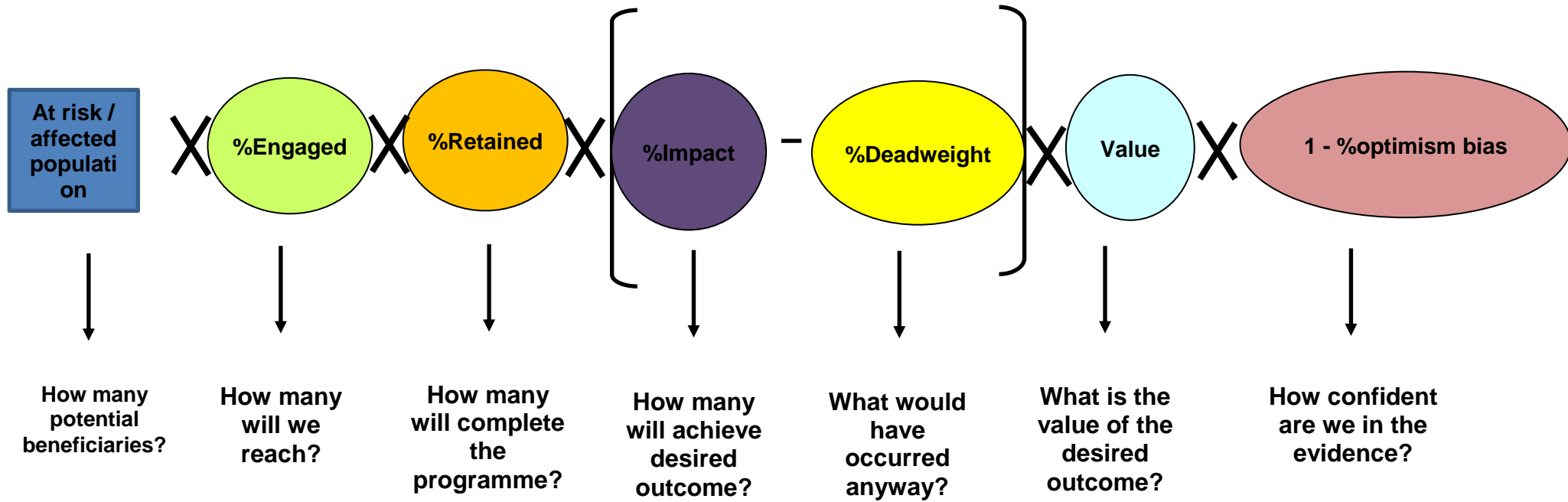
4.6.1.2 Organisation 1: benefits

As discussed when describing the CBA tool (see section 3.4 and Figure 24), the following data is needed to implement the CBA tool:

The data needed to apply the CBA tool for a specific outcome is:

- **The target population:** How many people could potentially access the intervention?
- **The engaged population:** How many people will have accessed the intervention?
- **The impact:** How many people will achieve the desired outcome?
- **The level of retention:** the percentage of individuals who continue to be engaged until the intervention is complete.
- **The deadweight:** What would have happened if the intervention had not been in place?
- **Value:** What is the value of the desired outcome?
- **Predicted impact and lag:** What is the predicted sustainability of the interventions impact?

Figure 23: Implementing the CBA tool (Adjusted from HM Treasury et al., 2014).



4.6.1.2.1 Benefit 1: MSD sickness absence < 6-months

Following the research study, there was an organisational restructure that resulted in limited access to employees' sickness absence data, thus sickness absence data was only provided for a limited number of employees ($n = 127$). For the purposes of the CBA, it is assumed that this cohort is representative of the wider population attending the VR service, and a percentage impact for the entire cohort will be used within the CBA tool.

Using the data gathered for organisation 1, the following figures and assumptions were used to populate the CBA tool for sickness absence < 6-months:

- **The target population:** $n = 304$, employees who were referred to the VR service in one year.
- **The affected population/predicted incidents:** $n = 1465.77$, the predicted total number of full time equivalent (FTE) working days for sickness absence for employees with < 6-months sickness absence due to MSDs. From the sickness absence data provided, the mean number of days of sickness absence < 6-months due to MSDs = 4.92, for 98% of employees referred to the VR service (125 employees out of 127 had sickness absence < 6 month). $98\% \text{ of } 304 = 297.92$. Thus, the predicted total number is $4.92 * 297.92 = 1465.77$.
- **The level of engagement:** = 94%, sickness absence data was provided for 127 employees who attended VR, 125 staff members (99%) attending the VR service had sickness absence due to MSDs for < 6-months. From the 304 employees referred to VR, 285 attended, thus engagement = 94%.
- **The level of retention:** = 92.5%. No data was collected during the study on the retention rate. The UK national average did not attend (DNA) rate for physiotherapy musculoskeletal outpatients is 7.5% (Health and Social Care Information Centre, 2012). Although organisation 1 was not an outpatients' physiotherapy service, the service was similar in nature and the MSDs that patients attending the service with are similar to the MSDs

patients would attend a physiotherapy outpatients department with. Thus, the physiotherapy outpatients' service is used as a proxy for the VR service.

- **Impact:** = 88%. Post intervention there was an 87.59% reduction in the number of FTE work days sickness absence, calculated as follows:

$(615.4 \text{ (total number of days sickness absence < 6-months pre-attending VR service)} - 76.4 \text{ (total number of sickness absence < 6-months post attending VR service)}) / 615.4 * 100$

- **% Deadweight:** = 81.74% (see section 3.5.3 for an explanation of the calculation)

Starting point = 615.4

Outcome = 76.4

Net effect = 32.25%

Counterfactual = $76.4 / (1 - 0.32)$

= $76.4 / 0.68$

= 112.35

Deadweight% = $615.4 - 112.35 / 615.4 * 100$

= 81.74%

- **Value:** = £81.00

The mean cost of sickness absence per day (n = £71.18) was calculated using the human capital approach:

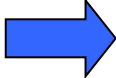
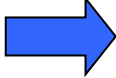
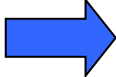
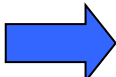
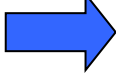
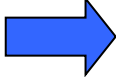
Time lost units (FTE work days) * price weight per time unit (mean of study population).

Within this organisation the level of sick pay is determined by the length of service e.g. 1-year service = 1 months full pay and 2 months half pay, 6 years of service = 6-months full pay and 6-months half pay. This data was not provided, nor was the length of episodes of sickness absence. Therefore, it was assumed that sickness absence of < 6-months was paid in full. Additional costs included were the employers' national insurance payments,

calculated at 13.8% of the wage (Gov.UK, 2015), thus, 13.8% of £71.18 = £9.82. Thus, total value per day of sickness absence = £81.00

- **Predicted impact:** It was assumed that 100% of the benefits will be realised within a year.
- **% Optimism bias:** = - 25%. An optimism bias of -25% was applied using the correction tables in the CBA tool, this correction is due to the fact that the data is 4-5 years old, and there is known data error within the sickness absence data collected. This optimism bias applies for all benefits (see Table 28).

Table 28: Confidence grade definitions and rationale for selected optimism bias corrections for organisation 1 benefits. (HM Treasury et al., 2014).

Confidence grade	Colour coding	Population/ Cohort Data	Evidence-base (engagement/ impact)	Age of data/ analysis	Known data error		Optimism bias correction
1		Figures taken from agency data systems	Randomised Control Trial in UK	Current Data (<1 year old)	+2%		0%
2		Figures derived from local stats	International Randomised Control Trial	1-2 years old	+5%		-5%
3		Figures based on national analysis in similar areas	Independent monitoring of outcomes with a robust evaluation plan	2-3 years old	+10%		-10%
4		Figures based on generic national analysis	Practitioner monitoring of outcomes with a robust evaluation plan	3-4 years old	+15%		-15%
5		Figures based on international analysis	Secondary evidence from a similar type of intervention	4-5 years old	+20%		-25%
6		Uncorroborated expert judgement	Uncorroborated expert judgement	>5 years old	+25%		-40%

4.6.1.2.2 Benefit 2: MSD sickness absence > 6-months

Using the data gathered for organisation 1, the following figures and assumptions were used to populate the CBA tool for sickness absence > 6-months:

- **The target population:** n = 304, employees who were referred to the VR service.
- **The affected population/predicted incidents:** n = 595.84, the predicted total number of FTE working days for sickness absence for employees with more than 6-months sickness absence due to MSDs. From the sickness absence data provided, the mean number of days of sickness absence more than 6-months due to MSDs = 196, for 1% of employees referred to the VR service (1 employee out of 127 had sickness absence more than 6 month). 1% of 304 = 3.04. Thus, the predicted total number is $196 * 3.04 = 595.84$.
- **The level of engagement:** = 94%, sickness absence data was provided for 127 employees who attended VR, 125 staff members (99%) had sickness absence due to MSDs for < 6-months. From the 304 employees referred to VR, 285 attended, thus engagement = 94%.
- **The level of retention:** = 92.5%. See section 4.6.1.1.1 for explanation.
- **Impact:** = 100%. Post intervention there was a 100% reduction in the number of FTE work days sickness absence, calculated as follows:
(196 (total number of days sickness absence < 6-months pre-attending VR service) - 0 (total number of sickness absence < 6-months post attending VR service)/196) * 100
- **% Deadweight:** = 100% (see section 4.2.1.1)
- **Value:** = £40.50
Using the human capital approach discussed above, the mean cost of sickness absence per day (n = £35.59) was calculated. Additional costs included were the employers' national

insurance payments, which are calculated at 13.8% of the wage (Gov.UK, 2015), thus, 13.8% of £71.18 = £4.91. Thus, total value per day of sickness absence = £40.50

- **Predicted impact:** It was assumed that 100% of the benefits will be realised within a year.
- **% Optimism bias:** = - 25%. An optimism bias of -25% was applied using the correction tables in the CBA tool, this correction is due to the fact that the data is 4-5 years old, and there is known data error within the sickness absence data collected (see Table 28).

See Figure 25 and 26 for screen shot of benefit 1 and benefit 2.

Figure 24: Section of the CBA tool demonstrating the inputted figures for outcome: sickness absence < 6-months

Benefits															
Ref.	Outcomes	Included outcome ?	Benefits	Who does benefit accrue to?	Target population	Pop notes/ assumptions	Affected population / Predicted incidents	Affected pop notes/ assumptions	Level of engagement with the affected population (%)	% engagement notes / assumptions	Retention rate (%)	% retention notes / assumptions	Annual turnover	% impact (effectiveness of changing skills / attitudes / behaviours)	% impact notes / assumptions / sources
B19	MSD Sickness absence (s.a.) less than 6 months	Yes	Reduced sickness absence	Company / organisation purchasing the VR intervention	304		1465.77		94%		93%		n/a	88%	
B20	MSD Sickness absence (s.a.) greater than 6 months	Yes	Reduced sickness absence	Company / organisation purchasing the VR intervention	304		595.84		94%		93%		n/a	100%	
B21	Mental health sickness absence (s.a.) less than 6 months	No	Reduced sickness absence	Company / organisation purchasing the VR intervention									n/a		
B22	Mental health sickness absence (s.a.) greater than 6 months	No	Reduced sickness absence	Company / organisation purchasing the VR intervention									n/a		
B23	Turnover	No	Reduced turnover in employees accessing the VR service	Company / organisation purchasing the VR intervention										0%	A VR service will reduce the overall yearly turnover by 20%
B24	Presenteeism	No	Reduced presenteeism in employees accessing the VR service	Company / organisation purchasing the VR intervention									n/a		
TOTAL															

Figure 25: Continued Section of the CBA tool demonstrating the inputted figures for outcome: sickness absence < 6-months

Starting point = no. of sickness absence days prior to the intervention	Outcome = total no. of sickness absence days post the intervention	Net effect: % improvement gained by using VR. This is determined from the literature	Counterfactual: assumed outcome without the intervention	% deadweight	% deadweight notes / assumptions	Unit fiscal benefit (£)	Public Value				Monetisation evidence financial year	GDP deflator compared to price base year	Unit cost notes /assumptions	Optimism bias correction
							Unit public value (fiscal) benefit (£)	Unit public value (economic) benefit (£)	Unit public value (social) benefit (£)	Unit public value (total) benefit (£)				
615.4	76.4	32.25%	112.7675277	82%	See phase 2 in thesis for calculation and assumptions	£ 81	£ 81			£ 81	2014-15	100.000		-25%
196	0	0%	0	100%	See phase 2 in thesis for calculation and assumptions	£ 41	£ 41			£ 41	2014-15	100.000		-25%
		0%	0		See phase 2 in thesis for calculation and assumptions		£ -			£ -	2014-15	100.000		-15%
		0%	0		See phase 2 in thesis for calculation and assumptions		£ -			£ -	2014-15	100.000		-15%
N/a	N/a	N/a	N/a	0%	See phase 2 in thesis for calculation and assumptions	£ 16,663	£ 16,663			£ 16,663	2014-15	100.000	See turnover costs section within thesis	-15%
		0%	0		See phase 2 in thesis for calculation and assumptions	£ 605	£ 605			£ 605	2014-15	100.000	See presenteeism costs section within thesis	-15%

4.6.2 Organisation 1 CBA results

Various scenarios and perspectives of the data available were analysed within the CBA to provide BCRs by exploring the impact of organisation 1's VR service on sickness absence due to MSDs, taking into account sickness absence for < and > 6-month outcomes.

The BCR = benefits/costs. A ratio less than 1 indicates the costs are higher than the benefits.

As seen in Table 29 and Figure 27, the BCR = 0.05. An economic BCR = 0.05, indicates that the economic costs of organisation 1 VR service are greater than the economic benefits. For every £100 the organisation spends on the VR service, it gets £5 back, therefore is losing £95 for every £100 spent.

Table 29: Outcomes and benefits incorporated into the GM New Economy Manchester CBA tool

Outcomes	Benefits	Who does the benefit accrue to	Costs	Benefits	Net present value	BCR
Sickness absence due to MSDS < 6-months	Reduced sickness absence due to MSDs	Organisation 1	£88,698.00	£4575.49	-£84,122.01	0.05 (-95%)
Sickness absence due to MSDS >6-months	Reduced sickness absence due to MSDs	Organisation 1	£88,698.00	0	-£88,698.00	0 (0%)
Combined all outcomes	Reduced sickness absence due to MSDS	Organisation 1	£88,698.00	£4575.49	-£84,122.01	0.05 (-95%)

Figure 26: Screenshot of the CBA output metrics for combined outcomes organisation 1

16					
17	Economic Case (Public Value CBA)		Financial Year	Net Present Value (NPV)	
18			2014-15		
19			Actual costs	Costs	£ 88,697.50
20		Benefits	£ 4,575.49		
21	Discounted costs	Costs	£ 88,697.50	£ 88,697.50	
22		Benefits	£ 4,575.49	£ 4,575.49	
23					
24				-£ 84,122.01	Net Present Public Value
25				-1.00	Public Value for Money BCR
26				0.05	Public Value Return on Investment
27					

Table 29 indicates that there was no economic benefit from the VR service for long-term sickness absence due to MSDs, although a small benefit of £4,575.49 in reduced short-term sickness was noted. When looking at Figure 27, the results appear to indicate a BCR of -1.00 and a ROI of 0.05. However, this appears to be inconsistent with the financial terms in the literature, as the calculation underpinning the ROI is in fact a BCR calculation: $=AB22/AB21$ i.e. benefits (AB22)/costs (AB21) (Keating and Keating, 2014; Phillips, 2011; McIntosh et al., 2011; Investopedia, 2018) (see Figure 28 below).

Figure 27: Screenshot indicating the underlying calculation of the ROI results box

Economic Case (Public Value CBA)		Financial Year	Net Present Value (NPV)
		2014-15	
Actual costs	Costs	£ 88,697.50	
	Benefits	£ 4,575.49	
Discounted costs	Costs	£ 88,697.50	£ 88,697.50
	Benefits	£ 4,575.49	£ 4,575.49

-£ 84,122.01	Net Present Public Value
-1.00	Public Value for Money BCR
0.05	Public Value Return on Investment

Looking at the results presented in Figure 28, the number/result (0.05) alongside the label ‘Public Value Return on Investment’ is in fact a BCR for the organisation.

The following formula is used to calculate the ROI (Phillips, 2011; Investopedia, 2018):

$$\text{ROI} = \frac{(\text{benefit} - \text{cost})}{\text{cost}}$$

In the scenario, the

$$\text{ROI} = \frac{(\pounds 4,575.49 - \pounds 88,697.50)}{\pounds 88,697.50} \times 100\%$$

$$\text{ROI} = -95\%$$

As seen on Figure 28, this result of a ROI of - 95% is not reflected on the CBA tool, in either the BCR or the ROI results box. This suggests that there is an inconsistency in the use of financial terms between the GM New Economy model and the financial literature.

As the BCR is 0.05, the costs are greater than the benefits. Thus, the intervention would not be recommended.

4.6.3 Organisation 1 CBA: Sensitivity analysis results

Sensitivity analysis – is a method whereby various parameters in the analysis are varied in order to test the impact on the overall result –assisting with decisions of allocating scarce resources (HM Treasury, 2011).

A simple sensitivity analysis was conducted (see Section 3.4) varying each parameter/project variable where there was uncertainty.

- a) Outcome: Sickness absence < 6-months.

The variable ‘level of engagement and impact’ was not subjected to a sensitivity analysis as there was no uncertainty surrounding the data provided by the organisation (see section 4.6.1.1.1). However, the variables, predicted incidents, deadweight and retention rate were subject to sensitivity analysis.

Looking at these results in turn, the variable predicted incidents was altered by 5% and 10% as it was possible that the predicted incidents might fluctuate between 0% and 10% in either direction (see Table 30).

Table 30: Sensitivity analysis for sickness absence < 6-months of variable: predicted incidents

Change in variable: Predicted incidents n = 1465.77	10%	+5%	0%	-5%	-10%
Overall Cost	£88,697.50	£88,697.50	£88,697.50	£88,697.50	£88,697.50
Overall Benefit	£5,033.05	£4,804.30	£4,575.49	£4,346.71	£4,117.94
Net Benefit	-£83,664.45	-£83,893.20	-£84,122.01	-£84,350.79	-£84,579.56
BCR	0.06	0.05	0.05	0.05	0.05

Through adjusting the number of predicted incidents, up and down 5% and 10%, the BCR ranges between 0.06 and 0.05. This indicates that the predicted incidents variable has a limited influence on the results.

The variable deadweight is changed by varying the net effectiveness (32.35%), which was determined from the literature (see section 4.2.1.1). Results of the included studies ranged from 16% to 54% improvement between the intervention and control group. Thus, the sensitivity analysis was varied with 16% as the minimum and 54% as the maximum, with the mid points between these ranges and calculated net effectiveness (32.35) i.e. 16%, 24.18%, 32.35%, 43.18% 54% (see Table 31).

Table 31: Sensitivity analysis for sickness absence < 6-months of variable: deadweight

% net effectiveness inputted and the resultant deadweight	Net effectiveness = 54% Deadweight = 73%	Net effectiveness = 43.18% Deadweight = 78%	Net effectiveness = 32.35% Deadweight = 82%	Net effectiveness = 24.18% Deadweight = 84%	Net effectiveness = 16% Deadweight = 85%
Overall Cost	£88,697.50	£88,697.50	£88,697.50	£88,697.50	£88,697.50
Overall Benefit	£10,719.55	£6,939.40	£4,575.49	£2,912.15	£1,739.33
Net Benefit	-£77,977.95	-£81,758.10	-£84,122.01	-£85,785.35	-£86,958.17
BCR	0.12	0.08	0.05	0.03	0.02

Through adjusting the net effectiveness within a range of 16%-54%, deadweight varied from 73% to 85%. This resulted in the BCR ranging between 0.12 and 0.02, indicating that the deadweight variable has an influence on the estimates but not the substantive findings.

The retention rate (92.5%) was estimated from the evidence-base indicating that on average 7.5% of individuals attending out patients' physiotherapy do not attend their follow-up

appointment (see section 4.6.1.1.1). The retention rate was varied between 85% and 100% i.e. 100%, 96.25%, 92.5%, 88.25%, and 85%. Using the 7.5% estimated non-attendance rate as a guide for the variance that could be reasonably assumed, this varied the retention rate by 7.5% in either direction.

Table 32: Sensitivity analysis for sickness absence < 6-months of variable: retention rate

Retention rate figures used	100%	96.25%	92.5%	88.25%	85%
Overall Cost	£88,697.50	£88,697.50	£88,697.50	£88,697.50	£88,697.50
Overall Benefit	£4,946.48	£4,760.99	£4,575.49	£4,365.27	£4,204.51
Net Benefit	-£83,751.02	-£83,936.51	-£84,122.01	-£84,332.32	-£84,492.99
BCR	0.06	0.05	0.05	0.05	0.05

Through adjusting the retention rate up and down by 7.5% the BCR ranges between 0.06 and 0.05, indicating that the retention rate has a limited influence on the results.

When changing the variables predicted incidents, deadweight and retention rate, a set percentage (based on what could be reasonably assumed), the BCR ranged between 0.12 and 0.05. The greatest variation was due to the variation in deadweight, however, the estimates do not vary greatly. At no point does the BCR = 1, i.e. breakeven point.

b) Outcome: Sickness absence > 6-months.

As in outcome a) only the variables, level of engagement and impact were subject to sensitivity analysis (see section 4.6.1.1.2).

The variable, predicted incidents was altered by 5% and 10%, as it is possible that the predicted incidents might fluctuate between 0% and 10% in either direction (see Table 33).

Table 33: Sensitivity analysis for sickness absence > 6-months variable: predicted incidence

Change in variable: Predicted incidents n = 595.84	10%	+5%	0%	-5%	-10%
Overall Cost	£88,697.50	£88,697.50	£88,697.50	£88,697.50	£88,697.50
Overall Benefit	£4,575.49	£4,575.49	£4,575.49	£4,575.49	£4,575.49
Net Benefit	-£84,122.01	-£84,122.01	-£84,122.01	-£84,122.01	-£84,122.01
BCR	0.05	0.05	0.05	0.05	0.05

Through adjusting the number of predicted incidents up and down 5% and 10% the output metrics did not change, indicating that the predicted incidence had no change on this outcome.

The variable deadweight was changed by varying the net effectiveness (0%), which was determined from the literature (see section 4.2.1.2). The only study meeting the inclusion criteria reported 34% improvement between the intervention and control group. Thus, the sensitivity analysis was varied with 0% as the minimum and 34% as the maximum, with the mid points between these ranges and determined net effectiveness (0%) i.e. 0%, 17%, 34% (see Table 34).

Table 34: Sensitivity analysis for sickness absence > 6-months of variable: deadweight

% net effectiveness inputted and the resultant deadweight	Net effectiveness = 0% Deadweight =100%	Net effectiveness = 17% Deadweight = 100%	Net effectiveness = 34% Deadweight = 100%
Overall Cost	£88,697.50	£88,697.50	£88,697.50
Overall Benefit	£4,575.49	£4,575.49	£4,575.49
Net Benefit	-£84,122.01	-£84,122.01	-£84,122.01
BCR	0.05	0.05	0.05

Adjusting the net effectiveness does not alter the deadweight or the results. However, sensitivity analysis is neither relevant nor instructive in this case as the sample size is only one.

As for the outcome: sickness absence < 6-months (see above) the retention rate was varied between 85% and 100% i.e. 100%, 96.25%, 92.5%, 88.25%, 85% (See Table 35). This varied the retention rate by 7.5 % either direction, using the 7.5% estimated non-attendance as a guide for the variance that could be reasonably assumed.

Table 35: Sensitivity analysis for sickness absence > 6-months of variable: retention rate

Retention rate figures used	100%	96.25%	92.5%	88.25%	85%
Overall Cost	£88,697.50	£88,697.50	£88,697.50	£88,697.50	£88,697.50
Overall Benefit	£4,575.49	£4,575.49	£4,575.49	£4,575.49	£4,575.49
Net Benefit	-£84,122.01	-£84,122.01	-£84,122.01	-£84,122.01	-£84,122.01
BCR	0.05	0.05	0.05	0.05	0.05

Through adjusting the number of predicted incidents up and down 7.5% the output metrics did not change, indicating that the retention rate has a no influence on the results for the outcome sickness absence > 6-months.

When changing the variables with a level of uncertainty (i.e. predicted incidents, deadweight and retention rate) by a set percentage (based on what could be reasonably assumed) the BCR did not change and at no point did it breakeven (i.e. BCR = 1). Thus, the VR intervention would not be recommended.

From the sensitivity analysis, it can be hypothesised that the uncertainties within the CBA tool with regards to sickness absence due to MSDs, both > and < 6-months, do not impact on the overall findings.

4.6.4 Organisation 1 CBA: Scenario analysis results

In addition to varying single variables (section 4.6.3) a scenario analysis was conducted for each outcome. The worst case and best-case scenarios were looked at, and a breakeven scenario explored (see Table 36).

- a) Scenario analysis for sickness absence < 6-months:

Table 36: Scenario analysis for sickness absence < 6-months

	Best case scenario	Worst case scenario	Break even
Predicted incidents = 1465.77	1612.35	1319.19	2000
Level of engagement n = 94%	100%	88%	100%
Retention rate n = 92.5%	100%	85%	100%
Deadweight N =82%	73%	85%	11%
Overall Cost	£88,697.50	£88,697.50	£88,697.50
Overall Benefit	£14,275.04	£1,417.18	£88,942.69
Net Benefit	-£74,422.46	-£87,280.18	£254.19
BCR	0.16	0.02	1

The scenario analysis demonstrates that in the best and worst case the BCR does not reach 1, therefore, the intervention would not be recommended. The breakeven point demonstrates that a large variation in the deadweight (from 82% to 11%) would be required to breakeven, which is not realistic based on the literature reviewed.

b) Scenario analysis for sickness absence > 6-months:

This scenario analysis was not conducted because the variable analysis demonstrated no change to the output metrics through varying single variables and subsequently multiple variables. Consequently, there is no best- and worst-case scenario that differs from the results found above for sickness absence > 6 months.

In summary, the findings that the intervention costs are greater than the benefits are maintained when comparing the best and worst-case scenario. Therefore, based on these results, in organisation 1 the VR intervention would not be recommended.

4.6.5 Organisation 2 – synthesis of data to be used in the CBA tool from phase 1 and 2 for the revised outcomes.

4.6.5.1 Organisation 2: costs

The total cost of VR service per annum for employees attending the service with mental health and MSDs conditions (n = 43) is £24,894.74. This was calculated based on 152 employees attending the VR service at a cost of £88,000.00 per annum. Therefore, the cost for 9 employees attending with MSDs = £5210.53, and the cost for 34 employees attending with mental health conditions = £19,684.21. The CBA tool was applied, with the assumption that 100% of the costs will be realised within 1 year. Optimism bias was calculated at 15%, this is because the data source was provided by the service, and is 3-4 years old. A confidence grade between 1 and 6 is allocated based on the data source, age of data and known data error. The highest confidence grade is used to determine the optimism bias which is the optimism bias correction used in the CBA tool (see Table 37). Thus, when accounting for optimism bias, the total cost to be used within the CBA tool = £28,628.95. See Figure 29 for a screen shot of the costs within the CBA tool.

Table 37: Confidence grade definitions and rationale for selected optimism bias corrections for organisation 2 cost. (HM Treasury et al., 2014).













Confidence grade	Colour coding	Data source	Age of data	Known Data error		Optimism bias correction
1		Independently audited cost data	Current Data (<1 year old)	+/-2%		0%
2		Formal service delivery contract costs	1-2 years old	+/-5%		+5%
3		Practitioner monitored costs	2-3 years old	+/-10%		+10%
4		Costs developed from ready reckoners	3-4 years old	+/-15%		+15%
5			4-5 years old	+/-20%		+25%
6		Uncorroborated expert judgement	>5 years old	+/-25%		+40%

Figure 28: Screenshot of CBA tool Costs tab for organisation 2

	Ref	Cost category	Predicted costs (£)	Who pays?	Capital/ Revenue/ In-kind	Optimism bias correction	Total costs	% Costs Yr1
4	C1	MSDS	£ 5,211	Organisation	Revenue	15%	£ 5,992	100%
5	C2	mental health conditions	£ 19,684	Organisation	Revenue	15%	£ 22,637	100%
6								
45								
46	TOTAL		£ 24,895				£ 28,629	

4.6.5.2 Organisation 2: benefits

See section 4.6.1.2 for a discussion on the data needed for each benefit.

4.6.5.2.1 Benefit 1: MSD sickness absence < 6-months.

Using the data gathered for organisation 2, the following figures and assumptions were used to populate the CBA tool for MSD sickness absence < 6-months:

- **At risk affected population:** $n = 9$
152 employees were referred the VR service. Sickness absence data was provided for 65 members of staff attending. It is assumed that this is representative of the entire cohort. Data was available for 9 employees with MSDs with 3 months sickness absence data.
- **Predicted incidents:** $n = 1044$
Predicted total number full-time equivalent working days sickness absence for employees with < 6-months sickness absence due to MSDs in the 3 months prior to having been referred to the VR service. From the sickness absence data for 65 staff members, 9 had sickness absence < 6-months due to MSDs, with a total number of sickness absence days of 261. The CBA tool represents a year, thus the data used is assumed to be representative of a year. Therefore, 261 days of sickness absence were recorded in the 3 months prior to the intervention, and over a year it is assumed that this number multiplied by 4 will provide a predicted number of incidents per year.
- **% Engaged:** = 100%
No data on engagement was provided. Thus, it is assumed that all employees engaged with the service.
- **% Retained:** = 100%
No data on retention was provided. Thus, it is assumed for the 9 employees attending the service for MSD's that retention is 100%.
- **% Impact:** = 66.67%

Post intervention there was a 66.67% reduction in FTE work days sickness absence (261 (sickness absence days pre) - 87 (sickness absence days post)/ 261 * 100 = 66.67%).

- **% Deadweight:** = 51% (see section 3.5.3 for an explanation of the calculation).

Starting point = 261

Outcome = 87

Net effect = 32.25%

- Counterfactual = $87/(1-0.32)$

= $87/0.68$

= 128

Deadweight% = $261-128/261 * 100$

= 50.96%

- **Value:** = £100.42

The mean cost of sickness absence per day was calculated using the human capital approach. The data on sickness absence pay was not provided. Therefore, it is assumed that sickness absence that was < 6-months was paid in full. Additional costs included are the employers national insurance payments, which are calculated at 13.8% of the wage (Gov.UK, 2015), thus, 13.8% of £88.24 = £12.18.

Thus, total value per day of sickness absence = £100.42


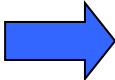
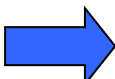
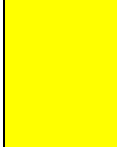
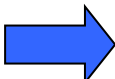
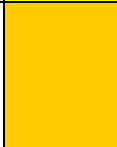
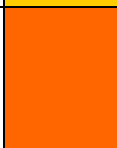
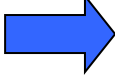
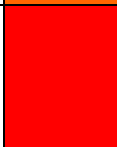
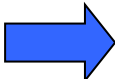
- **% Optimism bias:** = - 15%

Optimism bias was calculated at -15%, as the data was provided by the service, the outcomes were monitored independently to the organisation, there is no known data error, however the data for the benefits is 3-4 years old. Thus, the optimism bias that aligns with the lowest confidence grade in any of the criteria is -15% (see Table 38).

This applies for all the benefits.

See Figure 30 & 31 for screen shot of all benefits.

Table 38: Confidence grade definitions and rationale for selected optimism bias corrections for Case study 2 benefit 1 (HM Treasury et al., 2014).

Confidence grade	Colour coding	Population/ Cohort Data	Evidence-base (engagement/ impact)	Age of data/ analysis	Known data error		Optimism bias correction
1		Figures taken from agency data systems	Randomised Control Trial in UK	Current Data (<1 year old)	+/-2%		0%
2		Figures derived from local stats	International Randomised Control Trial	1-2 years old	+/-5%		-5%
3		Figures based on national analysis in similar areas	Independent monitoring of outcomes with a robust evaluation plan	2-3 years old	+/-10%		-10%
4		Figures based on generic national analysis	Practitioner monitoring of outcomes with a robust evaluation plan	3-4 years old	+/-15%		-15%
5		Figures based on international analysis	Secondary evidence from a similar type of intervention	4-5 years old	+/-20%		-25%
6		Uncorroborated expert judgement	Uncorroborated expert judgement	>5 years old	+/-25%		-40%

4.6.5.2.2 Benefit 2: MSD sickness absence > 6-months.

Due to the limitations of the sickness absence data provided and the need to limit it to include only individuals who had three months pre and post VR referral, this outcome could not be included in the CBA tool (see Figure 30 & 31).

4.6.5.2.3 Benefit 3: Mental health conditions sickness absence < 6-months

Using the data gathered for organisation 2, the following figures and assumptions were used to populate the CBA tool for sickness absence relating to mental health conditions < 6-months:

- **At risk affected population:** n = 34

152 employees were referred the VR service. Sickness absence data was provided for 65 members of staff attending, assumed to be representative of the entire cohort. Data was available for 34 employees with mental health conditions with 3 months sickness absence data.

- **Predicted incidents:** $n = 1984$

Predicted incidents refers to the predicted total number full-time equivalent working days sickness absence for employees with < 6-months sickness absence due to mental health conditions in the 3 months prior to been referred to the VR service. From the sickness absence data for 65 staff members, 34 had sickness absence < 6-months due to mental health conditions, with a total number of sickness absence days of 496. The CBA tool represents a year, thus the data used is assumed to be representative of a year. 496 days of sickness absence were recorded in the 3 months prior to the intervention, over a year it is assumed that this number multiplied by 4 will provide a predicted number of incidents per year.

- **% Engaged:** = 100%

No data on engagement was provided; therefore it is assumed that all employees engaged with the service.

- **% Retained:** = 100%

No data on retention was provided. Thus, it is assumed for the 34 employees attending the service for mental health conditions that retention is 100%.

- **% Impact:** = -28.33%

The pre and post sickness absence data for mental health conditions were tested for normal distribution using SPSS v.24. See Table 39 for the results of the normal distribution testing.

Table 39: Results of the normal distribution testing of the sickness absence data for mental health conditions

N = 34	Pre	Post	Normal values
Skewness value	0.451 (std error 0.403) Z = 1.119 (0.451/0.403)	1.023 (std error 0.403) Z = 2.54	Z value between -1.96 to +1.96
Kurtosis value	-0.904 (std error 0.788) Z = -1.147 (-0.904/0.788)	-0.387 (std error 0.788) Z = 0.491	Z value between -1.96 to +1.96
Shapiro-Wilk test p-value	0.12	0.000	Above 0.05
Histograms	Does not have the shape of a normal curve.	Not normally distributed	Visually indicate data is normally distributed
Normal Q-Q plots	The dots are approximately along the line.	The dots are approximately along the line.	Visually indicate data is normally distributed

A Shapiro-Wilk test ($p > 0.5$) (Shapiro & Wilk, 1965; Razali & Wah, 2011) and a visual inspection of the histograms and normal Q-Q plot (see Appendix 8) showed that the number of mental health conditions sickness absence days were approximately normally distributed pre-VR intervention, with a skewness of 0.451 (SE 0.403) and a kurtosis of -0.904 (SE 0.788). For the post sickness absence days, the data does not appear to be normally distributed, with the Shapiro-Wilk test ($P < 0.5$) and a visual inspection of the histograms and normal Q-Q plot (see Appendix 8) indicating a non-normal distribution, with a skewness of 1.023 (SE 0.403) and a kurtosis of -0.387 (SE 0.788) (Cramer, 1988; Cramer & Howitt, 2004; Doane & Seward, 2011).

It can be concluded that the post sickness absence data for mental health conditions is not normally distributed; therefore the truncated mean was explored. Looking at both the means and the truncated means, which accounted for outliers it is seen that there was still an increase in FTE work days. Post intervention there was a -28.33 % increase in FTE work days sickness absence; $(406 \text{ (sickness absence days pre)} - 521 \text{ (sickness absence days post)}) / 406 * 100 = -28.33\%$.

- **% Deadweight:** $n = -28.33\%$ (see section 4.2.1.2)
- **Value:** = £100.42

The mean cost of sickness absence per day was calculated as discussed in Section 4.6.5.2.1.

- **% Optimism bias:** = - 15%

Optimism bias was calculated at -15% (see benefit 1, section 4.6.5.2.1)

See Figures 30 & 31 for screen shots of all benefits

4.6.5.2.4 Benefit 4: Mental health conditions sickness absence > 6-months

Due to the limitations of the sickness absence data provided and the need to limit it to only include individuals who had three months pre and post VR referral data this outcome could not be included in the CBA tool (see Figures 30 & 31).

4.6.5.2.5 Benefit 5: Turnover

- **At risk affected population:** n = 43
152 employees were referred to the VR service within one year. Sickness absence data was provided for 65 members of staff attending. 43 employees were referred with mental health conditions or MSDs.
- **Predicted incidents:** n = 43
- **% Engaged:** = 100
Total number of employees with mental health conditions or MSDs attending the VR service.
- **% Retained:** = 100%
No data on retention was provided. Thus, it is assumed all employees attending the service for MSDs or mental health conditions that retention is 100%.
- **% Impact:** = 3.2%
Yearly turnover rate for the organisation is approximately 16%. No information on the reasons for turnover was provided. For the purposes of this model it will be assumed that all employees contribute equally to the turnover rate. From the literature (see

section 4.2.1.3) it is assumed that the introduction of a VR service will reduce the overall turnover by 20%.

In one year, 152 out of 1107 employees attended the VR service, 43 due to MSDs or mental health conditions. It is assumed that the employees attending the VR service were more likely to leave the company due to ill-health, however, due to the lack of data this assumption will not be included within the CBA tool. It is assumed that if these employees did not attend the VR service (i.e. no intervention) 16% of them would leave the company within a year. For employees attending the VR service it is assumed that 12.8% (i.e. 16% less 3.2% (20% of 16%)) will leave the organisation. In other words, of the 43 employees attending the VR service for MSDs and mental health conditions it will be assumed that 12.8% (n = 5.5) of these will leave the organisation within a year, whereas had these 43 employees not attended the VR service, 16% (n = 6.88) would have left the organisation within a year. Therefore, 5.5 employees attending the VR service with MSDs and mental health conditions would leave the organisation as opposed to 6.88, saving the organisation the cost of replacing 1.38 employees.

- **% Deadweight:** = 0% (see section 4.2.1.3 for explanation)

- **Value:** = £16,663.00 (see section 4.2.2.3 for explanation)

- **% Optimism bias:** = - 15%

Optimism bias was calculated at -15%, see benefit 1 for calculation of optimism bias.

See Figures 30 & 31 for all benefits.

4.6.5.2.6 Benefit 6: Presenteeism

There were insufficient participants to facilitate the use of presenteeism as an outcome for organisation 2 (see Figure 30 & 31).

Figure 29: Screenshot of benefits 1,2,3,4, 5 and 6 for organisation 2.

Benefits

Ref.	Outcomes	Included outcome ?	Benefits	Who does benefit accrue to?	Target population	Pop notes/ assumptions	Affected population / Predicted incidents	Affected pop notes/ assumptions	Level of engagement with the affected population (%)	% engagement notes / assumptions	Retention rate (%)	% retention notes / assumptions	Annual turnover	% impact (effectiveness of changing skills / attitudes / behaviours)	% impact notes / assumptions / sources
B19	MSD Sickness absence (s.a.) less than 6 months	Yes	Reduced sickness absence	Company / organisation purchasing the VR intervention	9		1044		100%		100%		n/a	67%	
B20	MSD Sickness absence (s.a.) greater than 6 months	No	Reduced sickness absence	Company / organisation purchasing the VR intervention									n/a		
B21	Mental health sickness absence (s.a.) less than 6 months	Yes	Reduced sickness absence	Company / organisation purchasing the VR intervention	34		1984		100%		100%		n/a	-28%	
B22	Mental health sickness absence (s.a.) greater than 6 months	No	Reduced sickness absence	Company / organisation purchasing the VR intervention									n/a		
B23	Turnover	Yes	Reduced turnover in employees accessing the VR service	Company / organisation purchasing the VR intervention	43		43		100%		100%		16	3%	A VR service will reduce the overall yearly turnover by 20%
B24	Presenteeism	No	Reduced presenteeism in employees accessing the VR service	Company / organisation purchasing the VR intervention									n/a		

Figure 30: Screenshot of benefits 1,2,3,4 and 5 for organisation 2 continued.

Starting point = no. of sickness absence days prior to the intervention	Outcome = total no. of sickness absence days post the intervention	Net effect: % improvement gained by using VR. This is determined from the literature	Counterfactual: assumed outcome without the intervention	% deadweight	% deadweight notes / assumptions	Unit fiscal benefit (£)	Public Value				Monetisation evidence financial year	GDP deflator compared to price base year	Unit cost notes /assumptions	Optimism bias correction
							Unit public value (fiscal) benefit (£)	Unit public value (economic) benefit (£)	Unit public value (social) benefit (£)	Unit public value (total) benefit (£)				
261	87	32.25%	128.4132841	51%	See phase 2 in thesis for calculation and assumptions	£ 100	£ 100			£ 100	2014-15	100.000		-15%
		0%	0		See phase 2 in thesis for calculation and assumptions	£ 41	£ 41			£ 41	2014-15	100.000		-25%
406	521	0%	521	-28%	See phase 2 in thesis for calculation and assumptions	£ 100	£ 100			£ 100	2014-15	100.000		-15%
		0%	0		See phase 2 in thesis for calculation and assumptions		£ -			£ -	2014-15	100.000		
N/a	N/a	N/a	N/a	0%	See phase 2 in thesis for calculation and assumptions	£ 16,663	£ 16,663			£ 16,663	2014-15	100.000	See turnover costs section within thesis	-15%
		0%	0		See phase 2 in thesis for calculation and assumptions	£ 605	£ 605			£ 605	2014-15	100.000	See presenteeism costs section within thesis	

4.6.6 Organisation 2: CBA results

Various scenarios and perspectives of the data available were analysed with the CBA to provide BCRs. These explored the impact of organisation 2's VR service on sickness absence and turnover due to MSDs and mental health conditions.

The BCR = benefits/costs. A ratio less than 1 indicates the costs are higher than the benefits.

As seen in Table 40 and Figure 32, the BCR = 1.17, which indicates that the economic costs of organisation 2's VR service are less than the economic benefits. For every £100 the organisation spends on the VR service, it gets £117 back, therefore is gaining £17 for every £100 spent.

Table 40: Outcomes and benefits incorporated into the GM New Economy Manchester CBA tool

Outcomes	Benefits	Who does the benefit accrue to	Costs	Benefits	Net present value	BCR
Sickness absence due to MSDS < 6-months	Reduced sickness absence due to MSDs	Organisation 2	£5,992.11	£14,080.52	£8,088.41	2.35 (135%)
Sickness absence due to mental health conditions < 6-months	Reduced sickness absence due to mental health conditions	Organisation 2	£22,636.84	0	£22,636.84	0 (0%)
Turnover	Reduced turnover due to MSDs and mental health conditions	Organisation 2	£28,628.95	£19,489.04	-£9,139.91	0.68 (-32%)
Combined all outcomes	Reduced sickness absence and turnover due to MSDS and mental health conditions	Organisation 2	£28,628.95	£33,569.56	£4,940.61	1.17 (17%)

Figure 31: Screenshot of the CBA output metrics for combined outcomes organisation 2

16					
17	Economic Case (Public Value CBA)	Financial Year		Net Present Value (NPV)	
18		2014-15			
19		Actual costs	Costs	£ 28,628.95	
20		Benefits	£ 33,569.56		
21	Discounted costs	Costs	£ 28,628.95	£ 28,628.95	
22		Benefits	£ 33,569.56	£ 33,569.56	
23					
24				£ 4,940.61	Net Present Public Value
25				Not applicable	Public Value for Money BCR
26				1.17	Public Value Return on Investment
27					

Table 40 and Figure 32 indicate that there was no economic benefit from the VR service in respect of sickness absence due to mental health conditions, whereas a modest benefit was realised for short-term sickness absence due to MSDs. The biggest economic benefit accrued due to the VR service is the reduction of turnover. As discussed in section 4.6.2, Figure 32 ROI results are in fact BCR results (this cannot be changed as Figure 32 is extracted from the GM New Economy model and the label boxes were locked).

4.6.7 Organisation 2: sensitivity analysis results

As outlined in section 3.4 a simple sensitivity analysis was conducted. Varying each parameter/project variable where there was uncertainty by a conceptually logical percentage.

- a) Outcome: Sickness absence < 6-months.

Only the variables, predicted incidents, level of engagement, deadweight and retention rate were subject to sensitivity analysis (see Section 4.6.5.2.1).

The variable, predicted incidents, was altered by 5% and 10% as it is possible that the predicted incidents might fluctuate between 0% and 10% in either direction (see Table 41).

Table 41: Sensitivity analysis for sickness absence due to MSDs < 6-months of variable: predicted incidence

Change in variable: predicted incidences 1044	+10%	+5%	0%	-5%	-10%
Net present value cost	£5,992.11	£5,992.11	£5,992.11	£5,992.11	£5,992.11
Net present value benefit	£15,488.57	£14,784.54	£14,080.52	£13,376.49	£12,672.46
Net present budget impact	£9,496.46	£8,792.43	£8,088.41	£7,384.38	£6,680.36
BCR	2.58	2.47	2.35	2.23	2.11

Through adjusting the number of predicted incidents up and down 5% and 10%, the BCR ranges between 2.58 and 2.11, indicating that the predicted incidents variable has a limited influence on the results. However, the results are not changed to the extent where the intervention would no longer be recommended (i.e. a BCR less than 1).

Data was not provided on the level of engagement. To explore this further, the variable was adjusted by 10% and 20% respectively, as it can be reasonably assumed that 80% of the referred employees will attend (see Table 42).

Table 42: Sensitivity analysis for sickness absence due to MSDs < 6-months of variable: level of engagement

Change in variable: level of engagement 100%	0%	-10%	-20%
Net present value cost	£5,992.11	£5,992.11	£5,992.11
Net present value benefit	£14,080.52	£12,672.47	£11,264.41
Net present budget impact	£8,088.41	£6,680.36	£5,272.30
BCR	2.35	2.11	1.88

When adjusting the level of engagement by 10% and 20% the BCR ranges between 2.35 and 1.88, indicating that the level of engagement variable has a limited influence on the results. However, the results are not changed to the extent that the intervention would no longer be recommended.

The retention rate (100%) was estimated as no data was provided by the organisation. No data was found on the retention rate of VR services. Thus, the retention rate was adjusted by 10% and 20% respectively, as it can be reasonably assumed that 80% of the referred employees will continue to attend the service until discharged (see Table 43).

Table 43: Sensitivity analysis for sickness absence due to MSDs < 6-months of variable: retention rate

Change in variable: retention rate n = 100%	0%	-10%	-20%
Net present value cost	£5,992.11	£5,992.11	£5,992.11
Net present value benefit	£14,080.52	£12,672.46	£11,264.41
Net present budget impact	£8,088.41	£6,680.36	£5,272.30
BCR	2.35	2.11	1.88

When adjusting the retention rate by 10% and 20% the BCR ranges between 2.35 and 1.88, indicating that the retention rate variable has a limited influence on the results. However, the results are not changed to the extent where the intervention would no longer be recommended.

The variable deadweight was changed by fluctuating the net effectiveness (32.35%) determined from the literature (see section 4.2.1.1). The included studies results ranged between 16% and 54% improvement between the intervention and the control group. Thus, the sensitivity analysis will be varied with 16% as the minimum and 54% as the maximum, with the mid points between these ranges and calculated net effectiveness (32.35) i.e. 16%, 24.18%, 32.35%, 43.18% 54% (see Table 44).

Table 44: Sensitivity analysis for sickness absence due to MSDs < 6-months of variable: deadweight

% net effectiveness inputted and the resultant deadweight	Net effectiveness = 54% Deadweight = 28%	Net effectiveness = 43.18% Deadweight = 41%	Net effectiveness = 32.35% Deadweight = 51%	Net effectiveness = 24.18% Deadweight = 56%	Net effectiveness = 16% Deadweight = 60%
Overall Cost	£5,992.11	£5,992.11	£5,992.11	£5,992.11	£5,992.11
Overall Benefit	£34,724.35	£22,479.13	£14,080.52	£9,443.45	£5,634.29
Net Benefit	-£28,732.24	£16,487.02	£8,088.41	£3,441.34	-£357,82
BCR	5.80	3.75	2.35	1.57	0.94

Through adjusting the net effectiveness within a range of 16%-54%, deadweight varied from, 28% to 60% this resulted in the BCR ranging between 5.80 and 0.94. This indicates that the deadweight variable has a large influence on the results. If deadweight is adjusted to 60% the BCR is slightly below 1 (0.94), indicating that the costs outweigh the benefits.

Thus, from the sensitivity analysis it can be hypothesised that the uncertainties within the CBA tool with regards to sickness absence < 6-months due to MSDs for the variables predicted incidents, retention rate and level of engagement do not impact on the overall findings. However, should the net effectiveness estimated from the literature be incorrect, it will influence the deadweight percentage and consequently impact on the results.

a) Outcome: Sickness absence due to mental health conditions < 6-months.

The only variable for the outcome sickness absence due to mental health conditions < 6-months subjected to sensitivity analysis was deadweight. As the net effectiveness for this outcome was calculated to be zero, unless the net effectiveness changes, the net benefits will be zero not matter which variable is adjusted. Therefore, the key variable explored was deadweight, as this is determined from the net effectiveness. To explore this, a range of net effectiveness values were inputted. These, in turn changed the calculated deadweight (see Table 45). The values of net effectiveness ranged between 0 and 31% (see Table 45) and were determined from the literature (see section 4.2.1.2).

Table 45: Sensitivity analysis for sickness absence due to mental health conditions < 6-months of variable: deadweight

% net effectiveness inputted and the resultant deadweight	Net effectiveness = 0% Deadweight = -28%	Net effectiveness = 8% Deadweight = -39%	Net effectiveness = 15% Deadweight = -51%	Net effectiveness = 23% Deadweight = -67%	Net effectiveness = 31% Deadweight = -86%
Overall Cost	£22,636.84	£22,636.84	£22,636.84	£22,636.84	£22,636.84
Overall Benefit	£-	£18,818.04	£38,189.56	£64,641.20	£97,226.55
Net Benefit	-£22,636.84	-£3,818.80	£15,552.72	£42,004.36	£74,589.71
BCR	0.00	0.83	1.69	2.86	4.30

Through adjusting the net effectiveness within a range of 0%-31% deadweight varied from -28% to -86%, resulting in the BCR ranging between 0 and 4.30 thereby indicating that estimates of the deadweight variable in this outcome have a substantial influence on the results. If net effectiveness is changed to 15% the BCR is 1.69 indicating that the benefits outweigh the costs.

From the sensitivity analysis, it can be hypothesised that should the net effectiveness estimated from the literature be incorrect, it will influence the deadweight percentage and consequently impact on the results.

b) Outcome: Turnover.

The variable impact and predicted incidents were not subjected to a sensitivity analysis (see section 4.6.5.2.5), however the variables deadweight, level of engagement and retention rate were.

The variable deadweight was estimated to be 0% (see section 4.2.1.3). Due to the uncertainty surrounding the underlying assumption, this variable will be adjusted by 5% and 10% respectively (see Table 46).

Table 46: Sensitivity analysis for turnover: deadweight

Change in deadweight variable n = 0%	Deadweight = 0%	Deadweight = 5%	Deadweight = 10%
Overall cost	£28,628.95	£28,628.95	£28,628.95
Overall benefit	£19,489.04	-£10,962.59	- £41,414.22
Net benefit	-£9,139.91	-£39,591.54	-£70,043.17
BCR	0.68	-0.38	-1.45

When the deadweight was varied between 0% and 10%, a large variation in the BCR was noted (0.68 - -1.45) indicating that the deadweight variable has an influence on the results.

Data was not provided on the level of engagement and retention rate. To explore this further, the variable was adjusted by 10% and 20% respectively, as it can be reasonably assumed that 80% of the referred employees will attend the service and continue to attend until discharged (see Tables 47 and 48).

Table 47: Sensitivity analysis for turnover variable: level of engagement

Change in variable: level of engagement n = 100%	0%	-10%	-20%
Net present value cost	£28,628.95	£28,628.95	£28,628.95
Net present value benefit	£19,489.04	£17,540.14	£15,591.24
Net present budget impact	-£9,139.91	-£11,088.81	-£13,037.72
BCR	0.68	0.61	0.54

Table 48: Sensitivity analysis for turnover variable: retention rate

Change in variable: retention rate n = 100%	0%	-10%	-20%
Net present value cost	£28,628.95	£28,628.95	£28,628.95
Net present value benefit	£19,489.04	£17,540.14	£15,591.24
Net present budget impact	£9,139.91	£11,088.81	£13,037.72
BCR	0.68	0.61	0.54

When the retention and engagement rate are adjusted by 10% and 20% the BCR ranges between 0.68 and 0.54; indicating that the retention rate and engagement rate has a limited influence on the results.

4.6.8 Organisation 2 CBA: Scenario analysis results

In addition to varying single variables (section 4.6.7) a scenario analysis was conducted for each outcome. The worst- and best-case scenarios were looked at, and a breakeven scenario was explored (see Tables 49 and 50).

c) Scenario analysis for sickness absence due to MSDS < 6-months:

Table 49: Scenario analysis for sickness absence due to MSDS < 6-months

N = 9	Current Scenario	Best case scenario	Worst case scenario	Break even scenario
Predicted incidents	1044	1148.4	939.60	1044
Level of engagement	100%	100%	80%	100%
Retention rate	100%	100%	80%	100%
Impact	67%	67%	67%	67%
Deadweight	51%	28%	60%	16.9%
Net present value cost	£5,992.11	£5,992.11	£5,992.11	£5,992.11
Net present value benefit	£14,080.52	£38,196.78	£3,245.35	£6,015.67
Net present budget impact	£8,088.41	£32,204.67	-£2,746.76	£23.56
BCR	2.71	6.37	0.54	1

The scenario analysis for MSDS shows that to break even the deadweight needs to be 16.9%. In the best-case scenario, there would be a BCR of 6.37 whereas in the worst-case scenario there would be a BCR of 0.54.

d) Scenario analysis for sickness absence due to mental health conditions less than 6-months:

As the deadweight for sickness absence will always be equal to the impact, the result will not change when variables, except deadweight, are adjusted (see section 4.6.6). Therefore, no scenario analysis on mental health conditions was conducted.

e) Scenario analysis for turnover

Table 50: Scenario analysis for turnover

N = 43	Current scenario	Best case scenario	Worst case scenario	Break even
Predicted incidents	43	51.6	34.4	64
Level of engagement	100%	100%	80%	100%
Retention rate	100%	100%	80%	100%
Effectiveness	3.2	3.2	3.2	3.2
Deadweight	0%	0%	10%	0%
Net present value cost	£28,628.95	£28,628.95	£28,628.95	£28,628.95
Net present value benefit	£19,489.04	£23,386.85	-£21,204.08	£29,006.95
Net present budget impact	-£9,139.91	-£5,242.10	-£49,833.03	£378.00
BCR	0.68	0.82	-0.74	1.01

As is noted in the turnover scenario analysis the BCR ranges from 0.68 to -0.74. To break even the number of individuals seen by the VR service with MSDs or mental health conditions needs to increase to 64 per annum.

In summary, the results that the interventions costs are greater than the benefits are maintained when comparing the best and worst-case scenario for the outcome turnover. However, for the outcome sickness absence < 6-months due to MSDs, the results vary from a BCR in the best-case scenario of 6.37, to a BCR in the worst-case scenario of 0.54. Therefore, based on these results, and the finding of a ROI of 17%, the VR intervention would be recommended.

In summary:

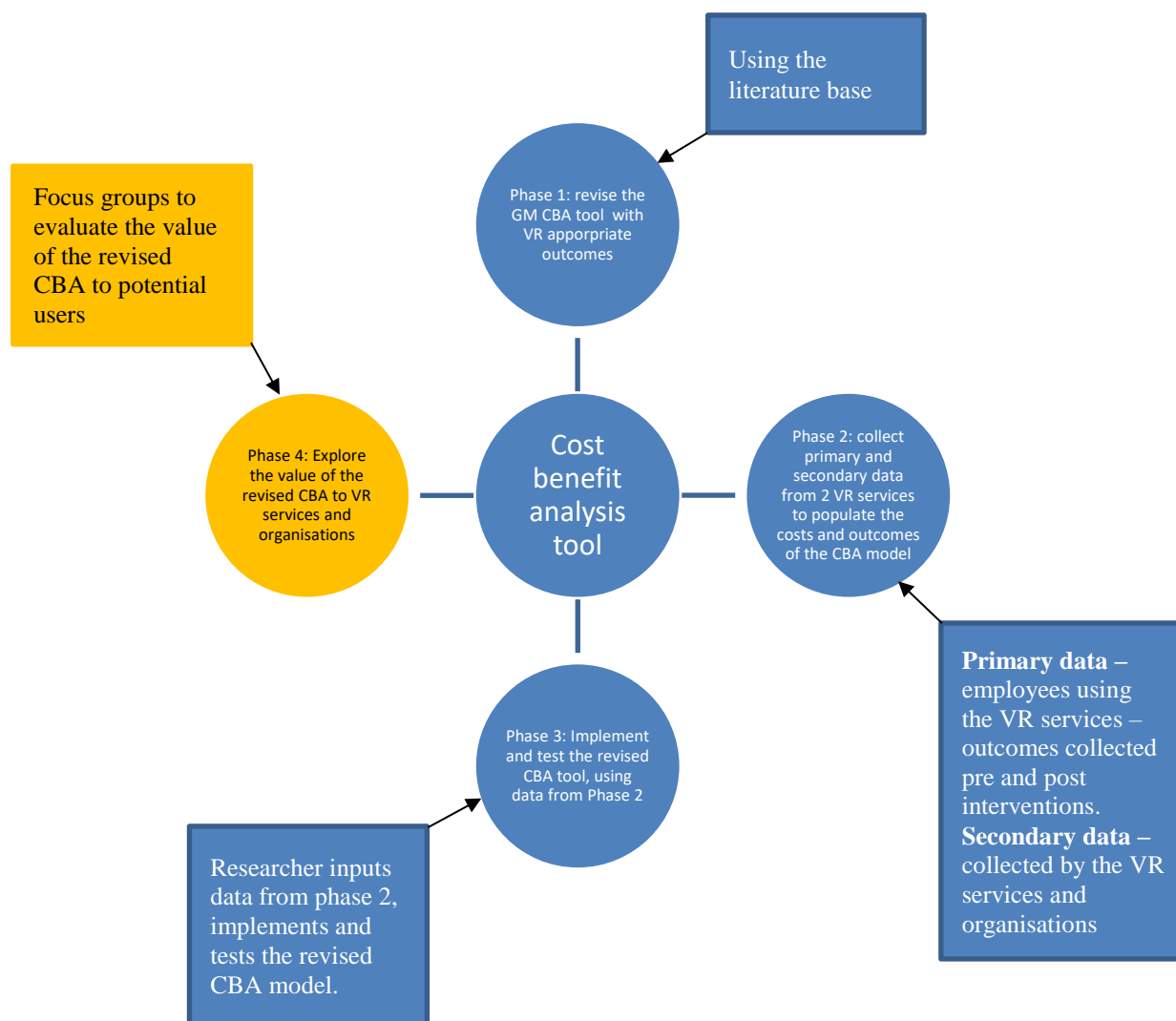
Organisation 1's total costs equalled £88,698.00. The total benefits for the included outcomes (i.e. sickness absence due to MSDs < and > 6-months) equalled -£84,122.00 thereby generating an economic BCR of 0.05 and a ROI of -95%. For every £100 organisation 1 spends on the VR service, it gets £5 back, therefore is losing £95 for every £100 spent.

Organisation 2's total costs equalled £28,628.95. The total benefits for included outcomes (i.e. sickness absence due to MSDs and mental health conditions < 6-months, and turnover) equalled £33,569.56, generating an economic BCR of 1.17 and a ROI of 17%. This indicates that for every £100 organisation 2 spends on the VR service it gets £117 back.

The variables needed to generate the benefits (i.e. impact, predicted incidents, deadweight, level of engagement and retention rate) were subject to sensitivity and scenario analysis for both organisations. Considering the scenario analysis, in organisation 1, no scenario generated a BCR greater than 1 thereby indicating that the VR intervention in organisation 1 would not be recommended. In organisation 2 the best-case scenario for sickness absence due to MSDs < 6-months resulted in a BCR of 6.37 whereas in the worst-case scenario there would be a BCR of 0.54. The VR intervention in organisation 2 would be recommended with caution. It was noted that the variation of deadweight (calculated from the net effectiveness which is determined from the literature) had the biggest influence on the results during the sensitivity and scenario analysis.

4.7 Phase 4 results

Figure 32: Diagrammatic representation of the 4 phases of this research project



Phase 4's objective was to appraise the value of the revised practical CBA tool to the VR provider and the organisation to which VR is provided. This section discusses the key themes that emerged from the analysis of the data retrieved from the focus group. The focus group comprised of individuals from organisation 2 who were during the research, and moving forwards would be responsible for collecting the data for the CBA tool, generating and reading the CBA reports, and making decisions with the aid of the CBA reports.

4.7.1 Focus group

Four individuals from the in-house VR service in organisation 2 took part in the focus group. These were the service director (P3), the national VR services manager (P1), the senior operations manager for the VR service (P2), and an intern (P4).

From the analysis the following key themes emerged:

- The usefulness of the CBA tool
- The usefulness of the report produced
- The ease of using the CBA tool
- Suggestions for development of the CBA tool

4.7.1.1 The usefulness of the CBA tool

The participants agreed that the CBA tool is a useful tool and that they do not have anything similar at this point in time. They were enthusiastic about the potential of the tool to be even more effective as it develops further, for example by having further outcomes included.

P2: “I think, like we said this morning, it’s always something that we’ve not had, and would be very, very useful. It looks like it will be a really good tool.”

P3: “I mean, there is nothing in this space, at the moment. Yes, and as it progresses and develops then yes, absolutely. But, as what it does now, it’s really useful.”

P1: “It’s still useful as it is.”

One participant felt that the CBA tool would be useful as part of a package of measures that incorporates other factors, such as findings from employee satisfaction surveys, or data about employee engagement, as opposed to it being the only aspect to decision making.

P1: *“It’s a good tool to have. I suppose it’s part of the package, isn’t it, because a lot of organisations now are also looking at, “How does it work in terms of employee engagement?” So, it’s less pounds and pence, and more employee satisfaction surveys, how do people feel valued? Would they work for the company?”*

The participants identified that the CBA tool would benefit their VR service in a number of ways. They felt that the CBA tool would be a useful adjunct to their marketing strategy, enabling them to demonstrate the potential savings to an organisation purchasing VR. Moreover, it would facilitate their conversations with existing and future clients, in identifying the organisations health needs and the potential cost savings should the organisation use VR to address the identified needs. Another potential use of the CBA tool would be within service design. The CBA tool would enable the VR service to explore their expenditure and the related benefits, and determine where they should be allocating their resources.

P3: *“I think, in time, if you were to do that with some companies you’d worked with, it would be amazing to say, “Actually, we’ve worked with so-and-so for six months, and on the basis of that we’ve saved them X amount of money.” You could use that to work out what you’ve saved them over a period of time, and say, “In a year that would be such-and-such. So, we’ve come to speak to you about saving you...””*

P3: *“Yes, sell, sell, sell. We’re all out speaking to companies and we’ve got a business development team as well.”*

P2: *“Service design as well, I think.”*

4.7.1.2 The usefulness of the report

The participants agreed that the report generated from the CBA tool would be helpful in decision making within the VR service demonstrating the value of implementing VR. However, they felt the usefulness of the report produced for their VR service was limited as the data used was from a small sample sizes.

P3: *“I think the biggest challenges are with the sample sizes and stuff like that, wasn't it? Casting my mind back, I think when I did read it you could see the indications of where it could help with further decision making and driving some of that activity. But, I think, for the actual data that was used, within our service, it wasn't very statistically impactful, in that sense.”*

Participants recognised the challenges in collecting data needed for the CBA tool such as recruiting participants, and organisations not collecting or measuring the relevant data. To overcome the difficulties of data collection and collating data retrospectively, it was suggested that VR services build data measurement and collection process into the service design.

P2: *“I think it's being aware of the data that you want to collect prior to running... Do you know what I mean? So, doing something retrospectively, here is a cost/benefit and trying to apply retrospectively to data can be a bit of a challenge, either because you haven't got people coming forward or because it hasn't been measured properly, or any of that sort of stuff.”*

I think, going forward, I would be looking at it so that you would have the sorts of data that you would want to collect, with a forward view of, “This is what we want it to tell us.” Then, either build that into your service design, in our case, or build that in as an employer, that they're the metrics you're measuring.”

4.7.1.3 The ease of using the CBA tool

When discussing the ease of using the CBA tool, there was a consensus that the CBA tool was user-friendly and easy to populate. The CBA tool is colour coded to assist the users to identify which columns to complete. The participants found when using the case study, the colour coding of the boxes enhanced the user-friendliness of the CBA tools.

P1: *“Although it’s quite a simple thing, literally saying, “Fill in the blue boxes,” is great. You know what I mean? Particularly when you work in business and you haven’t got time to work out that it’s column A, B and then you’ve also got to do AM. So, just colour-coding and stuff like that really helps.”*

P2: *“I think so, I think it would just be walking through the data and making sure you’re drawing on the right sources. It’s easy to populate.”*

When the participants considered using the model at a later stage, they were in agreement that they might have difficulties recalling where the data should go in the CBA tool. There was a consensus that for future use aide memoirs, such as a little module booklet, or instruction tabs built into the model, would be useful.

P2: *“I think if you were to go away and then say, ‘Here, you can use the model now’, we’d probably need to sit down and try and work out what it all was again. But, if there’s something that accompanies it, that explains it, like a little module or something you do first, like you said a booklet or anything like that, I think it will be pretty straight forward.”*

P1: *“You could even do, on the sheet itself, tabs that are other pre-populated documents, so people could see how it’s filled in, or an instruction per tab. So, when you get into it you’ve got access to the instructions on that tab.”*

Although the participants agreed populating the CBA tool was easy, they felt that collecting the data to be used within the CBA tool could be problematic. They expressed concerns with regards to knowing what data to collect as well as ensuring the accuracy of this data. They felt this could be addressed within an aide memoir.

P3: *“I think it is just the nature of the data that you’re collecting and the knowledge. I know you’ve done the crib sheet, and stuff like that, but, I think, being able to understand collecting the data that you’ve put together in the case study, if you like, and pulling that*

together accurately, notwithstanding how accurate the data is itself. But, do you know what I mean, just inputting that, understanding all the measures and metrics...”

4.7.1.4 Further development of the CBA tool

A number of ideas to further develop the CBA tool were identified during the focus group. It was suggested that the CBA tool be expanded to enable organisations to assess the cost/benefits of a variety of interventions as opposed to an intervention that is specific to VR.

P1: “Would it capture something more like an overarching umbrella of services that may include more digital type interventions? Would you just capture the costs in the same way?”

One participant felt another way to expand the model would be to include outcomes (costs and benefits) for a wider range of mental and physical health conditions. Incorporating all conditions addressed by VR would provide the complete picture to organisation. Moreover, it would assist with service redesign, for example it might identify costly interventions with small gains that the VR service could decide to no longer offer. However, this viewpoint was not unanimous, with another participant arguing that organisations would not be interested in that level of detail, but were more interested in the overall outcome i.e. is sickness absence across the organisation reduced and what are the costs/benefits of this result.

P1: “I suppose, my question mark would be around when you have other disability types coming in, which may, or may not, be harder to... There are quite a lot of stats there about mental health, and quite a of stats there about MSDs, when you get your diverse conditions there is less. There’s a business case there but there are less stats around absence levels and... Then that gives you the complete business case, in some respects.”

P3: “I think, overall, for a programme, if it wasn’t disability specific, you’d want to know the cost of the intervention against the cost saving. So, isn’t it better to do it [unclear audio 0:06:08] in an organisation anyway? I suppose, if you were buying a service, and you were saying, “Right, I’m spending this amount, say £70,000 on a VR service,” you’re not going

to be looking at one particular condition at a time, are you, because it's the effectiveness of what you're spending on that service, as a whole, that you're measuring, and what you're getting back from it."

A further potential development suggested by one participant was to tailor the CBA tool to the different industry sectors. The costs, causes, and duration of sickness absence, as well as the VR interventions that can be offered, differ for each industry sector. For example, an individual with a sprained ankle would be able to return to a desk-based job with adjustments, however, there are no adjustments suitable to allow a builder to return to a construction site.

P1: "The thing is, also, if you then talk to organisations about just getting the data off them, and in some respects, you don't have to provide the service to them, because you can put your assumptions in and then put it for an industry, in construction, for example, "This is how a VR model would benefit you." So, you could do your next PhD in different sectors."

During the focus group, it was recognised that there are a number of hidden/soft costs and benefits of VR services, such as improved job satisfaction, quality of life, team working etc., that cannot be captured in the CBA tool. It was identified that highlighting this to individuals using the CBA tool or reading the report would be necessary to allow an informed decision.

P1: "Sometimes, I think some of the hidden costs around sickness absence are the extra costs on employees, who work longer hours and that kind of thing, where there's not a value to it but, obviously, there is more of an impact on other people. I know it's ___[unclear audio 0:18:04] and you can't really capture that in this kind of model, but..."

P:1 "You could almost say, "This is almost like a minimum cost/benefit model, and bear in mind you'd have loads of hidden costs as well," which is quite powerful."

Lastly, participants recommended structural changes to the CBA tool. One participant felt that the inclusion of a front-end template, as opposed to populating the underpinning excel spreadsheet, would improve the presentation and ease of use of the CBA tool.

P1: *“I’d also say, maybe a front-end template. So, when you sit down with a company you can say, “How many employees do you have? What’s their average salary?” so you can just fill in all that stuff, nice and neat.”*

An additional structural change suggested was to include the ability on the excel spreadsheet to enable the inclusion/exclusion of the different costs. This feature is available for the outcomes, allowing the impact of different outcomes on the BCR to be explored. By including this feature for the costs, it would enable the exploration of the different costs for different outcomes.

P4: *“Then whether it would be possible to have an equivalent of the including outcome column on the costs page, so you don’t have to delete the data.”*

In summary:

The participants agreed that the CBA tool is a useful, practical tool and that they do not have anything similar at this point in time. They were enthusiastic about the potential of the tool to be even more effective as it develops further. The participants felt that the CBA tool would benefit their VR service in terms of marketing, service development/design and assisting organisations to identify health needs that VR could address. The participants agreed that the report generated as a result of the CBA tool would be helpful in decision making within the VR service and demonstrating the value of implementing VR. However, they felt the usefulness of the report produced for their VR service was limited as the data used was from a small sample sizes. Participants discussed ways of overcoming the identified data collection challenges, such as building the outcome measures and data collection into the service design. The participants felt that the CBA tool was user-friendly; however, they expressed concerns on remembering how to use it at a later date. They suggested the provision of aide memoires would assist when revisiting the CBA tool. Further suggestions for improving the CBA tool were discussed, namely: enabling the model to be used for any health intervention, as opposed to a VR specific intervention, including the costs and benefits of a wider range of causes of sickness absence, tailoring the CBA tool to the

different industry sectors, highlighting the hidden benefits and costs, and structural changes to the CBA tool such as including a front-end template and allowing the easy inclusion/exclusion of costs.

5. Discussion

In order to address the aims and objectives, outlined below, the research was completed in stages, with each stage addressing specific objectives and consequently used to inform the subsequent stage. Following a brief rationale for undertaking this research, the discussion section will address each objective in turn.

5.1 Aims

1. To develop economic outcomes, to be used within an existing CBA model, in order to ascertain the efficacy of a practical CBA tool in evaluating the costs and benefits of VR interventions and services.
2. To implement and explore the practical application of the revised CBA tool, including the developed outcomes, using data from two VR services.

5.2 Objectives:

1. To identify from the published literature the outcomes of VR interventions for organisations and employed individuals.
2. To revise the GM New Economy CBA model to ensure that the practical CBA tool developed is capable of analysing the costs and benefits of VR interventions.
3. To collect the relevant data required to populate the revised practical CBA tool from two VR Services and the organisations that they provide the VR to.
4. To implement and test the revised practical CBA tool incorporating the developed outcomes to identify the cost-benefits of the VR interventions and services in a real-world setting.
5. To appraise the value of the revised practical CBA tool to the VR provider and organisation VR is provided to.

5.3 Research Rationale

The cost of sickness absence and presenteeism has far reaching economic and social consequences. Within the UK ill-health among working age individuals costs the economy £100 billion a year; moreover, employers face an annual bill of around £9 billion for sickness absence costs and turnover due to ill-health (DWP & DH, 2016; Black & Frost, 2011). This appears to be a conservative apportionment of costs to employers as Stevenson & Farmer (2016) estimated the cost of mental health to employers to be between £33 billion and £42 billion, this calculation included presenteeism, sickness absence and turnover costs. Similar costs could be inferred for MSDs as they are, along with mental health conditions, one of top five causes of short and long-term sickness absence, and a leading cause of disability (CIPD & Simply Health, 2016; Joyce et al, 2015; Hoy et al, 2014). It is imperative that effective means of addressing sickness absence and presenteeism are identified. VR is widely advocated internationally and nationally as an intervention to help employed individuals SAW (DWP & DH, 2017; Black & Frost, 2011; Boorman, 2009; Carroll, Rick, Pilgrim, Cameron, & Hillage, 2009; Waddell et al., 2008). Although, the evidence points towards VR being effective, further research conducted in the UK is needed to firmly establish its effectiveness within the UK. Moreover, the evidence-base on the cost-effectiveness of VR is limited (Dibben et al., 2012; Waddell et al., 2008). With the current economic climate, globally and within the UK, it is imperative that scarce resources are used effectively. Therefore, there is a pressing need to develop the evidence-base on the cost effectiveness of VR, as well as enable the lay person to assess the costs and benefits of VR. Currently, there is no user-friendly practical economic tool available in the public arena for VR services and researchers to use. This research outlines the development of such a tool, envisioning that the practical CBA tool developed will lay the foundation for future work and practice. Moreover, during the development of the model a further two case studies within the UK were conducted adding to the evidence-base for VR within the UK.

5.4 Objective 1: To identify from the published literature the outcomes of VR interventions for organisations and employed individuals.

A number of potential direct benefits of VR aimed at assisting the employed population to SAW or RTW were identified, such as improving employees physical and mental health, decreased

sickness absence, decreased presenteeism, and reducing employee turnover (Hammond et al., 2017; Alexander et al., 2017; Black & Frost, 2011; Boorman, 2009; Cancelliere et al., 2011; Knapp et al., 2011; Van Holland et al., 2012; Oxenburgh & Marlow, 2005; Uegaki et al., 2011). In addition, a number of indirect benefits for both the employee and employer were identified, such as improved quality of life, decreased agency costs, decreased costs of care and increased earning potential of both employee and family (Cagno, et al., 2013; Oxenburgh & Marlow, 2005; Barham & Begum, 2005; Bevan and Hayday, 2001; WHO, 2003; SIGN, 2000). When considering which outcomes or benefits of VR to include in this research, specifically within the CBA tool, consideration was given to the ease of monetisation of the outcomes, the relative importance placed on the outcomes by the organisations that would be utilising the CBA tool and the economic value of including an outcome. Although, conducting a CBA from an organisational perspective limits the potential benefits included, at the start of this research organisations were the main purchasers of VR, and consequently the main stakeholders therefore most workplace interventions were evaluated from an organisational perspective (van Dongen et al., 2014; Tompa, Dolinschi, de Oliveira, 2006; Uegaki et al., 2010; van Dongen et al., 2011; van Dongen et al., 2012; Verbeek, Pulliainen, & Kankaanpää, 2009). Bearing this in mind, this research focused on an organisational perspective so as to ensure the tool was useful for the current VR providers. However, this picture is changing, both in terms of considering the funding of VR and where VR services are best placed (DWP & DH, 2017). These changes generate the need to consider the costs and benefits of VR from wider social and individual perspectives. A recent RCT explored the costs and benefits of a VR advice service for employees with musculoskeletal pain within a GP practices (Wynne-Jones et al, 2018), and considered a number of perspectives in the economic analysis. When deciding on the economic analysis tool for this research a tool was chosen that would facilitate further development incorporating a variety of outcomes from different perspective. For this research, an organisational perspective was taken and the outcomes identified to be included in the CBA tool were: sickness absence due to MSD and mental health conditions, presenteeism, and turnover. Each of these outcomes will be discussed in turn:

Sickness absence was included as it is commonly used in cost effectiveness studies for workplace interventions (Carrol et al., 2009; Bultman et al., 2009; Dibben et al., 2012; Dixon et al., 2002; Lambeek et al., 2010; Noben, 2012) and there are UK norms of sickness absence levels (CIPD &

Simply Health, 2016; ONS, 2014; CBI, 2013). The inclusion of sickness absence improves the comparability of the CBA tool to the evidence-base, moreover, sickness absence is easily monetised, the costs are of interest to organisations and this type of data is routinely collected (van Dongen et al., 2014). However, the health conditions resulting in sickness absence are wide ranging (HSE, 2017a; CIPD & Simply Health, 2016; CIPD, 2014a; CIPD, 2011; CBI, 2011; Wegge et al., 2007), which in turn impact differently on the expected length of sick leave. Due to the variety of causes of sickness absence the two most common causes, namely, MSDs and mental health conditions were the focus (HSE, 2017b; CIPD & Simply Health, 2016). Although it is recognised that by narrowing the CBA tools' capability to only include MSDs and mental health conditions, potential benefits of VR on other health conditions may be missed. If significant benefits cannot be monetised this may lead to incorrect conclusions (House, 1998), thus this limitation of the CBA model needs to be borne in mind when interpreting the results. Another factor considered when using sickness absence as an outcome was that the probability of an employee returning to work following sickness absence is substantially decreased after 6-months of absence, highlighting the importance of identifying cost effective interventions to prevent employees moving out of employment due to ill-health (Squires et al., 2012; NICE, 2009b; Waddell et al., 2008), moreover, the sickness absence pay in a number of public organisations, such as organisation 1, decreases to half pay at 6 months. Therefore, the cost of absence would differ before and after 6-months sickness absence. Two sickness absence outcomes, for both MSDs and mental health conditions, were developed i.e. sickness absence due to MSDs < and > 6-months, and sickness absence due to mental health conditions < and > 6-months.

Presenteeism was included as an outcome in this research study, as despite being a relatively new concept, the differing interpretations across countries, and the ongoing debate as how to measure and define presenteeism (Lohaus & Habermann, 2018; Garrow, 2016; Noben et al., 2014; Krol, et al., 2013; Brooks et al., 2010; Terry & Min, 2010), it has been increasingly considered when evaluating impacts of workplace interventions (Uegaki et al., 2011; Ijzelenberg et al. 2007; Cancelliere et al., 2011; Knapp et al., 2011). The costs of presenteeism have been identified as ranging between 1.8 and 10 times the cost of absenteeism (Virgin Pulse, 2017, cited in Hampson et al., 2017; Brown et al., 2014; Sainsbury Centre for Mental Health, 2007). This variation in the costs may be due to the lack of homogeneity in the outcome measures used in research (Lohaus &

Habermann, 2018). Additionally, there is a concern that decreases in sickness absence levels may be masking increases in presenteeism levels (CIPD, 2012). Presenteeism has been linked to productivity levels (Lohaus & Habermann, 2018; Bergstrom et al., 2009; Caverly et al., 2007; Hansen & Andersen, 2009; Hansson et al., 2006; Kivimaki et al., 2005; Schultz et al., 2009; Schultz & Edington, 2007; all cited in Claus, 2011), and if taken as a proxy of hours not worked, as was done in this research, is relatively easy to monetise. However, presenteeism effects are not always negative and may in fact be viewed favorably when individuals are using work as part of rehabilitation (Cocker et al., 2014). Taking into account the variations in defining, interpreting and measuring presenteeism, when considering economic evaluations perhaps the ‘term’ presenteeism is a misnomer. Lohaus and Habermann (2018) argue that the definition ‘attending work while ill’ is an open and all-encompassing definition, allowing exploration into a number of facets of presenteeism such as the consequences, the costs, why people exhibit the behaviour. All though this definition is broad, it still has limitations as would an individual with a long-term disability consider themselves ill? And when using this definition for research, it would necessitate the outlining and clarification of the position of the research. Thus, posing the question of why use the term presenteeism. It may be clearer to simply define the research question, as opposed to clearly outlining ones’ interpretation of presenteeism as was done in this research. In fact, stepping away from the term presenteeism to reduced productivity due to a health condition may enable the research goal to be more clearly articulated. Inherent difficulties noted in using an emerging topic such as presenteeism in economic evaluations are the limited evidence-base (Baxter et al., 2015; Baker & Aas, 2012). The findings from this research further illustrate this, as the limited evidence-base prevented robust conclusions being drawn, weakening the assumptions within the CBA tool. In order to ensure the CBA tool does not falsely attribute benefits, a cautious conclusion that the intervention will not have an effect was drawn. As a result, some users of the CBA tool may decide to exclude this outcome from the economic analysis. A useful feature of the CBA tool is that it allows for outcomes to be easily included or excluded.

The last outcome included in the CBA tool was turnover. Although the need for further high-quality evidence is recognised (Oakman et al., 2016; Palmer et al., 2012; Dewa et al., 2015; van Vilsteren et al., 2015; Nieuwenhuijsen et al., 2014; Schaafsma et al., 2013), there is a consensus in the literature that workplace interventions may reduce employee turnover, decreasing costs to

organisations, assisting individuals in avoiding unemployment, and reducing the knock on societal and economic costs of unemployment (Alexander et al., 2017; Black & Frost, 2011; Boorman, 2009; Cancelliere et al., 2011; Knapp et al., 2011). Turnover has a monetary value and is easily used within a CBA tool. Although costs of turnover are not regularly collected by organisations (Black & Frost, 2011; Oxenbarg and Marlow, 2005; Campion, 1991) there is sufficient literature (ERS Research and Consultancy, 2016; CIPD, 2013; CIPD, 2014b; Sainsbury Centre for Mental Health, 2007; Levy et al., 2014) to allow for an approximate cost to be calculated.

Indirect costs and benefits were not included in this model. It is acceptable practice to use a multiplier, dependent on the direct costs, to estimate the indirect costs, however, there is no consensus on the multiplier to use, with the multiplier used in studies ranging between 2 and 50 (Barra, 2010, cited in Cagno et al., 2013; Uegaki et al., 2011). Moreover, it is difficult to estimate some indirect costs such as increased workload on colleagues, and many organisations do not routinely collect these costs, decreasing the functionality of including them in the CBA tool. It is important when calculating costs and benefits of an intervention that benefits are not double counted (Krol et al., 2013; CEEU, 2011; Rebergen et al., 2009). Quality of life is an outcome that is increasingly being encouraged to be used in all health care interventions (CSP, 2014), so as to increase the comparability of outcomes of varied interventions and to enable economic analyses to be conducted. Although quality of life has been linked to productivity (McDonald, DiBonaventura, & Ullman, 2011; Pare et al., 2006; Dean et al., 2005), this relationship is not supported in all the literature (Lamer, Meerding, Severens, & Brouwer, 2005), and it is questionable as to whether including this in a CBA would merely be duplicating the impacts noted in decreased sickness absence and/or presenteeism (Krol et al., 2013). In this research, in order to provide a cautious indication of the cost effectiveness of VR when addressing sickness absence due to MSDs and mental health conditions, the outcomes included are: sickness absence due to mental health conditions and MSDs < and > 6-months; presenteeism; and turnover. Establishing the most cost-effective means to support individuals with these specific conditions to SAW has far reaching potential positive impacts for individuals, organisations and society, given the costs for sickness absence related to mental health conditions and MSDs (discussed in section 5.3).

5.5 Objective 2: To revise the GM New Economy CBA tool to ensure that the practical CBA tool developed is capable of analysing the costs and benefits of VR interventions.

To address objective 2, the intervention case (i.e. what happens when the intervention is put in place), the reference case (i.e. what would happen without the intervention been in place), the deadweight estimation (i.e. what percentage outcome would have occurred without the intervention), and unit cost for each outcome of interest, needed to be calculated (McPherson & Inglis, 2008; HM Treasury, 2011; Cox et al., 2011). The reference and intervention cases need to be synthesised from the existing evidence-base for each potential outcome/benefit, in order to ensure that the CBA tool is capable of analysing the net effectiveness of VR. The reference and intervention cases enable the researcher to determine what would have happened should the individual have not attended the VR service, allowing for an inference of the net effectiveness of VR to be established (McPherson & Inglis, 2008). From this net effectiveness deadweight can be calculated. A unique aspect of this research project is that the model is focused on VR, therefore in order to determine the reference case, intervention case and deadweight, the usual CBA tool was flipped; in other words a mirror image of a usual CBA tool was created. This flipped model was created to illustrate that the intervention outcome i.e. sickness absence from an organisational perspective has a finite benefit, once the employee is healthy and back in work the benefit of the intervention ceases. This differs from a typical CBA intervention benefit for example getting people back into work from a societal perspective where one may expect benefits to continue indefinitely due to an individual starting in the job market.

This research has added to the literature by determining new intervention and reference cases for sickness absence < 6-months due to MSDs, using four studies (Arnetz et al., 2003; Du Bois & Doncell, 2012; Karjalainen et al., 2003; Bultman et al., 2009). Using these four studies the net effectiveness of VR (32.6%) for MSDS was identified. The net effectiveness was used within the CBA tool to calculate the deadweight (i.e. what % of people would RTW without the intervention) for each VR organisation. Deadweight was calculated as 81.74% in organisation 1 and 50.96% in organisation 2. A strength of calculating deadweight from the estimated net effectiveness of the VR services is that it limits the effect of different populations on the result. An alternative method of calculating the net effectiveness would be to look at the expected probability of returning to

work within a set time period for MSDs accessing usual care. Squires et al. (2012) using this method developed a Markov model to explore long-term sickness absence due to MSDs. The data calculated for the Markov model utilised synthesised evidence from a systematic review informing NICE Public Health Guidance 19: Managing Long-Term Sickness and Incapacity for Work (2009b). The review examined the effectiveness of interventions for MSDs compared to usual care, using RTW as an outcome. Squires et al., (2012) calculated the probability of being on sick leave with usual care and going back to work (0-6-months) as 64.8%, using a weighted average of effectiveness studies. Squires et al.'s (2012) calculations and the calculations presented in this research have limitations due to the evidence-base from which they are constructed. The quality of the research in this field is generally poor (Squires et al., 2012); none of the included studies are based within the UK; and due to the lack of long-term follow-up data, assumptions were made by Squires et al. (2012). Both methodologies relied on a limited evidence-base. This research's findings (81.74% and 50.96%) are in line with those of Squires et al. (2012) (64.8%). Although these initial findings are positive, and add to the evidence-base, there is still a need for further empirical research to confirm the existing findings within the literature.

Looking at the sickness absence data for > 6-months, there was insufficient data available to calculate the net effectiveness of VR interventions. Squires et al. (2012) used a mean estimate of 2.3% likelihood of returning to work between 6 – 12 months due to MSDs (DWP, 2005, cited in Squires et al., 2012). This mean however, was not from a meta-analysis of the research, it was based on the DWP's (2005) statistics for incapacity benefit and severe disablement allowance, which is a different population to the population of this study i.e. employed individuals. Moreover, the data are from 2005, making their generalisability to the UK today questionable. The only cautious conclusion that can be made is that previous literature has not demonstrated an effect on long-term sickness absence. As a result, in this study, for long-term sickness absence due to MSDs deadweight was calculated as equal to the impact of the intervention.

In reviewing the literature for the outcome 'sickness absence due to mental health conditions < and > 6-months', the lack of homogeneity in reporting outcomes resulted in the inclusion/exclusion criteria being revised. With this revision four studies were examined in detail (van Oostrom et al., 2010; Noordick et al., 2013; Schene et al., 2007; Blonk et al., 2006). From the included studies,

two studies (Blonk et al., 2006; Schene et al., 2007) reported significant improvement with the addition of VR elements, whereas the other two studies (Van Oostrom et al., 2010; Noordik et al., 2013) had no significant differences in favour of the VR intervention. This inconsistency is evident throughout the literature on mental health and workplace interventions (Vogel et al., 2017; Nieuwenhuijsen et al., 2014; Kroger et al., 2013; Rebergen et al., 2009; Hees et al., 2013) with a Cochrane review concluding that although workplace interventions may reduce the length of the first episode of sickness absence due to mental health conditions, the sustainability of this RTW is variable, and there is “no evidence of a considerable effect of workplace interventions on time to RTW in workers with mental health problems” (Van Vilsteren et al., 2015, p.2). This lack of consensus in the literature could be due to the variety of conditions falling under the mental health umbrella, as well as the variety of workplace interventions considered within reviews. This highlights the need for a structured approach when evaluating the impact of VR interventions. Considering the reference and intervention cases, it is acknowledged that the effectiveness of VR in reducing sickness absence due to mental health conditions is inconclusive. Furthermore, a recent RCT with an economic evaluation alongside indicated that a participatory, supportive work programme for employees with mental health conditions was not economically viable (Lammerts, Van Dongen, Schaafsma, van Mechlen & Anema, 2017). Although there is a body of evidence supporting the concept of good work being good for your health (Taylor et al., 2017; Waddell et al., 2008), which would lead one to conclude that VR would have positive benefits on employees mental health, at this point the only cautious conclusion that could be made for the development of the CBA tool was that the intervention will not have an effect. This may change as the evidence-base expands. The CBA tool in this study assumes that the deadweight equals the impact of the intervention. When this assumption was subjected to a sensitivity analysis it highlighted that this assumed assumption is very cautious. The findings from the literature show values of -45%, 0%, 30% and 31%. As the evidence-base develops these results will be refined, allowing for further development of the CBA tool.

The literature review for turnover produced similar results with no studies meeting the inclusion criteria. Although there is a consensus that workplace interventions aimed at improving health of individuals may decrease turnover (Alexander et al., 2017; Black & Frost, 2011; Boorman, 2009; Cancelliere et al., 2011; Knapp et al., 2011) the studies exploring this topic are of low

methodological quality and further research is needed to form robust conclusions (Oakman et al., 2016; Baxter et al., 2015; Palmer et al., 2012; Dewa et al., 2015; van Vilsteren et al., 2015; Nieuwenhuijsen et al., 2014; Schaafsma et al., 2013). Although, the evidence for the net effectiveness of VR is inconclusive, for the purposes of this CBA tool, it was deemed reasonable to assume a net positive effect. In this CBA tool, deadweight equals zero. This may introduce bias and was further explored by running a sensitivity analysis on the CBA tool results. The sensitivity analysis indicated that the deadweight percentage for turnover influenced the overall results and needs to be explored in scenario analysis when using the CBA tool to ensure that the robustness of the results.

Considering presenteeism, the results of the literature search were insufficient for the purposes of identifying a reference and intervention case. The presenteeism outcomes were heterogeneous, limiting comparability; the studies primary aims were mainly to promote health as opposed to reducing presenteeism; workability, work performance and working role function were interpreted as a measure of presenteeism (Baker & Aas, 2012); and results were presented as a combination of lost time due to absenteeism and presenteeism, limiting the ability to distinguish presenteeism levels in the control and intervention. These limitations are partly due to the fact that presenteeism is a relatively new concept (Baker & Aas, 2012) as well as the fact that there is presently no consensus on the best way to measure it (Krol et al., 2013; Brooks et al., 2010; Terry & Min, 2010). De Graaf et al. (2012) using a face-to-face survey and the WHO Disability Assessment Schedule (n = 6646) in the Netherlands, estimated the number of days lost to sickness absence and sickness presenteeism associated with common mental and physical disorders. De Graaf et al. (2012) concluded that in addition to sickness absence, on average, an individual with a mental health condition would have an additional 8.0 days of reduced-qualitative functioning, and those with physical disorders an additional 3.5 days of reduced-qualitative functioning. These days of reduced-qualitative functioning, could then be costed on hourly wages, a method of quantifying presenteeism that is commonly used, and used within this research. However, Schultz et al. (2009) raise the question as to whether those individuals are 0% productive during those hours. Additionally, Vingard et al. (2004), cautions the conclusion that presenteeism is necessarily negative for employees and employers, stating that there is insufficient evidence to demonstrate decreased work performance, additionally, presenteeism may be preferable to the employee and

employer, as the structure of the workplace has been shown to assist recovery from certain ill-health conditions (Cocker et al., 2014). Bearing this debate in mind, there was limited evidence to enable robust conclusions to be made on reference and intervention cases. The only cautious conclusion that could be made was that the intervention will not have an effect. As the evidence-base develops these results will be refined, further developing the CBA tool.

In addition to identifying the intervention and reference case, the net effectiveness and calculating the deadweight, the unit costs of each outcome needed to be ascertained. Considering sickness absence costs, it is commonly accepted that sickness absence is a measure of productivity (Kigozi et al., 2016; Uegaki et al., 2011; Krol et al., 2013). However, there is inconsistency within the literature with economic evaluations using various methods of calculating sickness absence (Kigozi, et al., 2016; Krol et al., 2013; Uegaki et al., 2011). The most commonly used approach is the human capita (HC) approach which estimates the loss of production due to absence, and the expected or potential earnings lost (Kigozi et al., 2016; Stromberg et al., 2017; Rost et al., 2014). The HC approach may over or underestimate the cost of sickness absence (van Dongen et al., 2014; Jo, 2014; Rost et al., 2014), however compared to the friction costs (FC) approach, an approach attempting to quantify the loss of production over time, requiring a large amount of data, it is a simple wage calculation (Jo, 2014; Lensberg et al., 2013). The HC approach was used within this research. Presenteeism costs were estimated to cost between 1.8 and 5.1 times the cost of absenteeism (Brown et al., 2014; Sainsbury Centre for Mental Health, 2007), with the cost per employee estimated at £605 (Sainsbury Centre for Mental Health, 20017; CIPD, 2008). The HC and FC debate identified when considering the measurement of sickness absence pertains to the measurement of presenteeism (Schultz et al., 2009; Kigozi et al., 2016). The FC approach is seldom used in the calculation of presenteeism costs (Kigozi et al., 2016). As turnover costs are seldom recorded by organisations (CIPD, 2014b) an estimate was necessary for the CBA tool. The estimates in the literature ranged from £7750 (CIPD, 2013; CIPD, 2014b) to £30,614 (ERS Research and Consultancy, 2016) per employee. An average of the estimates in the literature was calculated and used as an estimate of turnover costs per employee, estimated to be £16,663.

As is seen from the reference and intervention cases, and unit costs, developed for sickness absence due to MSDs and mental health conditions, turnover and presenteeism, the evidence-base in this

field is limited. This necessitated assumptions on variables within the CBA tool to be made, which are described in the methodology. Moreover, these limitations resulted in the cautious conclusion being drawn that VR interventions will not have an effect on presenteeism and sickness absence due to mental health. The limited evidence is to be expected in a newly emerging field, and as the literature develops, these conclusions will be refined. Although the CBA tool has constraints due to the limited evidence, if data had been readily available there would have been no need for the tool (Pilgrim et al., 2008). In order for the cost effectiveness of VR to be studied there needs to be a suitable model, and this research is forming the ground work for future analyses of VR cost benefits.

5.6 Objective 3: To collect the relevant data required to populate the revised practical CBA tool, from two VR services and the organisations to which VR is provided.

As objective 3 sought to collect data for the first VR specific CBA tool, it was necessary to initially establish that the services evaluated in the two organisations were incorporating VR approaches. From the literature discussed in chapter 1, it was seen that VR is a term commonly misunderstood (Langman, 2012). There are a range of: definitions of VR (DWP, 2004; VRA, 2013; Waddell et al., 2008; Langman, 2012; Fadyl, McPherson, Nicholls, 2015; Nice, 2009b); practitioners of VR (Langman, 2012); and a debate as to the similarities and differences between VR and OH (Frank, 2013; O'Donnell & Reymond, 2009). This diversity creates difficulties in establishing whether a service is actually a VR service. From synthesising the evidence-base for VR, it was hypothesised in this research that a best practice approach of VR within the workplace, for common health conditions, would consist of the following elements: workplace based interventions, case management, early intervention, a stepped-care approach, multi-disciplinary work-focused rehabilitation and accommodating workplaces, allowing for the implementation of early RTW and temporary modified work arrangements (Coleman et al., 2013; Dubbin et al., 2012; Accident Compensation Corporation, 2004, cited in Ellis et al., 2010; Schaafsma et al., 2010; Lambeek et al., 2010; Boorman, 2009; Waddell et al., 2008, Irving et al., 2004). When comparing organisation 1 to the identified best practice for VR interventions, it fell into the remit of a VR service as it followed best practice with respect to ensuring early intervention, liaising with the workplace to implement workplace accommodations and rehabilitation was work focused. However,

organisation 1's VR service did not use a formalised step care approach, nor did the service consist of a multi-disciplinary team. Organisation 2 was also lacking a multi-disciplinary team and did not facilitate early access to treatment. It did follow a clear stepped-care approach, uses a case management model, and liaises with the workplace to implement temporary work modifications to facilitate an early RTW. Organisation 1 and 2 can be identified as meeting the requirements of a VR service.

The primary outcomes to be used in the CBA tool were those identified in phase 1 of the research project. Organisation 1 explored sickness absence levels using data provided from an electronic database. The secondary outcomes collected as part of the wider VR service evaluation in organisation 1, not to be used within the CBA tool, were psychological distress using the GHQ-12 (Goldberg, 1972), job satisfaction using the JSS (Warr et al., 1979) and patients' functional ability using the PSFS (Stratford et al., 1995). Organisation 2's primary outcomes to be used in the CBA tool were sickness absence and turnover. In addition, presenteeism using the Work Limitations Questionnaire (Lerner et al., 2001), and sickness absence from a self-report questionnaire (Work Limitations Questionnaire Work Absence Module) (Lerner et al., 2001) were collected and planned to be used within the CBA tool, however insufficient participants (n=3) rendered this unfeasible. The secondary outcome collected in organisation 2, as part of the wider VR service evaluation, was Quality of Life using the EQ-5D-5L (EuroQol Group, 1990). In organisation 1, sickness absence data was provided by the organisation from the electronic sickness absence records. However, inaccuracies in the data were noted, presumed to be due to human error. Additionally, when considering the potential uses of the CBA tool, both for VR services and organisations, it was considered that VR services may not always have the ability to access organisational sickness absence data. In order to overcome this problem, in organisation 2, two methods of collecting sickness absence were used. The first approach was, as in organisation 1, obtaining sickness absence from the organisations central database, which again was anecdotally reported to have inaccuracies due to the time-consuming nature of entering sickness absence data, and managers not entering all absences. The second was via self-report (WLQ sickness absence module (Lerner et al., 2001)). Self-reports have been reported to have accuracy for recall up to three months prior to completing the self-report (Zhang et al. 2012, cited in Krol et al., 2013). However, due to the low number of participants self-reported sickness absence was not included in the CBA tool.

The primary outcome data collected from VR organisation 1, and used within the service evaluation, indicates that attending the VR Service led to a decrease in employee psychological distress (n = 62), participants' dissatisfaction with work (n = 34), and their identified functional limitations (n = 27) which is positive. This improvement was maintained at 3-months follow-up. However, the limitations of the study, namely; the high number of drop-outs, lack of comparator control group, possible bias due to the clinician handing out and collecting the questionnaires, and the minimal 6-month data, mean that no comment can be made on the sustainability of the improvements beyond three months, and although positive the generalisability of these results are questionable. The secondary outcome data, used within the CBA tool, was collected from the electronic staff record. Sickness absence due to MSDs highlighted a significant ($p = 0.009$) decrease in the mean number of sickness absence days, and associated costs, from 12-months pre to 12-months post VR. This data was collected for a larger number of participants (n=127), increasing the strength of this positive finding.

Organisation 2 failed to recruit sufficient participants (n = 3). This was noted during the study and was raised a number of times during the recruitment phase, via email, telephone calls and face to face meetings with the individuals responsible for recruiting participants and collecting the data. In spite of this the measures proposed during these interactions did not increase participation. Due to the low number of participants (n = 3) in organisation 2, no analysis was conducted on the primary outcome data. As in organisation 1, organisations 2's secondary outcome data provided on sickness absence days and cost for MSDs (n = 9) showed a decrease from 3-months pre to 3-months post VR. Although again these findings were positive, due to the small numbers and the lack of a comparator group, these results need to be read with caution and cannot be generalised to all individuals accessing the VR service. Interestingly, sickness absence due to mental health conditions and 'no reasons' were greater following the VR referral than before. Although again based on a small number (n=34), and with only a 3-month follow-up period, these findings support the literature's ambiguity over the effectiveness of VR for mental health conditions. This finding, along with the findings from the literature review highlights the need for research and development of VR interventions for employees with mental health conditions.

It is recommended that intervention evaluations contain an economic analysis to ensure the appropriate allocation of resources (Rabarison, Bish, Massoudi and Giles, 2015; NICE, 2013a; NICE, 2012; HM Treasury, 2011; MRC, no date). Yet, the evidence-base regarding the cost-effectiveness of VR for the SAW population is limited. The challenges experienced in this research sheds light on some of the difficulties in evaluating VR for the SAW population and may be extrapolated further to explain why the evidence-base in VR is poor. In order to inform future research in this field, it is necessary to reflect on the pragmatic challenges encountered in this research and consider possible solutions. Recruitment was a challenge encountered in organisation 2. Recruitment is a common challenge to research projects (Newington & Metcalfe, 2014; Kaur, Smyth & Williamson, 2012; Steinke, 2004). This challenge is particularly evident when exploring sensitive topics (Steinke, 2004; Doloriert & Sambrook, 2009; Lee, 1999). Although the definition of sensitive topics is debated (Elmir, Schmeid, Jackson & Wilkes, 2011; Lee, 1999), in the broadest sense it can be identified when considering whether the research poses a risk or threat to the participant or researcher (Fahie, 2014; Lee, 1999). The threat may be intrusive such as exploring private or stressful areas, potentially stigmatising or incriminating to the participants, or political, i.e. considering the vested interested of organisations or powerful people (Fahie, 2014; Lee, 1999). This study's research topic could potentially be viewed by the participants as a sensitive topic, both from an internal and political viewpoint. Sickness absence and disability are stressful topics for affected individuals, and as employees were referred to the VR service by their managers, the research could be viewed by the employees to be in the interests of the employer/organisation as opposed to the participants. These perceived potential conflicts of interest may explain the poor recruitment.

In addition to the recruitment challenges in organisation 2, challenges in collecting meaningful data were encountered in both organisations. Organisation 1 had a large loss to follow-up, in both the primary and secondary data. It was hypothesised that this may have been a result of a change of clinician mid-way through the evaluation and the organisation undergoing major transformation. Moreover the question is raised as to whether the battery of questionnaires used needs to be streamlined in order to encourage completion. In organisation 2, the secondary data provided was of poor quality. The sickness absence and VR service data were provided by two different internal recording systems, this resulted in a mismatch of dates consequently reducing the number of cases

analysed. The challenges of conducting systematic research in organisations are well documented (Giga, Cooper & Faragher, 2003; Olsen et al., 2008) and the challenges encountered in this research could in part explain why the evidence-base is so poor. Moving forwards there is a need to identify simple solutions to enhance data collection in VR evaluations.

Although both studies had data collection challenges leading to low numbers, possibly highlighting the sensitive nature of the research topic and inherent difficulties in collecting the data needed for economic analyses, these results further substantiate and add to the existing UK evidence-base that VR is an effective intervention for MSDs (Dibben et al., 2012; Black, 2008; Waddell et al., 2008). However, effectiveness does not necessarily equate to cost-effectiveness, which was further explored in phase 3 (objective 4) of this research.

5.7 Objective 4: To implement and test the revised practical CBA tool incorporating the developed outcomes to identify the cost-benefits of the VR interventions and services in a real-world setting

Phase 3 was reliant on the data collected from the organisations in phase 2.

Although there are a number of economic analysis tools, when weighing up the benefits and limitations of the different models in relation to VR, a CBA tool was chosen. A CBA tool allows for the comparison of any intervention/programme regardless of whether it is focused on health or non-health outcomes or has different underpinning goals (Gray, 2011; House, 1998). VR services are by the nature of the definition of VR varied in the services they provide, the interventions they use, the populations they target and the practitioners delivering the service. This heterogeneity in the provision of VR services is a limiting factor in developing the evidence-base, thus the development of a user-friendly CBA tool for VR services, would facilitate comparison between services and identification of what elements of VR are effective. Moreover, it is often difficult to have a comparison group within VR interventions, thus a CBA tool with deadweight incorporated negates this need. These two elements of this CBA tool make this an ideal economic analysis to further the evidence-base in VR.

The refined CBA tool was based on an organisational perspective i.e. looking at the costs and benefits to the host organisation purchasing the VR intervention. The CBA tool for organisation 1 indicates that the economic costs are greater than the benefits (BCR = 0.05). Whereas for organisation 2, the results indicate that the economic benefits outweigh the costs (BCR = 1.17). Organisation 1's CBA tool did not include the outcome 'turnover' as during the research time period the organisation underwent major restructuring with a high number of redundancies. Interestingly, if turnover had not been included in organisation 2's CBA tool, then the economic costs would also have outweighed the benefits, resulting in a BCR less than 1. This seems to indicate that turnover plays an important role when assessing the economic effectiveness of VR services, although further research would be needed to establish this. In addition, there was a question surrounding the accuracy of the data provided for Organisation 1 that may also account for the differences in the BCRs between the organisations. This highlights the need for there to be consolidation and standardisation of the data that is collected on work outcomes, as this type of standardisation will enable the evidence of what works for whom, and the associated costs to be further developed (Bartys et al., 2017). The results from the CBA tool for organisation 2, add to the existing UK evidence-base on the cost-effectiveness of VR, although it is necessary to take into account the limitations highlighted.

When conducting a sensitivity and scenario analysis for organisation 1, it was seen that the BCR did not vary greatly when adjusting the variables up or down by a set percentage. For the outcome 'sickness absence > 6-months' varying deadweight did not change the BCR. This was due to it been a single case in the organisation for that outcome. Deadweight was based on the net effectiveness of VR interventions, determined from the mean differences between the post sickness absence data of the intervention and control groups in the underpinning literature. A very small sample size would not be representative of the mean and would produce skewed results. This finding illustrates that the CBA tool is not valid when using very small sample sizes. In organisation 2, varying the net effectiveness and consequently the deadweight resulted in changes to the BCR from above 1 to below 1, indicating that the deadweight variable has a large influence on the results. Deadweight is based on the net effectiveness, which in this research was determined from the literature, highlighting the need for the underpinning evidence-base to be robust, valid and reliable. From the sensitivity and scenario analysis it can be concluded that the variables,

except deadweight, used in the CBA tool are robust, as the BCR does not vary greatly when adjusting them by a set percentage (Pilgrim et al., 2008; Pannell, 1997; Keating & Keating, 2014; Snell, 2011, CEEU, 2011). As changing the key assumptions and uncertainties around the net effectiveness and deadweight changed the results, one cannot say with certainty that the results are illustrative of the truth (Pilgrim et al., 2008; Pannell, 1997; Keating & Keating, 2014; Snell, 2011, CEEU, 2011). However, even though the results are sensitive to the value inputted to determine deadweight, the results are in line with Squire et al.'s (2012) estimate.

Additionally, the indirect benefits to staff members attending the VR service were not included in the CBA, which although there was a justification for their inclusion, when presenting the results of the CBA tool, the additional potential costs and benefits must be mentioned, allowing the reader of the results, to form their own conclusion. It can be hypothesised that, if the indirect savings not accounted for within the CBA tool were included, the BCR might change. Moreover, due to insufficient data the HC approach was utilised for calculating the costs of sickness absence which may have either under or overestimated the costs of sickness absence (Krol et al., 2013, Rost et al., 2014). As this CBA tool is a decision-making aid, other considerations need to be highlighted to the users of the CBA tool.

Through implementing and testing the new CBA tool a number of strengths and weaknesses were identified. The strengths highlighted include the ability of the tool to compare different VR services with different underpinning service designs; to incorporate a number of health and non-health related outcomes; and to evaluate the costs and benefits of a VR service without the need for a control group. The weaknesses identified when implementing the model are that there are a number of benefits of VR that cannot be monetised which may lead to incorrect conclusions; the limited evidence-base prevented robust conclusions being drawn, weakening the assumptions within the CBA tool; and the difficulties in collecting data to input into the model, which may impact on the validity of the results.

Notwithstanding the small sample sizes, the CBA tool developed in this research is a suitable practical tool to explore the cost effectiveness of VR interventions. This research determined the most suitable outcomes, and added to the knowledge in this area by developing new reference and

intervention cases for these outcomes in line with the current evidence-base. In addition, this research tested the CBA tool in real-world settings, which highlighted the strengths and weakness of the CBA tool, and identified areas for future research. The sensitivity and scenario analysis demonstrated that the validity of the results of the CBA tool is dependent on the underpinning evidence-base. The assumptions underpinning the net effectiveness, and consequently deadweight, are based on the evidence-base sourced for this research. As deadweight is the variable that has the greatest impact on the results of the CBA tool, it is hypothesised that as the literature base for VR develops, this CBA tool will adjust accordingly, increasing its validity.

5.8 Objective 5: To appraise the value of the revised practical CBA tool to the VR provider and the organisation to which VR is provided.

Phase 4 addressed objective 5 through conducting a focus group.

The participants of the focus group highlighted that there is currently no similar CBA tool available, as supported by the literature. They were enthusiastic about the tool and its potential. The participants felt that this tool would be beneficial for VR services in a number of ways. They were of the opinion that it would be useful in marketing and building customer relationships, as it would enable them to have conversations with future and existing customers around the costs and benefits of VR. However, this use of the tool would only be realised if the results supported their marketing agenda. No focus group was conducted with Organisation 1. Organisations 1's results did not show a positive cost benefit ratio and therefore their thoughts on the uses of the CBA tool might have differed. Organisation 2 thought that the results from the CBA tool would facilitate service design through assisting in identifying where to focus their resources. It is anticipated that this would be a potential benefit of the tool for Organisation 1, as although the findings were negative they could be further explored to see how the service design/delivery could adapt to improve the cost benefits of the service. Organisation 2 believed that it would add a useful dimension to a package of measures incorporating findings from employee satisfaction surveys, or data about employee engagement. This is supported by the literature which situates economic models as part of the decision-making process, as opposed to providing the full picture (Cox, 2011; Keating & Keating, 2014; Snell, 2011; Sculpher et al., 2006). The participants found the CBA tool user-friendly, and

were able to input the necessary data and understand the results produced. The participants expressed concerns regarding the collection of the data and suggested an aide memoir would assist.

The participants suggested a number of further developments for the CBA tool, including highlighting the ‘hidden’ benefits and costs of VR within the CBA tool. Whilst the need to consider ‘hidden’ costs and benefits is widely accepted (Cagno, et al., 2013; Oxenburgh & Marlow, 2005; Barham & Begum, 2005; Bevan and Hayday, 2001), in previous studies that have attempted to quantify them the ratios and estimates have varied greatly (Oxenburgh & Marlow, 2005). In addition, including these in the CBA tool incurs the risk of measuring the same effect twice (Zhang, Bansbak, & Anus, 2011). Thus, it is recommended that each organisation derive the hidden costs specific to them (Oxenburgh & Marlow, 2005), and include them as an adjunct to the CBA tool.

The participants also mentioned that a CBA tool including a wider range of causes of sickness absence would help to create a more comprehensive picture of the costs and benefits of VR. The CBA tool developed within this research was focused on MSDs and mental health conditions, as they were the most common causes of sickness absence when the research commenced and in 2014 MSDS were the reason for the greatest loss of work days (ONS, 2014). Moreover, MSDs and mental health conditions are leading causes of global disability (Joyce et al., 2015; Hoy et al., 2014). Therefore, it is anticipated that the greatest cost savings would result from targeting these two conditions. However, other conditions causing long-term sickness absence such as cancer and stroke are commonly addressed by VR and as the model develops these would be useful outcomes to include. The participants queried whether the CBA tool could be tailored to different industries; however, currently the limited evidence-base does not facilitate this. Notwithstanding this, the CBA tool does allow the users to insert their own costs of sickness absence, and as the net effectiveness of VR interventions is used within the CBA tool to calculate the deadweight (i.e. what % of people would RTW without the intervention) it limits the effect of different populations on the result; rendering the CBA tool appropriate to be used across industry types. Lastly, the participants suggested useful structural changes to the CBA tool, such as including a front-end template and allowing the easy inclusion/exclusion of costs.

The potential value and ease of use of the CBA tool was clearly identified by the participants who were excited by the potential it offered. In this regard they asked if could use it (after the study period) as recompense for having taken part in the research. This is an extremely positive endorsement of the tool, although their enthusiasm needs to be countered by the small sample size (Litosseliti, 2003; Morgan, 1996), the acknowledgement that a focus group was not conducted in Organisation 1, and the fact that bias may have been introduced as the researcher was the focus group facilitator (Litosseliti, 2003; Morgan, 1996).

6. Conclusion and recommendations

This chapter concludes the research study, by summarising the key findings and putting forward recommendations for future research and practice. The limitations of this research are acknowledged, and suggestions for future work are included.

6.1 Summary of the research

The cost effectiveness of VR within the workplace, focusing on assisting individuals to SAW, is not established within the literature. This lack of evidence is a barrier to the implementation of VR within the UK and internationally, as in the UK's current economic climate it is imperative for organisations to be able to consider the costs and benefits of their investments. To my knowledge there is no academically robust CBA tool available within the UK to measure the costs and benefits of VR services. This research commenced with the objective of identifying and creating a practical CBA tool that would enable the cost effectiveness of VR within the UK to be established within the evidence-base, and that could used in a non-academic setting i.e. by organisations themselves. This research provides the foundations required to establish the cost effectiveness of VR services within the UK.

The research went through a series of phases, identifying the deadweight and costs of included outcomes i.e. sickness absence due to MSDs and mental health, presenteeism and turnover, culminating in the production of a CBA tool, capable of analysing the costs and benefits of the VR

service presented in organisations 1 and 2. The data used to adapt the CBA tool e.g. net effectiveness values were subjected to robustness tests in order to further ascertain the tools efficacy in evaluating VR. The sensitivity and scenario analysis tests identified that in order for the CBA tool to be able to analyse the costs and benefits of VR services samples with normal distributions are needed. Moreover, these tests identified that should the net effectiveness of VR, which was determined from the literature, become more robust, this would improve the effectiveness and robustness of the CBA tool and subsequently its use as an analysis tool. This study highlights that the CBA tool is still in its early stages of development and that further refinement will occur as the VR evidence-base improves. Ultimately this will increase its application for commercial and research purposes.

Phase 1 aimed to identify the key outcomes of VR and assimilate these into an already existing model, the GM New Economy CBA, through adapting and changing the assumptions of the model. The following outcomes: sickness absence due to MSDS, sickness absence due to mental health conditions, turnover and presenteeism; have been successfully developed and incorporated into the CBA tool. In order to achieve this, the reference and intervention cases specifically for VR interventions for each outcome were determined; this is the first time this has been done. This was achieved through flipping/using a mirror image of the usual CBA tool, which again has not been done before. Due to limitations in the evidence-base of the impact of VR on sickness absence due to mental health conditions and presenteeism, for the purpose of the CBA model deadweight was set to equal the impact of the intervention i.e. concluding that the intervention will not have an effect on mental health conditions and presenteeism.

Phase 2 aimed to collect the relevant data to input into the CBA tool and test its efficacy in evaluating VR services. This was achieved by evaluating two VR services using pre-experimental repeated-measures within-group (time series) (pre-intervention, post-intervention, 3 and 6-month post-intervention follow-up) research design, collecting primary data from the participants of the study and secondary data from the host organisation. Organisation 1's results indicated that the VR service had a significant improvement on the employees' health, as well as lowering their absence levels, however, due to the large loss to follow-up these results need to be read with caution as they may be biased and lack validity. Organisation 2 only recruited 3 participants, thus no analysis was

conducted on the primary outcomes. The secondary data provided for organisation 2 indicated that the VR service lowered sickness absence levels. These tentative findings indicate positive outcomes post attending VR services, adding to the evidence-base on the effectiveness of VR.

Phase 3 was a continuation of the proceeding work, amalgamating the outcomes developed in phase 1 with the data collected in phase 2, to implement the revised CBA tool and test its efficacy. In the application of the CBA tool, the robustness of the variables adapted in the CBA tool were tested through sensitivity analysis and scenario analysis, with the results indicating that these variables are robust with sufficient sample sizes that allow for a normally distributed sample.

Phase 4 looked at the ease of use and usefulness of the CBA tool within the commercial sector. This was ascertained through a focus group in organisation 2. The participants were enthusiastic about the CBA tool, the user-friendliness of the model, and the potential uses such as marketing and service development. The participants identified the difficulties in collecting the data to be utilised within the CBA tool, as well as identifying areas for further development/refinement of the CBA tool. However, these results need to be read with caution as a focus group was not conducted in Organisation 1, where the results were not as favourable.

6.2 Recommendations

6.2.1 For research

Through the literature review and the results obtained in phase 1 of this research it is clear that the evidence-base for cost-effectiveness of VR in the SAW population is in its infancy. Limitations noted in the evidence-base were a lack of homogeneity in the populations, conditions, interventions, and outcome measures used within VR research, an inconsistency in reporting the impact of VR on sickness absence, differing definitions of long and short-term sickness absence, a lack of comparator/control groups, and the varied definitions of VR. Moreover, it was identified that health conditions vary greatly in their impact on sickness absence, and by not exploring subsets of conditions the effect of VR may not be adequately captured or understood. In addition, the

need for solutions to enhance data collection was identified. In order to develop the evidence-base, a structured approach consisting of the following actions is recommended:

- Ensure that the VR intervention aligns with the definition of a VR approach (for further discussion on the VR approach see section 2.2.1.4), allowing a body of work on VR interventions to be developed.
- Establish a standardised set of outcome measures to be used within workplace research, considering the effectiveness and cost-effectiveness of VR interventions. This research has indicated that the following core data is needed, this could be used to inform the standardised set of outcome measures:
 - Sickness absence data for employees, separated into two groups namely: greater than and less than 6-months absence duration. Sickness absence data collected to include the cause of sickness absence, the number of work days off sick, the number of episodes, and length of episodes, during a set time period pre- and post-intervention.
 - Organisation annual turnover.
 - Presenteeism, as a measurement of how the health condition impact on their productivity, the Work Limitations Questionnaire (WLQ) (Lerner et al., 2001) is suggested as an appropriate outcome measure to capture this.
 - Costs of the VR service.
 - Number of employees referred to the VR service.
 - Number of employees attending the VR service.
 - Number of employees completing the VR intervention.
 - Total number of employees in the organisation.
 - Average salary of employees in the organisation or the cost of sickness absence per day per employee.
- Produce an evaluation guidance document that highlights the data needed and ways in which to overcome challenges in researching VR for the SAW population.
- Consider further adapting the CBA tool in order to streamline the outcome measures required, simplifying data collection.
- Review the outcome measurement tools used in order to streamline data collection.

- Produce a data collection guidance document for organisations and VR services. Outlining the data needed to effectively evaluate the costs and benefits of VR, as well as practical suggestions for service redesign to incorporate effective data collection.
- Document and report the activities underpinning VR services in order to determine which aspects of VR interventions work.
- Standardise sickness absence reporting, to facilitate meta-analysis of the literature,
- Include comparator/control groups, to facilitate attribution of results to the VR intervention.
- Analyse sub-groups of the various mental and physical health conditions, to enable a detailed exploration of the effectiveness of VR services on different mental and physical health conditions.
- Further research on the effects of VR on presenteeism.
- Further research exploring the impact of VR on turnover and the link between this and the cost effectiveness of VR.

6.2.2 For practice

Through this research, it was identified that VR services do not routinely collect outcome measures that facilitate determining the cost/benefits of the service. Moreover, there are often a number of inaccuracies in the data they do collect. As the evidence-base for VR is limited, it is necessary for VR services/interventions to collect data in respect of the effectiveness of their interventions which will enable the knowledge base to grow. It is proposed that standardised outcome measures and data collection processes are built into service design and delivery, and that organisations only commission VR services collecting and evaluating core data as outlined in section 6.2.1. To ensure comparability of the VR services/interventions and evaluations it is recommended that the VR services record the specific interventions provided to clientele.

6.3 Limitations of the research

The limitations of this project are outlined and discussed in sub-categories: the methodology used, the data collected, and the CBA tool itself.

The methodology used in this research had limitations. In phase 1, the research design was influenced by the quantity and quality of the existing literature, which, as this research is in a newly emerging field, was limited. This resulted in a review/synthesis of the literature being conducted, as opposed to a meta-analysis; the gold standard. Consequently, the results and assumptions drawn must be viewed with this in mind. In phase 2, the research, participants were recruited voluntarily and convenience sampling, as opposed to a more robust method of sampling, was used. This may have resulted in a biased sample, as people with an interest in the cost effectiveness of the service may have been more motivated to participate. The pragmatic research design used in phase 2 meant that there was no comparator group; although this is allowed for within the CBA tool, it is a limitation that needs to be considered when interpreting the results. Overall, the mixed methods approach, although allowing one to build on the first three phases, thereby further exploring the usefulness of the CBA tool in VR, is limited in that the findings from phase 4 are not generalisable and the focus group was only conducted in one organisation, although it illuminates emerging themes.

Considering the data collected, in phase 2 inaccuracies were noticed in the sickness absence data provided by the organisations. Additionally, the accuracy of the primary outcome data collected by the clinician in organisation 1 was questioned due to a change of clinician part way through the project. However, the findings of the study support those of the existing evidence-base. In organisation 2 the project failed to recruit sufficient numbers, highlighting the sensitive nature of this topic area and possible bias in participants recruited.

The key limitation of the developed CBA tool is the weakness of the evidence-base underpinning the assumptions which was outside of the control of the researcher, however, this is accommodated for with the inclusion of optimism bias ratios, conducting sensitivity analysis and scenario analysis. However, in order to develop the evidence-base a CBA tool is needed. Thus, it is accepted that this is a starting point and will add to the body of knowledge by laying the foundations for future research.

6.4 Future work

Although this current body of work contributes to the limited evidence-base by providing evidence from two VR interventions and a practical, user-friendly CBA tool for the economic analysis of VR, there is scope for improvement and further development to enhance the value of the CBA tool currently developed.

During the sensitivity analysis, deadweight was identified as the variable with the most influence on the CBA tool results. Deadweight is reliant on the evidence-base on the net effectiveness of VR; however as the evidence-base is weak there is a need to further test the robustness of the deadweight variable. Future research could include alternative methods of calculating deadweight, which could then be compared and contrasted to the results in this research.

The research in this project provides a clear methodology for developing outcomes to be used in the CBA tool. This research focused on the two most common causes of sickness absence and risk of long-term disability, MSDs and mental health conditions. However, to enable the tool to capture the full impact of VR interventions from the organisational perspective future studies could use this outlined methodology to expand the scope of the model to include a number of causes of sickness absence such as cancer and long-term conditions e.g. neurological conditions and respiratory conditions. Moreover, future studies could further adapt this tool to include the costs and benefits of helping employees SAW from societal and individual perspectives.

This research outlines the core data needed to be able to use the CBA tool. These findings can inform a paper highlighting the core data to be included in research standards or guidelines.

In order to improve the commercial acceptability of the model, a front-end template could be developed. This would enable the organisation to simply enter their data on the template and produce a result, without having to see the underlying excel spreadsheet. Moreover, creating a data collection guide alongside the model would assist organisations in identifying the data needed to populate the CBA tool. Allowing organisations to build data collection into their service design, with the aim to improve the accuracy of the data collected, as well as increase participation.

The following articles are planned to be written:

- 1) Is VR an essentially contested concept (paper in preparation)
- 2) Development of a CBA tool capable of analysing the effects of VR for the SAW population
- 3) Core data needed to establish the cost-effectiveness of VR interventions

6.5 Conclusion

The work within this research project overhauled an existing CBA model and its underlying assumptions, using a mirror image of the traditional CBA model to develop the model specifically for VR services. These activities resulted in a practical, user-friendly CBA tool, based on academic rigour, capable of analysing the cost benefits of VR services for employed individuals. The cost-effectiveness literature in the VR field is limited and there is no CBA tool within the UK for VR. A need has been identified for a tool that can be easily used within the commercial world, for organisations to assess the worth of their investments and to inform service developments within VR services, and within the research world to enable research into the costs and benefits of VR for the employed population, increase the comparability of research findings, and to help determine within the heterogeneity of the VR services which elements/services have the greater economic return. This tool is the first step towards meeting this identified need and lays the foundations for further research in this field.

7. References

- Abasolo, L., Blanco, M., Baciller, J., Candelas, G., Collado, P., Lajas, C., ... Jover, J.A. (2005). A health system proma to reduce work disability related to musculoskeletal disorders, *Annals of Internal Medicine*, 143, 404-414.
- Adler, A., & Seligman, M. E. P. (2016). Using wellbeing for public policy: Theory, measurement, and recommendations. *International Journal of Wellbeing*, 6(1), 1-35. doi:10.5502/ijw.v6i1.429
- Aghdasi, S., Kiamanesh, A. R., & Ebrahim, A.N. (2011). Emotional intelligence and organisational commitment: testing the mediatory role of occupational stress and job satisfaction. *Procedia - Social and Behavioral Sciences*, 29, 1965-1976.
- Ahuja, M.K, Chudoba, K.M., Kacmar, C.J., McKnight, D.H., & George, J.F. (2007). IT road warriors: balancing work-family conflict, job autonomy, and work overload to mitigate turnover intentions. *MIS Quarterly*, 31(1), 1-17.
- Akl, E.A., Briel, M., You, J.J., Sun, X., Johnston, B.C., Busse, J.W., ... Guyatt, G.H. (2012). Potential impact on estimated treatment effects of information lost to follow-up in randomised controlled trials (LOST-IT): systematic review. *British Medical Journal*, 344, e2809. doi: <https://doi.org/10.1136/bmj.e2809>
- Alexander, L. Cooper, K., & Mitchell, D. (2017). Effectiveness of vocational rehabilitation on work participation in adults with musculoskeletal disorders: an umbrella review. *Physiotherapy*, 103(1), e146-e147. <https://doi.org/10.1016/j.physio.2017.11.142>
- Allebeck, P., & Mastekaasa, A. (2004). Chapter 3. Causes of sickness absence: research approaches and explanatory models. *Scandinavian Journal of Public Health*, 32(36). doi: 10.1080/14034950410021835

Alter, C.L., (2009). Predictors of referrals for psychosocial services: Recommendations from the Institute of Medicine Report – Cancer care for the whole patient. *Journal of Clinical Oncology*, 27(5), 659-660.

Anderson, R., & Hardwick, R. (2016). Realism and resources: towards more explanatory economic evaluation. *SAGE*, 22(3), 323 -341. <https://doi.org/10.1177/1356389016652742>

American College of Occupational and Environmental Medicine (2006). ACOEM guidance. Preventing needless work disability by helping people stay employed. *Journal of Occupational and Environmental Medicine*, 48(9), 972-985.

Amick, B.C., Lee, H., Hogg-Johnson, S., Katz, J.N., Brouwer, S., Franche, R-L., & Bultmann, U. (2017). How do organisational policies and practices affect return to work and work role functioning following a musculoskeletal injury? *Journal of Occupational Rehabilitation*, 27(3), 393-404.

Arnetz, B.B., Sjogren, R., Rydehn, B., & Meisel, R. (2003). Early workplace intervention for employees with musculoskeletal-related absenteeism: a prospective controlled intervention study. *Journal of Occupational and Environmental Medicine*, 45(5), 499-506.

Aronsson, G., & Gustafsson, K. (2005). Sickness presenteeism: Prevalence, attendance pressure factors, and an outline of a model for research. *Journal of Occupational and Environmental Medicine*, 47(9), 958-966.

Aronsson, G., Gustafsson, K. & Dallner, M. (2000). Sick but yet at work. An empirical study of sickness presenteeism. *Journal of Epidemiology and Community Health*, 54, 502–509.

Baker, N., & Aas, R.W. (2012). Critically appraised papers. Organisational leadership, health risk screening, individually tailored programs, and supportive workplace culture might reduce presenteeism. Commentary. *Australian Occupational Therapy Journal*, 59, 247-250. doi: 10.1111/j.1440-1630.2012.01019.x

Baker-McClearn, D., Greasley, K., Dale, J., & Griffith, F. (2010). Absence management and presenteeism: the pressures on employees to attend work and the impact of attendance on performance. *Human Resource Management Journal*, 20, 3.

Baptiste, N.R. (2008). Tightening the link between employee wellbeing at work and performance: a new dimension for HR. *Management Decision*, 46(2), 284-309.

Barham, C. & Begum, N. (2005). *Sickness absence from work in the UK*. London: Office for National Statistics.

Barmby, T.A., Ercolani, M.G., & Treble, J.G. (2002). Sickness absence: an international comparison. *The Economic Journal*, 112(480), F315-F331.

Barten, J.A., Pisters, M.F., Huisman, P.A., Takken, T. & Veenhof, C. (2012). Measurement properties of patient-specific instruments measuring physical function. *Journal of Clinical Epidemiology*, 65(6), 590-601.

Bartys, S., Frederiksen, P., Bendix, T., & Burton, K. (2017). System influences on work disability due to low back pain: An international synthesis of the literature. *Health Policy*, 121, 903-912. <http://dx.doi.org/10.1016/j.healthpol.2017.05.011>

Bashir, S., Syed, S., & Quershi, J.A. (2017). Philosophical and methodological aspects of a mixed-methods research: a review of the academic literature. *JSIR-MSSE*, 1(15), 31-50.

Batt-Rawden, K.B., & Tellnes, G. (2013). Social factors of sickness absences and the significance of the nature-culture interplay in coping. *Materia Socio Medica*, 25(2), 127-130. doi: [10.5455/msm.2013.25.127-130](https://doi.org/10.5455/msm.2013.25.127-130)

Baxter, S., Campbell, S., Sanderson, K., Cazaly, C., Venn, A., Owen, C., & Palmer A.J. (2015). Development of the Workplace Health Savings Calculator: a practical tool to measure economic

impact from reduced absenteeism and staff turnover in workplace health promotion. *BMC Research Notes*, 8, 457. Doi: 10.1186/s13104-015-1402-7

Beaton, D.E., Tang, K., Gignac, M.A.M., Lacaille, D., Badley, E.M., Anis, A.H., & Bombardier, C. (2010). Reliability, validity, and responsiveness of five at-work productivity measures in patients with rheumatoid arthritis or osteoarthritis. *Arthritis Care and Research*, 61(1), 28-37.

Belin, A., Dupont, C., Oules, L., Kuipers, Y., & Fries-Tersch, E. (2016). *Rehabilitation and return to work: analysis report on EU policies, strategies and programmes*. Bilbao: European Agency for Safety and Health at Work (EU-OSHA).

Bergstrom, G., Bodin, L., Hagberg, J., Aronsson, G, & Josephson, M. (2009). Sickness presenteeism today, sickness absenteeism tomorrow? A prospective study in sickness presenteeism and future sickness absenteeism. *Journal of Occupational and Environmental Medicine*, 51, 629–638.

Bevan, S. & Hayday, S. (2001). *Costing sickness absence in the UK*. Brighton: The Institute for Employment Studies.

Bevan, S., Passmore, E., & Mahdon, M. (2007). *Fit for Work? Musculoskeletal Disorders and Labour Market Participation*. London: The Work Foundation.

Black, C. (2008). *Working for a healthier tomorrow: Dame Carol Black's review of the health of Britain's working age population*. London: The Stationery Office.

Black, C., & Frost, D. (2011). *Health at work – an independent review of sickness absence*. London: The Stationery Office.

Blonk, R.W.B., Brenninkmeijer, V., Lagerveld, S.E., & Houtman, I.L.D. (2006) Return to work: A comparison of two cognitive behavioural interventions in cases of work-related psychological complaints among the self-employed. *Work & Stress*, 20(2), 129–44.

Bomel Limited (2005). *Occupational health and safety support systems for small and medium sized enterprises. A Literature Review*. Norwich: Health and Safety Executive Books.

Boorman, S. (2009). NHS Health and Wellbeing review: final report. Retrieved 6 April, 2010, from www.orderline.dh.gov.uk

Braakman-Jansen, L.M.A., Taal, E., Kuper, I.H., & van de Laar, M.A.F.J. (2012). Productivity loss due to absenteeism and presenteeism by different instruments in patients with RA and subjects without RA. *Rheumatology*, 51, 354-361. doi: 10.1093/rheumatology/ker371

Breakwell, G.M., Smith, J.A., & Wright, D.B. (Eds) (2012). *Research methods in psychology*. 4th Edition. London: Sage Publications.

Briggs, A.H., & Gray, A.M. (1999). Handling uncertainty when performing economic evaluation of health care interventions. *Health Technology Assessment*, 3, 2.

Briggs, A.H., & O'Brien, B.J. (2001). The death of cost-minimisation analysis. *Health Economics*, 10, 179-184. doi: 10.1002/hec.584.

British Heart Foundation & ERS Research & Consultancy (2016). Cost savings calculator. Retrieved 2 January, 2018, from <https://www.bhf.org.uk/health-at-work/get-started/cost-savings-calculator>

Brooks, A., Hagen, S. E., Sudhakar, M. S., Sathyanarayanan, S., Schultz, A. B. & Edington, D. W. (2010). Presenteeism: Critical issues. *Journal of Occupational Medicine*, 52, 1055–1067.

Brouwer, W.B.F., Koopmanschap, M.A., & Rutten, F.F.H. (1999). Productivity losses without absence: measurement validation and empirical evidence. *Health Policy*, 48, 13-27.

Brouwer, R., & Georjoui, S. (2012). Economic Evaluation: Chapter 12 in 2012 World Health Organisation (WHO). In Dufour, A.I., Bartram, J., Bos, R. & Gannon (Ed), *Animal Waste, Water Quality and Human Health*. London: IWA Publishing.

Botchkarev, A. (2016). Essential notion of health economic evaluation: definition. *Atlantic Review of Economics*. 2.

Brown, H.E., Burton, N., Gilson, N.D., & Brown, W. (2014). Measuring presenteeism: which questionnaire to use in physical activity research? *Journal of Physical Activity and Health*, 11, 241-248.

Bultman, U., Sherson, D., Olsen, J., Hansen, C.L., Lund, T., & Kilsgaard, J. (2009). Coordinated and tailored work rehabilitation: a randomised controlled trial with economic evaluation undertaken with workers on sick leave due to musculoskeletal disorders. *Journal of Occupational Rehabilitation*, 19, 81-93.

Busch, H., Bodin, L., Bergstrom, G., & Jensen, I. (2011). Patterns of sickness absence a decade after pain-related multidisciplinary rehabilitation. *Pain*, 152, 1727-1733.

Burstrom, B., Nylen, L., Clayton, S., & Whitehead, M. (2011). How equitable is vocational rehabilitation in Sweden? A review of the evidence on the implementation of a national policy framework. *Disability and Rehabilitation*, 33(6), 453-466.

Burton, J. (2010). *WHO Healthy workplace framework and model: background and supporting literature and practice*. Geneva: World Health Organisation.

Burton, W.N., Chen, C-Y., Schultz, A.B., & Li, X.M.S. (2017). Association between employee sleep with workplace health and economic outcomes. *Journal of Occupational and Environmental Medicine*, 59(2), 177-183. doi: 10.1097/JOM.0000000000000934

Butler, P. (2017). Universal Credit: why it is a problem and can it be fixed? *The Guardian*, 2nd October.

Buys, N., Matthews, L.R., & Randall, C. (2015). Contemporary vocational rehabilitation in Australia. *Disability and Rehabilitation*, 37(9), 820-824. doi:10.3109/09638288.2014.942001

Cagno, E., Micheli, G.J.L., Masi, D., & Jacinto, C. (2013). Economic evaluation of OHS and its way to SMEs: a constructive review. *Safety Science*, 53, 134-152.

Cancelliere, C., Cassidy, D.J., Amendolia, C., & Cote, P. (2011). Are workplace health promotion programmes effective at improving presenteeism in workers? A systematic review and best evidence synthesis of the literature. *BMC Public Health*, 11, 395.

Cambridgeshire and Peterborough NHS Foundation Trust (2013). Stepped Care Recovery models. Retrieved 28 December, 2017, from <http://www.cpft.nhs.uk/professionals/stepped-care-model.htm>

Cameron, R., & Molina-Azorin, J.F. (2011). The acceptance of mixed methods in business and management research. *International Journal of Organisational Analysis*, 19(3), 256-271.

Campion, M.A. (1991). Meaning and measurement of turnover: Comparison of alternative measures and recommendations for research. *Journal of Applied Psychology*, 76(2), 199-212.

Carroll, C., Rick, J., Pilgrim, H., Cameron, J., & Hillage, J. (2009) Workplace involvement improves return to work rates among employees with back pain on long-term sick leave: a systematic review of the effectiveness and cost-effectiveness of interventions. *Disability and Rehabilitation*, 32(8), 60-621.

Cavallo, D. (2006). Using return on investment analysis to evaluate health promotion programs: challenges and opportunities, RTI-UNC Centre of Excellence in Health Promotion. *Economics*, 1(3), 1-4.

Central Expenditure Evaluation Unit (CEEU) (2011). Guide to economic appraisal: carrying out a cost-benefit analysis, The Public Spending Code, standard analytical spending procedures. Retrieved from <http://publicspendingcode.per.gov.ie/wp-content/uploads/2012/08/D03-Guide-to-economic-appraisal-CBA-16-July.pdf>

Centre for Mental Health (2011). *Managing presenteeism: a discussion paper*. London: Business in the Community.

Centre for Workforce Intelligence (2012). MAC shortage occupation list update: Healthcare profession submission 2012. Retrieved 30 November, 2014, from <http://www.cfwi.org.uk/publications/mac-shortage-occupation-list-update-healthcare-profession-submission-2012/>

Charles, H., S., Jr. (2001). Ethical climate's relationship to job satisfaction, organisational commitment, and turnover intention in the salesforce. *Journal of Business Research*, 54(1), 39-52.

Chartered Institute of Personnel and Development (CIPD) (2008). *Absence management: annual survey report*. London: CIPD.

Chartered Institute of Personnel and Development (CIPD) (2010). *Annual survey report: Absence Management*. London: CIPD.

Chartered Institute of Personnel and Development (CIPD) (2011). *Annual survey report: Absence Management*. London: CIPD.

Chartered Institute of Personnel and Development (CIPD) (2012). Press office. Fall in absence levels could be masking deeper problems in the workplace. Retrieved 12 April, 2015, from <http://www.cipd.co.uk/pressoffice/press-releases/fall-absence-levels-could-masking-deeper-problems-workplace-091012.aspx>

Chartered Institute of Personnel and Development (CIPD) (2013). *Resourcing and talent planning: annual survey report*. London: CIPD.

a) Chartered Institute of Personnel and Development (CIPD) (2014). *Absence management, annual survey report*. London: CIPD.

b) Chartered Institute of Personnel and Development (CIPD) (2014). *Employee turnover and retention: factsheets*. London: CIPD.

Chartered Institute of Personnel and Development (CIPD) (2015). *Absence management, annual survey report*. London: CIPD.

Chartered Institute of Personnel and Development (CIPD), & Simply Health (2016). *Annual survey report: absence management 2016*. London: CIPD.

Chartered Society of Physiotherapy (CSP) (2014). EQ-5D-5L. The Quality of Life Questionnaire. Retrieved 7 March, 2015, from <http://www.csp.org.uk/professional-union/practice/your-business/evidence-base/outcome-experience-measurement/eq-5d-5l>

Chatman, A.B., Hyams, S.P., Neel, J.M., Stratford, P.W., Schomberg, A., & Stabler, M. (1997). The patient-specific functional scale: measurement properties in patients with knee dysfunction. *Physical Therapy*, 77(8), 820-829.

Chatterji, M., & Tilley, C.J. (2002) Sick leave, absenteeism and sick pay. *Oxford Economic Papers*, 54, 669–687.

Cho, J. Y., & Lee, E-H. (2014). Reducing confusion about grounded theory and qualitative content analysis: Similarities and differences. *The Qualitative Report*, 19(64), 1-20. Retrieved from <http://www.nova.edu.salford.idm.oclc.org/ssss/QR/QR19/cho64.pdf>

Choi, N. & Majumdar, S. (2014). Social entrepreneurship as an essentially contested concept: opening a new avenue for systematic future research. *Journal of Business Venturing*, 29, 363-373.

Citizens Advice Bureau (CAB) (2010). Not working. CAB evidence on the ESA work capability assessment. Retrieved from https://www.citizensadvice.org.uk/global/migrated_documents/corporate/not-working-march-2010-final.pdf

Citizens Advice Services (2015). *The value of the citizens advice service: our impact in 2014/2015*. UK: The National Association of Citizens Advice Bureau.

Claes, R. (2011). Employee correlates of sickness presence: A study across four European Countries. *Work & Stress*, 25(3), 224-242.

Clayton, S., Gosling, R., Povall, S., Missio, K., Bambra, C., & Whitehead, M. (2010). *Assembling the evidence jigsaw: insights from a systematic review of UK studies of return to work initiatives for disabled and chronically ill people*. Social Policy Association Annual Conference, University of Lincoln. Retrieved 29 April, 2011, from <http://www.social-policy.org.uk/lincoln/Clayton.pdf>

Cleland, J.A., Fritz, J.M., Whitman, J.M., & Palmer, J.A. (2006). The reliability and construct validity of the Neck Disability Index and patient specific functional scale in patients with cervical radiculopathy. *Spine*, 1(5), 598-602.

Cochrane (no date). Unit 9: Synthesising the evidence. Retrieved 25 January, 2018, from [https://ph.cochrane.org/sites/ph.cochrane.org/files/public/uploads/Unit %20Nine.pdf](https://ph.cochrane.org/sites/ph.cochrane.org/files/public/uploads/Unit%20Nine.pdf)

Cocker, F., Nicholson, J.M., Graves, N., Oldenburg, B., Palmer, A.J., Martin, A., ... Sanderson, K. (2014). Depression in working adults: comparing the costs and health outcomes of working when ill. *PLoS ONE*, 9(9), e105430. doi:10.1371/journal.pone.0105430

Cockburn, L., & Kirsh, B. (no date). Does the model matter? A review of literature on vocational outcomes for consumers of mental health services: project summary. Retrieved 2 February, 2014, from http://www.cotfcanada.org/documents/critical_reviews/CLR1.pdf

College of Occupational Health Therapists (2008). *The College of Occupational Therapists' Vocational Rehabilitation Strategy*. London: The College of Occupational Health Therapists.

Coleman, N., Sykes, W., & Groom, C. (2013). Barriers to employment and unfair treatment at work: a quantitative analysis of disabled people's experiences. Equality and Human Rights Commission: Research Report no. 88. Retrieved from <https://www.equalityhumanrights.com/en/publication-download/research-report-88-barriers-employment-and-unfair-treatment-work-quantitative>

Colosi, L., & Dunifon, R. (2006). *What's the difference? 'Post then Pre' and 'Pre then Post'*. UK: Cornell Cooperative Extension, Cornell University.

Confederation of British Industry (CBI) (2011). *Healthy returns? Absence and workplace health survey, 2011*. London: CBI.

Confederation of British Industry CBI (2013). *Fit for purpose: absence and workplace health survey*. London: CBI.

Conley-Tyler, M. (2005). A fundamental choice: internal or external evaluation. *Evaluation Journal of Australasia*, 4(1&2), 3-11.

Coomer, K., & Houdmont, J. (2013). Occupational health professionals' knowledge, understanding and use of work ability. *Occupational Medicine*, 63, 405-409.

Cooper, H. (2009). *Research synthesis and meta-analysis, a step-by-step approach. 4th Edition*. London: SAGE.

- Cowen, M.E. & Kattan, M.W. (2009). *Encyclopedia of Medical Decision Making*. London: SAGE.
- Cox, J., Morris, D., Binks, J., Lowe, J, Harrison, V., Clease, J., ... Culley, C. (2011). *Greater Manchester cost benefit analysis technical specification: version 1.0*. Manchester: Greater Manchester New Economy.
- Coyle, S.L., Boruch, R.F., & Turner, C.F. Eds (1991). *Chapter 6. Randomized and observational approaches to evaluating effectiveness of AIDS prevention programs*. In, *Evaluating Aids Prevention Programmes*. Washington D.C.: National Academies Press.
- Craig, P., Macintyre, S., Michie, S., Nazareth, I. & Petticrew, M. (2008). *Developing and evaluating complex interventions: new guidance*. London: Medical Research Council.
- Cramer, D. (1998). *Fundamental statistics for social research*. London: Routledge.
- Cramer, D., & Howitt, D. (2004). *The SAGE dictionary of statistics*. London: SAGE.
- Creswell, J. (2002). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. Saddle River: Prentice Hall.
- Creswell, J.W., Plano Clark, V.L., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research design. In Tashakkori, A., Teddlie, C. (Eds.), *Handbook of mixed methods in social and behavioural research* (pp. 209 – 240). Thousand Oaks, SAGE.
- Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, SAGE.
- Crowther, R., Marshall, M., Bond, G., & Huxley, P. (2001). Vocational rehabilitation for people with severe mental illness [review]. *Cochrane Database Systematic Reviews*; 1-72. CD003080.

De Bustillo, M., Llorente, R., & Fernández, M.E. (2005). Job satisfaction as an indicator of the quality of work. *Journal of Socio-Economics*, 34, 5, 656-673.

De Graaf, R., Tuithof, M., van Dorsselaer, S., ten Have, M. (2012). Comparing the effects on work performance of mental and physical disorders. *Social Psychiatry and Psychiatric Epidemiology*, 47, 1873–1883. DOI 10.1007/s00127-012-0496-7

De Tienne, K.B., Agle, B.R., Phillips, J.C., & Ingerson, M-C. (2012). The impact of moral stress compared to other stressors on employee fatigue, job satisfaction, and turnover: an empirical investigation. *Journal of Business Ethics*, 110, 377-391. doi: 10.1007/s10551-011-1197-y

De Witte, H., De Cuyper, N., Handaja, Y., Sverke, M., Näswall, K., & Hellgren, J. (2010). Associations between quantitative and qualitative job insecurity and well-being. *International Studies of Management and Organisation*, 40(1), 40-56.

De Witte, H., Pienaar, J., & De Cuyper, N. (2016). Review of 30 longitudinal studies on the association between job insecurity and health and well-being: is there causal evidence? *Australian Psychologist*, 51, 18-31. doi: 10.1111/ap.12176

Dean, B.B., Aquilar, D., Barghout, V., Kahler, K.H, Frech, F., Grovees, D., & Ofman, J.J. (2005). Impairment in work productivity and health-related quality of life in patients with IBS. *American Journal of Managing Care*, 11(1), S17-26.

Dennett, L. & Thompson, G. (2015). A systematic review of measurement properties of instruments assessing presenteeism. *The American Journal of Managed Care*, 21(2), e171 – e185.

Denzin, N. & Lincoln, Y. (2005). *Qualitative Research*. London: SAGE.

Department for Business Innovation and Skills (BIS) (2009). *BIS Occasional Paper No. 1 – research to improve the assessment of additionality*. UK: BIS.

Department for Communities and Local Government (DCLG) (2014). Policy paper. Transformation challenge award and capital receipt flexibility 2014-2016 prospectus. Retrieved 6 June, 2016, from <https://www.gov.uk/government/publications/transformation-challenge-award-and-capital-receipt-flexibility-2014-to-2016-prospectus>

Department for Work and Pensions (2004). Health, work and wellbeing: caring for our future. Retrieved 20 April, 2010, from <http://www.dwp.gov.uk/docs/health-and-wellbeing.pdf>

Department for Work and Pensions (2009). Health, work and wellbeing: case studies. Retrieved 13 April, 2013, <http://www.dwp.gov.uk/health-work-and-wellbeing/case-studies/>

Department for Work and Pensions (2011). *Mental health and Work*. London: The Stationery Office.

Department for Work and Pensions (2013). *Fitness for work: the government response to 'Health at work – an independent review of sickness absence*. London: The Stationery Office.

Department for Work and Pensions (2017). *Universal Credit Employment Analysis Impact Update. DWP ad hoc research report no. 53*. Department for Work and Pensions, London, UK. Retrieved 28 September, 2017, from, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/644541/universal-credit-employment-impact-analysis-update.pdf

Department for Work and Pensions, Department of Health (2013). *Improving health and work: changing lives. The Government's response to Dame Carol Black's review of the health of Britain's working-age population*. London: Department for Work and Pensions.

Department for Work and Pensions, Department of Health (2016). *Improving lives. The work, health and disability green paper*. London: Williams Lea Group on behalf of the Controller of Her Majesty's Stationery Office.

Department for Work and Pensions, Department of Health (2017). *Improving Lives: the future of work, health and disability*. London: APS Group on behalf of the Controller of Her Majesty's Stationery Office.

Department for Work and Pensions, Department of Health, Health and Safety Executives (2005). *Health, work and wellbeing – caring for our future. A strategy for the health and wellbeing of working-age people*. London: HM Government.

Department of Health (2004). *Choosing health: making healthier choices easier* (Public Health White Paper). London: The Stationery Office.

Department of Health (2014). Wellbeing – why it matters to health policy. Retrieved 7 April, 2018, from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/277566/Narrative_January_2014_.pdf

Dettori, J.R. (2011). Loss to follow-up. *Evidence-based Spine Care Journal*, 2(1), 7-10.

Desiron, J.A., DeRijk, A., Van Hoof E., & Donceel, P. (2011). Occupational therapy and return to work: a systematic review. *BMC Public Health*, 11, 615-615.

Dew, K., Keefe, V., & Small, K. (2005). Choosing to work when sick: workplace presenteeism. *Social Science and Medicine*, 60, 2273 – 2282.

Dewa, C.S., Hoch, J.S., Carmen, G., Guscott, R., & Anderson, C. (2009). Cost, effectiveness and cost-effectiveness of collaborative mental health care program for people receiving short-term disability benefits for psychiatric disorders. *The Canadian Journal of Psychiatry*, 54(6), 379 – 388.

Dewa, C.S., Loong, D., Bonato, S., & Joosen, M.C.W (2015). The effectiveness of return-to work interventions that incorporate work-focused problem-solving skills for workers with sickness

absences related to mental disorders: a systematic literature review. *British Medical Journal Open*, 5, e007122.

Dibben, P., Wood, G., Nicolson, R., & O'Hara, R. (2012). *Quantifying the effectiveness of interventions for people with common health conditions in enabling them to stay in or return to work: A rapid evidence assessment*. London: Department of Work and Pensions.

Dionne, G., & Dostie, B. (2007). New evidence on the determinants of sickness absenteeism using linked employer-employee data. *ILR Review, Cornell University, ILR School*, 61(1), 108-120.

Dixon, K. (2005). Weighing the costs of presenteeism: recognise the signs and repair the damage of employee burnout. *Chief Executive-New York*, 209: 22–23.

Dixon, L., Hoch, J.S., Clark, R., Bebout, R., Drake, R., McHugo, G., & Becker, D. (2002). Cost-effectiveness of two vocational rehabilitation programs for persons with severe mental illness. *Psychiatric Services*, 53(9), 1118 – 1124.

Doane, D. P., & Seward, L.E. (2011). Measuring Skewness. *Journal of Statistics Education*, 19(2), 1-18.

Doloriert, C., & Sambrook, S. (2009). Ethical confessions of the “I” of autoethnography: The student's dilemma. *Qualitative Research in Organisations and Management: An International Journal*, 4(1), 27–45.

Doloros, MA., & Tonco, C. (2007). Purposive sampling as a tool for informant selection. *Ethnobotany Research & Applications*, 5, 147-158.

Dritsaki, M., Achana, F., Mason, J., & Petrou, S. (2017). Methodological issues surrounding the use of base-line health-related quality of life data to inform trial-based economic evaluations of interventions within emergency and critical care settings: a systematic literature review. *Pharmoeconomics*, 35(5), 501-515.

Drummond, M.F., Sculpher, M.J., Torrance, G.W., O'Brien, B.J. and Stoddart, G.L. (2005). *Methods for the economic evaluation of health care programmes. 4th Edition*. Oxford: Oxford University Press.

Drummond, M.F., Sculpher, M.J., Claxton, K., Stoddart, G.L., & Torrance, G.W. (2015). *Methods for the economic evaluation of health care programmes*. Oxford: Oxford University Press.

Du Bois, M., & Donceel, P. (2012). Guiding low back claimants to Work. *Spine*, 37(17), 1425-1431.

Dudovisky, J. (2018). Research philosophy. Retrieved 24 January, 2018, from https://research-methodology.net/research-philosophy/pragmatism-research-philosophy/#_ftn3

Dumville, J.C., Torgerson, D.J., & Hewitt, C. (2006). Reporting attrition in randomised controlled trials. *BMJ*, 332, 969. doi: <https://doi.org/10.1136/bmj.332.7547.969>

Duval, S., & Tweedie, R. (2000). Trim and full. A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*, 56, 455–463. doi:10.1111/j.0006-341X.2000.00455.x

Easterbrook, P. J., Berlin, J. A., Gopalan, R., & Matthews, D.R. (1991). Publication bias in clinical research. *Lancet*, 337, 8746, 867-872.

Edejer, T.T., Baltussen, R., Adam, T., Hutubessy, R., Acharya, A., Evans, D.B., & Murray, C.J.L. (Eds) (2003). *WHO guide to cost-effectiveness analysis*. Geneva: World Health Organisation.

Edge, C.E., Cooper, A.M., & Coffey, M. (2017). Barriers and facilitators to extended working lives in Europe: A gender focus. *Public Health Reviews*, 38, 2. <https://doi.org/10.1186/s40985-017-0053-8>

Edmans, A. (2011). Does the stock market fully value intangibles? Employee satisfaction and equity prices. *Journal of Financial Economics*, 101(3), 621-640. doi: 10.1016/j.jfineco.2011.03.021

Edmondson, A. C., & McManus, S. E. (2007). Methodological fit in management field research. *Academy of Management Review*, 32(4), 1155-1179.

Egan, T.M., Yang, B., & Bartlett, K.R. (2004). The effects of organisational learning culture and job satisfaction on motivation to transfer learning and turnover intention. *Human Resource Development Quarterly*, 15(3), 279-301.

Egger, M., & Smith, D.G. (1998). Bias in location and selection of studies. *British Medical Journal*, 316(7214), 61-66.

Egger, M., Smith, G.D., & Phillips, A.N. (1997). Meta-analysis principles and procedures. *British Medical Journal*, 315, 1533. doi: <https://doi-org.salford.idm.oclc.org/10.1136/bmj.315.7121.1533>

Electricity Industry Occupational Health Advisory Group (2008). Guidance Note 1.2. The Role of Occupational Health in the Management of Absence Attributed to Sickness, OHAG. Retrieved 15 November, 2014, from http://www.energynetworks.org/modx/assets/files/electricity/she/occ_health/OHAG_guidance_notes/OHAG_1_2.pdf

Ellis, M. (1999). Repeated measure designs. *The Counselling Psychologist*, 27(4), 552- 578.

Ellis, N., Johnston, V., Gargett, S., MacKenzie, A., Strong, J., Battersby, M., ... Jull, G. (2010). Does self-management for return to work increase the effectiveness of VR for chronic compensated musculoskeletal disorders? Protocol for a randomised controlled trial. *BMC Musculoskeletal Disorders*, 11, 115.

Elmir, R., Schmied, V., Jackson, D., & Wilkes, L. (2011). Interviewing people about potentially sensitive topics. *Nurse Researcher*, 19(1), 12–16.

Elo, S., Kaariainen, M., Kanste, O., Polkki, T., Utriainen, K., & Kyngas, H. (2014). Qualitative content analysis: a focus on trustworthiness. *SAGE Open*, 1-10. doi: 10.1177/2158244014522633

Endicott, J., & Nee, J. (1997). Endicott Work Productivity Scale (EWPS): A new measure to assess treatment effects. *Psychopharmacology Bulletin*, 33(1), 13–16.

Environmental Assessment Institute (2006). *Risk and uncertainty in cost benefit analysis. Toolbox paper*. Copenhagen: Environmental Assessment Institute.

ERS Research and Consultancy (2016). *Health at work: economic evidence report*. UK: ERS.

- a) Escorpizo, R., Finger, M.E., Glässel, A., & Cieza, A. (2011). An international expert survey on functioning in vocational rehabilitation using the International Classification of Functioning, Disability and Health. *Journal of Occupational Rehabilitation*, 21(2), 147-155. doi: <https://doi.org/10.1007/s10926-010-9276-y>
- b) Escorpizo, R., Reneman, M.F., Ekholm, J., Fritz, J., Krupa, T., Marnetoft, S.U., ... Chan, C.C.H. (2011). A conceptual definition of vocational rehabilitation based on the ICF: building a shared global model. *Journal of Occupational Rehabilitation*, 21(2), 126–33.

Etikan, I., Musa, S.A., & Alkassim, R.S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4. doi: 10.11648/j.ajtas.20160501.11

European Foundation for the Improvement of Living and Working Conditions (2009). *Vocational rehabilitation in cooperation, Sweden*. Dublin: Eurofound. Retrieved from, <https://www.eurofound.europa.eu/observatories/eurwork/case-studies/egs/vocational-rehabilitation-in-cooperation-sweden>

European Foundation for the Improvement of Living and Working Conditions (2010). *Absence from work*. Dublin: Eurofound. Retrieved from, https://www.eurofound.europa.eu/sites/default/files/ef_files/docs/ewco/tn0911039s/tn0911039s.pdf

EuroQol Group (1990). EuroQol-a new facility for the measurement of health-related quality of life. *Health Policy*, 16(3), 199-208.

EuroQol Group (2009). *EQ-5D English version for the UK*. UK: Euroqol Group.

Fadyl, J.K., Mcpherson, K. & Nicholls, D. (2015). Re-creating entrepreneurs of the self; discourse of worker and employee 'value' and current vocational rehabilitation practices. *Sociology of Health & Illness*. 37(4), 506-521.

Fahie, D. (2014). Doing sensitive research sensitively: ethical and methodological issues in researching workplace bullying. *International Journal of Qualitative Methods*, 13, 19-36.

Fairbrother, K., & Warn, J. (2003). Workplace dimensions, stress and job satisfaction. *Journal of Managerial Psychology*, 18(1), 8-21. <https://doi.org/10.1108/02683940310459565>

Fields, D.L. (2002). *Taking the measure at work. A guide to validated scales for organisational research and diagnosis*. Thousand Oaks: SAGE publications.

Finger, M.E., Escorpizo, R., Glassel, A., Gmunder, H.P., Luckenkemper, M., Chan, C., ... Cieza, A. (2012). ICF Core Set for vocational rehabilitation: results of an international consensus conference. *Disability and Rehabilitation*, 34(5), 429-438.

Finger, M.E., de Bie, R., Selb, M., & Escorpizo, R. (2016). An examination of concepts in vocational rehabilitation that could not be linked to the ICF based on an analysis of secondary data. *Work*, 53, 775-792.

Fleten, N., & Johnsen, R. (2006). Reducing sick leave by minimal postal intervention: a randomised, controlled intervention study. *Occupational Environmental Medicine*, 63, 676-682.

Floderus, B., Goransson, S., Alexanderson, K., & Aronsson, G. (2005). Self-estimated situation in patients on long-term sick leave. *Journal of Rehabilitation Medicine*, 37, 291-299. doi: 10.1080/16501970510034422

Franche, R.-L., Cullen, K., Clarke, J., Irvin, E., Sinclair, S., & Frank, J. (2005). Workplace-based return-to-work interventions: a systematic review of the quantitative literature. *Journal of Occupational Rehabilitation*, 15(4), 607-631.

Frank, A. O. (2013). A future forum for occupational health: role of vocational rehabilitation. *Occupational Medicine*, 63, 306.

Franx, G., Oud, M., de Lange, J., Wensing, M., & Grol, R. (2012). Implementing a stepped-care approach in primary care: results of a qualitative study. *Implementation Science*, 7, 8. doi: 10.1186/1748-5908-7-8

Frost, J. (2015). *Repeated measures designs: benefits, challenges and an ANOVA example*. The Minitab Blog. Retrieved 30 January, 2018, from <http://blog.minitab.com/blog/adventures-in-statistics-2/repeated-measures-designs-benefits-challenges-and-an-anova-example>

Fujiwara, D. (2010). *Social cost-benefit analysis framework: methodologies for estimating and incorporating the wider social and economic impacts of work in cost-benefit analysis of employment programmes*. UK: Department of Work and Pensions.

Gabbay, M., Taylor, L., Sheppard, L., Hillage, J., Bambra, C., Ford, F., ... Kelly, P. (2011). NICE guidance on long term-term sickness and incapacity. *British Journal of General Practice*, e118-e124.

Garrow, V. (2016). *Presenteeism. A review of the current thinking*. Brighton: Institute for Employment Studies.

Gaskin, K. (2011). *The volunteer investment and value audit. A self-help guide*. London: Institute for Volunteering Research.

Gelo, O., Braakmann, D. & Benetka, G. (2008). Quantitative and qualitative: beyond the debate. *Integrative Psychological and Behavioural Science*, 42, 266. <https://doi-org.salford.idm.oclc.org/10.1007/s12124-008-9078-3>

Georgellis, Y., Lange, T., & Tabvuma, V. (2012). The impact of life events on job satisfaction. *Journal of Vocational Behavior*, 80(2), 464-473.

GL Assessment (2011). Health and psychology, resources, general health questionnaire. Retrieved 6 April, 2011, from http://WW.glassessment.co.uk/health_and_psychology/resources/general_health_questionnaire/faqs.asp?css=1

Glick, H.A., Polsky, D.P., & Shulman, K.A. (2001). Trial-based economic evaluations: an overview of design and analysis. In M. Drummond and M. McGuire (Ed). *Economic Evaluation in Health Care: merging theory with practice*, Office for Health Economics. Oxford: Oxford University Press.

Giga, S. I., Cooper, C. L., & Faragher, B. (2003). The Development of a Framework for a Comprehensive Approach to Stress Management Interventions at Work. *International Journal of Stress Management*, 10(4), 280-296.

Gimeno, D., Bultmann, U., Benavides, F.G., Alexanderson, K., Abma, F.L., Ubalde-Lopez, M., ... Delcos, G.L. (2014). Cross-national comparisons of sickness absence systems and statistics: towards common indicators. *European Journal of Public Health*, 24(4), 663–666.

Given, L.M. (Ed.) (2008). *The Sage encyclopaedia of qualitative research methods*. Thousand Oaks: Sage.

Gobelet, C., Luthi, F., Al-Khodairy, A.T., & Chamberlain, M.A. (2007). VR: a multidisciplinary intervention. *Disability & Rehabilitation*, 29(17), 1405-1410.

Goetzel, R.Z., Ozminkowski, R.J., & Long, S.R. (2003). Development and reliability analysis of the Work Productivity Short Inventory (WPSI) instrument measuring employee health and productivity. *Journal of Occupational Environmental Medicine*, 45(7), 743–762. doi:10.1097/01.jom.0000079085.95532.3

Golbasi, Z., Kelleci, M., & Dogan, S. (2008). Relationships between coping strategies, individual characteristics and job satisfaction in a sample of hospital nurses: Cross-sectional questionnaire survey. *International Journal of Nursing Studies*, 45(12), 1800-1806.

Gold, M.R., Siegel, J.E., Russel, L.B., & Weinstein, M.C. (1996). *Cost-effectiveness in health and medicine*. Oxford: Oxford University Press.

Goldberg, D. (1972). *The detection of psychiatric illness by questionnaire: A technique for the identification and assessment of non-psychotic psychiatric illness*. New York: Oxford University Press.

Gov.UK (2014). *State pension age timetables*. London: The Stationary Office. Retrieved 30 November, 2014, from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/310231/state-pension-age-timetable.pdf

Gov.UK (2015). Rates and thresholds for employers 2014 – 2015. Retrieved 2 April, 2015, from <https://www.gov.uk/rates-and-thresholds-for-employers-2014-to-2015#statutory-sick-pay-ssp>

Grant, A. M., & Wall, T. D. (2009). The neglected science and art of quasi-experimentation: why-to, when-to, and how-to advice for organisational researchers. *Organisational Research Methods*, 12(4), 653-686. doi: 10.1177/1094428108320737

Gray, A. (2011). *Applied methods of cost-effectiveness analysis in health-care*. Oxford: Oxford University Press.

Gray, A.M., & Wilkinson, T. (2016). Economic evaluation of healthcare interventions: old and new directions. *Oxford Review of Economic Policy*, 32(1), 102-121.

Graveling, R.A., Crawford, J.O., Cowie, H., Amati, C., & Vohra, S. (2008). *A review of workplace interventions that promote mental wellbeing in the workplace*. Geneva: World Health Organisation.

Green, F. (2015). Health effects of job insecurity. *IZA World of Labor*, 212. doi: 10.15185/izawol.212

Greene, J. C. (2007). *Mixed methods in social inquiry*. San Francisco: Jossey-Bass.

Greenhalgh, T. (1997). How to read a paper: papers that summarise other papers (systematic reviews and meta-analyses). *British Medical Journal*, 315, 672. <https://doi.org/10.1136/bmj.315.7109.672>.

Gross, D.P., Battie, M.C., & Asante, A.K. (2008). The patient-specific function scale: validity in workers compensation claimants. *Archives Physical Medical Rehabilitation*, 89, 1294 – 1299.

Guidi, S., Bagnara, S., & Fichera, G. P. (2012). The HSE indicator tool, psychological distress and work ability. *Occupational Medicine-Oxford*, 62(3), 203-209. doi: 10.1093/occmed/kqs021

Guyatt, G.H., Oxman, A.D., Vist, G., Kunz, R., Brozek, J., Alonso-Coello, P., ... Schunemann, H.J. (2011). GRADE guidelines: 4. Rating the quality of evidence- study limitations (risk of bias). *Journal of Clinical Epidemiology*, 64(4), 407-415.

Hakkaart-van Roijen, L., & Bouwmans, C.A.M. (2002). *Manual Short Form-Health and Labour Questionnaire*. Institute for MTA. Rotterdam: Erasmus University Medical Centre.

Halbesleben, J. R.B., Whitman, M.V., & Crawford, W.S. (2014). A dialectical theory of the decision to go to work: Bringing together absenteeism and presenteeism. *Human Resource Management Review*, 24, 177–192.

Hansen, C.D., & Andersen, J.H. (2008). Going ill to work – What personal circumstances, attitudes and work-related factors are associated with sickness presenteeism? *Social Science and Medicine*, 67, 956-964.

Hanson, M.A., Burton, K., Kendall, N.A.S, Lancaster, R.J., & Pilkington, A. (2006). *The costs and benefits of active case management and rehabilitation for musculoskeletal disorders*, Research Report 493. London: HSE Books.

Hamberg-van Reenan, H.H., Proper, K.I., & van der Berg, M. (2012). Worksite mental health interventions: a systematic review of economic evaluations. *Occupational and Environmental Medicine*, 69(11), 837-45. doi: 10.1136/oemed-2012-100668.

Hammond, A. (2008). Rehabilitation in musculoskeletal diseases. *Best Practice & Research Clinical Rheumatology*, 22(3), 435–449. doi:10.1016/j.berh.2008.02.003

Hammond, A., O'Brien, R., Woodbridge, S., Bradshaw, L., Prior, Y., Radford, K., ... Pulikottil-Jacob, R. (2017). Job retention vocational rehabilitation for employed people with inflammatory arthritis (WORK-IA): a feasibility randomized control trial. *BMC Musculoskeletal Disorders*, 18, 315. Doi: 10.1186/s12891-017-1671-5

Hampson, E., Soneji, U., Jacob, A., Mecu, B., & Mc Gahan., H. (2017). *Mental health and employees. The case for investment*. London: Deloitte MSC Limited.

Harrison, F. (2011). Getting started with meta-analysis. *Methods in Ecology and Evolution*, 2, 1-10.

Harrison, J. (2012). Editorial: a future forum for UK occupational health? *Occupational Medicine*, 62, 590-591.

Harrison, J., & Dawson, L. (2016). Occupational Health: meeting the challenges of the next 20 years. *Safety and Health at Work*, 7(2), 143-149. doi.org/10.1016/j.shaw.2015.12.004

Harrington, M. (2010). *An independent review of the work capability assessment*. London: The Stationary Office. Retrieved 27 April, 2011, from www.dwp.gov.uk/wca-review

Hassan, E. (2006). Recall bias can be a threat to retrospective and prospective research designs. *The internet Journal of Epidemiology*, 3, 2. Retrieved 13 April, 2013, from <http://archive.ispub.com/journal/the-internet-journal-of-epidemiology/volume-3-number-2/recall-bias-can-be-a-threat-to-retrospective-and-prospective-research-designs.html#sthash.wg6UGfz3.dpuf>

Hayday, S., Broughton, A., & Tyers, C. (2007). *Managing sickness absence in the police service, a review of current practice*, Health and Safety Executive and the Home Office. Norwich: HSE Books.

Health and Safety Executive (HSE) (2010). *Managing sickness absence and return to work in small businesses*. Suffolk: HSE Books.

Health and Safety Executive (HSE) (2013). *Guidance: Musculoskeletal disorders*. UK: HSE. Retrieved 6 April, 2013, from www.hse.gov.uk/msd/

Health and Safety Executive (HSE) (2014). *Musculoskeletal disorders in Great Britain 2014*. UK: HSE. Retrieved 7 December, 2014, from www.hse.gov.uk/statistics/

- a) Health and Safety Executive (HSE) (2017). *Work-related stress, depression or anxiety statistics in Great Britain*. UK: HSE. Retrieved from: <http://www.hse.gov.uk/statistics/causdis/stress/stress.pdf>
- b) Health and Safety Executive (HSE) (2017). *Work-related musculoskeletal disorders (WRMSDs) statistics in Great Britain*. UK: HSE. Retrieved from: <http://www.hse.gov.uk/statistics/causdis/musculoskeletal/msd.pdf>

Health Environment and Work Website (2013). What is occupational Health? Retrieved 1 February, 2013, from <http://www.agius.com/hew/resource/ohsilo.htm>

Health Research Authority NHS (2014). Determine whether your study is research. Retrieved 14 April, 2015, from <http://www.hra.nhs.uk/research-community/before-you-apply/determine-whether-your-study-is-research/>

Hees, H.L., de Vries, G., Koeter, M.W., & Schene, A.H. (2013). Adjuvant occupational therapy improves long-term depression recovery and return-to-work in good health in sick-listed employees with major depression: results of a randomised controlled trial. *Occupational and Environmental Medicine*, 70, 252–60.

Henrichson, C., & Rinaldi, J. (2014). *Cost-benefit analysis and justice policy toolkit*. New York: Vera Institute of Justice.

Heritage, B., Pollock, C., & Roberts, L. (2015). Confirmatory factor analysis of Warr, Cook, and Wall's (1979) job satisfaction scale. *Australian Psychologist*, 50, 122-129. doi: 10.1111/ap.12103.

Hesse-Biber, S. (2015). Mixed methods research: the 'thing-ness' problem. *Qualitative Health Research*, 25(6), 775-788. doi: 10.1177/1049732315580558

Hicks, C. (2004). *Research methods for clinical therapists: applied project design and analysis* (4th ed.). Oxford: Churchill Livingstone.

Higgins, A., O'Halloran, P., & Porter, S. (2012). Management of long term sickness absence: a systematic realist review. *Journal of Occupational Rehabilitation*, 22(3), 322-332.

HM Government (2005). *Health, work and wellbeing: caring for our Future. A strategy for the health and wellbeing of working age people*. London: Department for Work and Pensions, the Department of Health and the Health and Safety Executive.

HM Treasury (2011). *The Green Book: appraisal and evaluation in central government*. London: Treasury guidance, TSO.

HM Treasury, Public Service Transformation Network, & New Economy (2014). Supporting public service transformation: cost benefit analysis guidance for local partnerships. Retrieved 8 July, 2014, from www.gov.uk

Hoefsmit, N., Houkes, I., & Nijhuis, F. (2012). Intervention characteristics that facilitate return to work after sickness absence: a systematic literature review. *Journal of Occupational Rehabilitation*, 22(4), 462-477.

Holden, M. & Lynch, P. (2004). Choosing the appropriate methodology: understanding research philosophy. *The Marketing Review*, 4, 397- 409.

Holden, L., Scuffha, P.A., Hilton, M.F., Ware, R.S., Vecchio, N., & Whiteford, H.A. (2011). Health related productivity losses increase when the health condition is co-morbid with psychological distress: findings from a large cross-sectional sample of working Australians. *BMC Public Health*, 11, 417.

Holmas, T-H., Dahl, S-A., Skjeret, F. (2008). *Attitudes towards sickness absence in Nordic countries. Working paper*. Bergen: Stein Rokkan Centre for Social Studies Health Economics.

Holmes, E. (2008). *The feasibility of comparing sickness absence surveys and the labour force survey, Research Report*. Buxton: Health and Safety Executive.

House, E.R. (1998). Economic models of evaluation. *Scandinavian Journal of Social Welfare*, 7, 110 -113.

Howarth, A. (2017). Tory Government defeated on controversial Universal Credit. *The Scotsman*, 18th October.

Hoy, D., March, L. Brooks, P., Blyth, F., Woolf, A., Bain, C., ... Buchbinder, R. (2014). The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. *Annals of the Rheumatic Diseases*, 73, 968-974.

Hultberg, E-L., Lonroth, K., Allebeck, P., & Hensing, G. (2006). Effects of co-financed interdisciplinary teamwork on sick leave for people with musculoskeletal disorders. *Work*, 26, 369-377.

Hultin, H., Lindholm, C., & Moller, J. (2012). Is there an association between long-term sick leave and disability pension and unemployment beyond the effect of health status? A cohort study. *PLoS ONE*, 7(4), e35614. doi:10.1371/journal.pone.0035614

Huhtala, M., Kaptein, M., & Feldt, T. (2016). How perceived changes in the ethical culture of organizations influence the well-being of managers: a two-year longitudinal study. *European Journal of Work and Organizational Psychology*, 25(3), 335-352. doi: 10.1080/1359432X.2015.1068761

IJzelenberg, H., Meerding, W-J.,& Burdorf, A. (2007). Effectiveness of a back-pain prevention program. A cluster randomised controlled trial in an occupational setting. *Spine*, 7, 711-719.

Ilies, R., & Judge, T.A. (2002). Understanding the dynamic relationships among personality, mood, and job satisfaction: a field experience sampling study. *Organisational Behavior and Human Decision Processes*, 89(2), 1119-1139.

Imarinen, J. (2007). The Work Ability Index (WAI). *Occupational Medicine-Oxford*, 57(2), 160–160. doi:10.1093/occmed/kqm008

Investopedia (2018). Benefit cost ratio. Retrieved 8 February, 2018, from <https://www.investopedia.com/terms/b/bcr.asp>

Irving, A., Chang, D., & Sparham, I. (2004). *Developing a framework for vocational rehabilitation: qualitative research (DWP RR 224)*. Leeds: Corporate Document Services.

Ivankova, N.V., Creswell, J. W., & Stick, S.L. (2006). Using mixed-methods sequential explanatory design: from theory to practice. *Field Methods*, 18(1), 3-20. doi: 10.1177/1525822X05282260

Jackson, C (2007). The General Health Questionnaire. *Occupational Medicine*, 57, 79.

Jackson, E. (2013.) Choosing a methodology: Philosophical underpinning. *Practitioner Research in Higher Education*, 7(1), 49-62.

Jakicic, J.M., Tate, D.F., Lang, W., Davis, K.K., Polzien, K., Rickman, A.D., ... Finkelstein, E.A. (2012). Effect of a stepped-care intervention approach on weight loss in adults: a randomized clinical trial. *JAMA*, 307(24), 2617-2626

Jensen, I.B., Bergstrom, G., Ljungquist, T., & Bodin, L. (2005). A 3-year follow-up of a multi-disciplinary rehabilitation programme for back and neck pain. *Pain*, 115, 273-283. doi:10.1016/j.pain.2005.03.005

Jensen, I.B., Busch, H., Bodin, L., Hagber, J., Nygren, A., & Bergstrom, G. (2009). Cost effectiveness of two rehabilitation programmes for neck and back pain patients: A seven year follow-up. *Pain*, 142(3), 202-208.

Jo, C. (2014). Review. Cost of illness studies: concepts, scopes, and methods. *Clinical and Molecular Hepatology*, 20, 327-337.

John, G. (2010). Presenteeism in the workplace; a review and research agenda. *Journal of Organisational Behaviour*, 31, 519-542. doi: 10.1002/job.630

Johns, G., & Miraglia, M. (2015). The reliability, validity, and accuracy of self-reported absenteeism from work: A meta-analysis. *Journal of Occupational Health Psychology*, 20(1), 1-14. <http://dx.doi.org/10.1037/a0037754>

Johnston, K., Buxton, M.J., Jones, D.R., & Fitzpatrick, R. (1999). Assessing the cost of healthcare technologies in clinical trials. *Health Technology Assessment*, 3, 6.

Joore, M., Brunenberg, D., Nelemans, P., Wouters, E., Kuijpers, P., Honig, A., ... Boonen, A. (2010). The impact of differences in EQ-5D and SF-6D utility scores on the acceptability of cost-utility ratios: results across five trial-base cost-utility studies. *Value in Health*, 13(2), 222-229.

Jorgensen, M.B., Faber, A., Hansen, J.V., Holtermann, A., & Sogaard, K. (2011). Effects on musculoskeletal pain, work ability and sickness absence in a 1-year randomised controlled trial among cleaners. *BMC Public Health*, 11, 840.

José, A., & Cabral, V. (2005). Skill mismatches and job satisfaction. *Economics Letters*, 89(1), 39-47.

Joyce, S., Modini, M., Christensen, H., & Mykletun, A. (2015). Workplace interventions for common mental disorders: a systematic meta-review. *Psychological Medicine*, 46(4), 683-697. doi: <https://doi.org/10.1017/S0033291715002408>

Jull, G. (2017). Biopsychosocial model of disease: 40 years on. Which way is the pendulum swinging? *British Journal of Sports Medicine*, 51, 1187- 1188. doi:10.1136/bjsports-2016-097362

Jupp, V. (2014). *Time series design*. The Sage Dictionary of Social Research Methods. Retrieved 30 January, 2017, from <http://srmo.sagepub.com/view/the-sage-dictionary-of-social-research-methods/n208.xml>

Karjalainen, K., Malmivaara, A. Pohjolainen, M.D., Hurri, H., Mutanen, P., Rissanen, P., ... Roine, R. (2003). A mini-intervention for subacute low back pain. A Randomized controlled trial. *Spine*, 28(6), 533-541.

Karrholm, J., Ekholm, K., Jakobsson, B., Ekholm, J., Bergroth, A., & Schuldt, K. (2006). Effects of work resumption of a co-operation project in vocational rehabilitation. Systematic, multi-professional, client-centred and solution-oriented co-operation. *Disability Rehabilitation*, 28(7), 457-467.

Kaur, G., Symth, R.L., & Williamson, P. (2012). Developing a survey of barriers and facilitators to recruitment in randomized controlled trials. *Trials*, 13, 218. <https://doi.org/10.1186/1745-6215-13-218>

Keating, B.P. & Keating, M.O. (2014). *Basic cost benefit analysis for assessing local public projects*. New York: Business Expert Press.

Kelly, M.P., McDaid, D., Ludbrook, A., & Powell, J. (2005). *Briefing paper. Economic appraisal of public health interventions*. UK: Health Development Agency.

Kendall, K., Burton, K., Main, C., & Watson, P. (2010). *Tackling Musculoskeletal Problems: a guide for clinic and workplace, 2nd ed*. Norwich: TSO.

Kessler, R.C., Barber, C., Beck, A., Berglund, P., Cleary, P.D., McKenas, D., ... Wang, P. (2003). The World Health Organisation Health and Work Performance Questionnaire (HPQ). *Journal of Occupational Environmental Medicine*, 45, 156-174.

Keysor, J. J., LaValley, M. P., Brown, C., Felson, D. T., AlHeresh, R. A., Vaughan, M. W., ... Allaire, S. J. (2017). Efficacy of a Work Disability Prevention Program for People with Rheumatic and Musculoskeletal Conditions: The Work It Study Trial. *Arthritis Care Research*. Accepted Author Manuscript. doi:10.1002/acr.23423

Khan, F., Ng, L., & Turner-Stokes, L. (2009). Effectiveness of vocational rehabilitation intervention on the return to work and employment of persons with multiple sclerosis. *Cochrane Database of Systematic Reviews*, 1, CD007256. doi: 10.1002/14651858.CD007256.pub2.

Kigozi, J., Jowett, S., Lewis, M., Barton, P., & Coast, J. (2016). Estimating productivity costs using the friction cost approach in practice. Systematic review. *The European Journal of Health Economics*, 17(1), 31-44.

Kim, S-H., Kim, S-O., Lee, S-I., & Jo, M-W. (2014). Deriving a mapping algorithm for converting SF-36 scores to EQ-5D utility score in a Korean population. *Health and Quality of Life Outcomes*, 12, 145.

Kitzinger, J. (1999). *The challenge and promise of focus groups in Developing Focus Group Research: Politics, Theory and Practice*. London: Sage Publications.

Kivimaki, M., Head, J., Ferries, J.E., Hemingway, H., Siple, M.J., Vahtera, J., & Marmot, M. (2005). Working while ill as a risk factor for serious coronary events: The Whitehall II Study. *American Journal of Public Health*, 95(1), 98-102.

Klein, R., Day, P., & Redmayne, S. (1996). *Managing scarcity: priority setting and rationing in the National Health Service (State of Health)*. UK: Open University Press.

Knapp, M., McDaid, D., & Parsonage, M. (Ed) (2011). *Mental health promotion and prevention: the economic case*. London: Department of Health.

Knudsen, A.K., Harvey, S.B., Mykletun, A., & Overland, S. (2012). Common mental disorders and long-term sickness absence in a general working population. The Hordaland Health Study. *Acta Psychiatrica Scandinavica*, 127, 287–297. doi: 10.1111/j.1600-0447.2012.01902.x

Koopman, C., Pelletier, K.R., & Murray, J.F. (2002). Stanford presenteeism scale: health status and employee productivity. *Journal of Occupational Environmental Medicine*, 44(1), 14–20. doi:10.1097/00043764-200201000-00004

Koopmans, P.C., Bültmann, U., Roelen, C.A.M., Hoedeman, R., van der Klink, J.L.C., & Groothoff, J.W. (2011). Recurrence of sickness absence due to common mental disorders. *International Archives of Occupational and Environmental Health*, 84, 193–201. doi: 10.1007/s00420-010-0540-4 123.

Kowalchuk, K., Jennings, S., Richardson, G., van Vliet, D. Hefford, C., & Abbott, H. (2012). The patient-specific functional scale: psychometrics, clinimetrics, and application as a clinical outcome measure. *Journal of Orthopaedics and Sports Physical Therapy*, 42(1), 30-D17. doi: 10.2519/jospt.2012.3727

Kristensen, T.S. (1991). Sickness absence and work strain among Danish slaughterhouse workers: an analysis of absence from work regarded as coping behavior. *Social Science Medicine*, 32, 15–27.

Kristman, V., Manno, M., & Cote, P. (2004). Loss to follow-up in cohort studies: how much is too much? *European Journal of Epidemiology*, 19(8), 751-760.

Kroger, C., Bode, K., Wunsch, E-M., & Kliem, S. (2015). Work-related treatment for major depressive disorder and incapacity to work: preliminary findings of a controlled, matched study. *Journal of Occupational Health Psychology*, 20(2), 248 – 258.

Krol, M., Brouwer, W., & Rutten, F. (2013). Productivity Costs in Economic Evaluations: Past, Present, Future. *Pharmacoeconomics*, 31, 537–549.

La Placa, V., & Knight, A. (2014). Well-being: it's influence and local impact on public health. *Public Health*, 128, 38-42.

Laerd Dissertation (2012). Sampling strategy. Retrieved 12 April, 2015, from <http://dissertation.laerd.com/sampling-strategy.php>

Lambeek, L.C., Bosmans, J.E., Van Royen, B.J., van Tulder, M.W., Van Mechelen, W., & Anema, J.R. (2010). Effect of integrated care for sick listed patients with chronic low back pain: economic evaluation alongside a randomised controlled trial. *British Medical Journal*, 341, c6414. doi: 10.1136/bmj.c6414

Lamer, L.M., Meerding, W-J., Severens, J.L., & Brouwer, W.B.F. (2005). The relationship between productivity and health-related quality of life: an empirical exploration in persons with low back pain. *Quality of Life Research*, 14(3), 805-813.

Lammerts, L., Van Dongen, J.M., Schaafsma, F.G., van Mechlen, W., & Anema, J.R. (2017). A participatory supportive return to work program for workers without an employment contract, sick-listed due to a common mental disorder: an economic evaluation alongside a randomized controlled trial. *BMC Public Health*, 17, 162. doi: 10.1186/s12889-017-4079-0

Lander, F., Friche, C., Tornemand, H., Andersen, J.H., & Kirkeskov, L. (2009). Can we enhance the ability to return to work among workers with stress-related disorders? *BMC Public Health*, 9, 372. doi: 10.1186/1471-2458-9-372

Langman, C. (2012). *Introduction to vocational rehabilitation: policies, practices and skills*. Oxen: Routledge.

Lee, M. S-M., Lee, M.-B., Liao, S-C., & Chiang, F-T. (2009). Relationship between mental health and job satisfaction among employees in a medical center department of laboratory medicine. *Journal of the Formosan Medical Association*, 108(2), 146-154.

Lee, C-F., & Lee, A.C. (2006). *Encyclopaedia of finance*. Boston: Springer.

Lee, R. (1999). *Doing research on sensitive topics*. London: SAGE Publications.

Leech, N., & Onwuegbuzie, A. (2008). A typology of mixed methods research designs. *Quality and Quantity*, 43(2), 265-275.

Lenderink, A. F., Zoer, I., Dijk, F. J. H., Frings-Dresen, M. H. W., van der Molen, H. F., & Spreuwers, D. (2012). *Review on the validity and reliability of self-reported work-related illness*. London: Netherlands Centre for Occupational Diseases.

Lensberg, B.R., Drummond, M.F., Danchenko, N., Despiegel, N., & Francois, C. (2013). Challenges in measuring and valuing productivity costs, and their relevance in mood disorders. *ClinicoEconomic and Outcomes Research*, 5, 565-573.

Leon, L., Jover, J.A., Candelas, G., Lajas, C., Vadillo, C., Blanco, M., ... Abasolo, L. (2009). Effectiveness of an early cognitive-behavioural treatment in patients with work disability due to musculoskeletal disorders. *Arthritis and Rheumatism*, 61(7), 996-1003. doi: 10.1002/art.24609

Lerner, D., Amick, B.C. 3rd., Rogers, W.H., Malspeis, S., Bungay, K., & Cynn, D. (2001). The Work Limitations Questionnaire. *Medical Care*. 39(1), 72–85. doi:10.1097/00005650-200101000-00009

Lerner, D., Amick, B.C.I., Lee, J.C., Rooney, T., Rogers, W.H., Chang, H., & Berndt, E.R. (2003). Relationship of employee-reported work limitation to work productivity. *Medical Care*, 41(5), 649 – 659.

Lerner, D., Chang, H., Rogers, W.H., Benson, C., Schein, J., & Allaire, S. (2009). A method for imputing the impact of health problems on at-work performance and productivity from available health data. *Journal of Occupational and Environmental Medicine*, 51(5), 515-524.

Lerner, D., Adler, D.A., Roger, W.H., Change, H., Lapitsky, L., McLaughlin, T., & Reed, J. (2010). Work performance of employees with depression: the impact of work stressors. *American Journal of Health Promotion*, 24(3), 205-213. doi: 10.4278/ajhp.090313-QUAN-103

Lerner, D., Benson, C., Chang, H., Rogers, W.H., Adler, D., Lyson, M., & Parsons, S.K. (2017). Measuring the work impact of caregiving for individuals with schizophrenia and / or schizoaffective disorder with the caregiver work limitations questionnaire (WLQ). *Journal of Occupational and Environmental Medicine*, 59(10), 1007 – 1016. doi: <https://doi.org/10.1097/JOM.0000000000001113>

Levy, C., Hillage, J., & Bevan, S. (2014). *Modelling report: Economic analysis of workplace policy and management practices to improve the health of employees*. UK: The Work Foundation.

Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Gotzsche, P.C., Loannidis, J.P.A., ... Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses that evaluate healthcare interventions: explanation and elaboration. *British Medical Journal*, 339, b2700. doi: <https://doi.org/10.1136/bmj.b2700>

Liamputtong, P. (2011). *Focus group methodology: Principles and practice*. Thousand Oaks: Sage.

Linaker, C., Harris, E.C., Cooper, C., Coggon, D., & Palmer, K.T. (2011). The burden of sickness absence from musculoskeletal causes in Great Britain. *Occupational and Environmental Medicine*, 61(7), 458-464. doi: 10.1093/occmed/kqr061

Lindstrom, I., Ohlund, C., Eek, C., Wallin, L., Peterson, L., Fordyce, W., & Nachemson, A. (1992). The effect of graded activity on patients with sub-acute low back pain: a randomized prospective clinical study with an operant-conditioning behavioural approach. *Physical Therapy*, 72, 279-293.

Litosseliti, L. (2003). *Using focus groups in research*. London: Continuum.

Little, R (2011). *Health Economics. Health economic evaluation*. York: Yorkshire and Humber Public Health Observatory.

Lohaus, D. & Habermann, W. (2018). Presenteeism: a review and future directions. *Human Resource Management Review*, article in press. doi: <https://doi.org/10.1016/j.hrmmr.2018.02.010>

Loisel, P., Abenhaim, L., Durand, P., Esdaile, J., Suissa, S., Goselin, L., ... Lemaire, J. (1997). A population-based, randomized clinical trial on back pain management. *Spine*, 22, 2911–2918.

Loisel, P., Lemaire, J., Poitras, S. Durand, M.J., Champagne, F., Stock, S., ... Tremblay, C. (2002). Cost-benefit and cost effectiveness analysis of a disability prevention model for back pain management; a six year follow-up study. *Occupational Environmental Medicine*, 59(12), 807-815.

Maertz Jr, C.P, Griffeth, R.W., Campbell, N.S., & Allen, D.G. (2007). The effects of perceived organisational support and perceived supervisor support on employee turnover. *Journal of Organisational Behaviour*, 28(8), 1059-1075. doi: 10.1002/job.472

Makowska, Z., Merecz, D., Moscicka, A., & Kolasa, W. (2002). The validity of general health questionnaires, GHQ-12 and GHA-8, in mental health studies in working people. *International Journal of Occupational Medicine and Environmental Health*, 15(4), 353-362.

Mann, T. (1996). *Clinical Guidelines: Using Clinical Guidelines to Improve Patient Care Within the NHS*. London: Department of Health.

Marmot, M. (2010). *Fair society, healthy lives: the Marmot Review: strategic review of health inequalities in England post- 2010*. London: Department for International Development. ISBN 9780956487001

Massey, O.T. (2010). A proposed model for analysis and interpretation of focus groups in evaluation research. *Evaluation and Program Planning*, 34, 21-28. Retrieved from <https://doi.org/10.1016/j.evalprogplan.2010.06.003>

Matthews, L.R., Buys, N., Randall, C., Marfels, B., Niehaus, M., & Bauer, J. (2013). A comparative study of the job tasks, functions, and knowledge domains of rehabilitation professionals providing vocational rehabilitation services in Australia and Germany. *Rehabilitation Counselling Bulletin*, 58(2), 80-90. doi: <https://doi.org/10.1177/0034355213504304>

Mattke, S., Balakrishnan, A., Bergamo, G., & Newberry, S.J. (2007). A review of methods to measure health-related productivity loss. *American Journal of Managed Care*, 13(4), 211-217.

Mauskopf, J. (2017). Cost-consequence analysis. In, M.W. Kattan (Ed.), *Encyclopedia of medical decision making*. London: SAGE Publications.

McDaid, D., & Park, A-LA. (2011). Investing in mental health and wellbeing: findings from the DataPrev project. *Health Promotion International*, 26(S1).

McDonald, M., DiBonaventura, M, & Ullman, S. (2011). Musculoskeletal pain in the workforce: the effects of back, arthritis, and fibromyalgia pain on quality of life and work productivity. *Journal of Occupational & Environmental Medicine*, 53(7), 765-770. doi: 10.1097/JOM.0b013e318222af81

McIntosh, E., Clarke, P.M., Frew, E.J., & Louviere, J.J (Eds) (2011). *Applied methods of cost-benefit analysis in health care*. Oxford: Oxford University Press.

McKevitt, C., Morgan, M., Dundas, R., & Holland, W.W. (1997). Sickness absence and 'working through' illness: a comparison of two professional groups. *Journal of Public Health Medicine*, 19(3), 295-300.

McLafferty, I. (2004). Focus group interviews as data collecting strategy. *Journal of Advanced Nursing*, 48(2), 187 – 194.

McPherson, A.H., & Inglis, I. (2008). *Additionality and economic impact assessment guidance note. A summary guide to assessing the additional benefit, or additionality, of an economic development project or programme*. Glasgow: Scottish Enterprise.

Medical Research Council (no date). *Developing and Evaluating Complex Interventions: new guidance*. London: Medical Research Council.

Meijester, T., van Duuren-Stuurman, B., Heederik, D., Houba, R., Koningsveld, E., Warren, N., & Tielemans, E. (2011). Cost-benefit analysis in occupational health: a comparison of interventions scenarios for occupational asthma and rhinitis among bakery workers. *Journal of Occupational Environmental Medicine*, 68, 739-745.

Melchior, M., Niedhammer, I., Berkman, L.F., & Goldberg, M. (2003). Do psychosocial work factors and social relations exert independent effects on sickness absence? A six-year prospective study of the GAZEL cohort. *Journal of Epidemiology & Community Health*, 57, 233-233. doi: 10.1136/jech.57.4.233

Menestrel, S.M., Walahoski, J.S., & Mielke, M.B. (2014). A partnership model for evaluation: considering an alternative approach to the internal-external evaluation debate. *American Journal of Evaluation*, 35(1), 61 – 72. doi: 10.1177/1098214013506600

Messonnier, M., & Meltzer, M. (2003). Cost-benefit analysis. In A.C. Haddix, S.M. Teutsch, & P.S Corso (Eds.) *Prevention effectiveness. A guide to decision analysis and economic evaluation. Second edition*. New York: Oxford University Press.

Meyer, K., Fransen, J., Huwiler, H., Uebelhart, D., & Klipstein, A. (2005). Feasibility and results of a randomised pilot-study of a work rehabilitation programme. *Journal of Back and Musculoskeletal Rehabilitation*, 18, 67–78.

Miller, W., Rein, D., O'Grady, M., Yeung, J-E., Eichner, J., & McMahon, M. (2013). *ASPE (Office of the assistant secretary for planning and evaluation) report. A review and analysis of economic models of prevention benefits*. Washington: US Department of Health and Human Services.

Mitchie, S., & Williams, S. (2003). Reducing work related psychological ill health and sickness absence: a systematic review. *Journal of Occupational and Environmental Medicine*, 60, 3-9.

Moffat, S., White, M., Mackintosh, J., & Howel, D. (2006). Using quantitative and qualitative data in health services research – what happens when mixed method findings conflict? *Health Services Research*, 6, 28-38.

Molina-Azorin, J.F., Bergh, D.D., Corley, K.G., & Ketchen, D.J. (2017). Mixed methods in organisational sciences: taking stock and moving forwards. *Organisational Research Methods*, 20(2), 179-192.

Morgan, D. (1996). Focus groups. *Annual Review Sociology*, 22, 129–152.

Morgan, D. (1997). *Focus groups as qualitative research, 2nd edition*. Thousand Oaks: SAGE.

Munir, F. (2008). *The Work Limitation Questionnaire*. Oxford: Oxford University Press on behalf of the Society of Occupational Medicine.

Murphy, L., Chamberlain, E, Weir, J., Berry, A., Nathaniel-James, D. & Agnew, R. (2006). Effectiveness of VR following acquired brain injury: preliminary evaluation of a UK specialist rehabilitation programme. *Brain Injury*, 20(11), 1119-1129.

National Centre for Environmental Economics Office of Policy U.S. (2010). *Guidelines for preparing economic analyses. Updated May 2014*. U.S.: Environmental Protection Agency.

National Institute for Health and Care Excellence (NICE) (2004). *Guidance on cancer service improving supportive and palliative care for adults with cancer, the manual*. London: NICE.

National Institute for Health and Clinical Excellence (NICE) (2008). *Promoting physical activity in the workplace: business case*. Retrieved 23 December, 2011, from <http://guidance.nice.org.uk/PH13/BusinessCase/xls/English>

a) National Institute for Health and Care Excellence (NICE) (2009). *Promoting mental wellbeing at work: business case*. London: NICE. Retrieved 13 April, 2013, from <http://www.nice.org.uk/nicemedia/live/12331/46023/46023.PDF>.

b) National Institute for Health and Care Excellence (2009). *Managing long-term sickness and incapacity for work. NICE guidelines PH 19*. London: NICE.

National Institution for Health and Care Excellence (2012). *Process and methods guides. The guidelines manual*. London: NICE. Retrieved 11 April, 2015, from <http://publications.nice.org.uk/pmg6>

a) National Institution for Health and Care Excellence (2013). NICE quality standards, Retrieved 13 April, 2013, from <http://www.nice.org.uk/guidance/qualitystandards/qualitystandards.jsp>

b) National Institution for Health and Care Excellence (2013). Guide to methods of technology appraisal, Retrieved 6 January, 2018, from <https://www.nice.org.uk/process/pmg9/chapter/introduction>

National Spinal Taskforce (2013) Commissioning spinal services – Getting the service back on track: A guide for commissioners of spinal services, Retrieved 15 February, 2014, from <http://www.nationalspinaltaskforce.co.uk/>

Nelson, E.C., Eftimovska, E., Lind, C., Hager, A., Wasson, J.H., & Lindblad, S. (2015). Patient reported outcome measures in practice. *BMJ*, 350, g7818. doi: <https://doi.org/10.1136/bmj.g7818>

Newcomer, K.E., Patry, H.P., & Wholey, J.S. (2015). *Handbook of practical program evaluation, fourth edition*. Hoboken: John Wiley & Sons, Inc.

Newington, L., & Metcalfe, A. (2014). Factors influencing recruitment to research: qualitative study of the experiences and perceptions of research teams. *BMC Medical Research Methodology*, 14, 10. doi: [10.1186/1471-2288-14-10](https://doi.org/10.1186/1471-2288-14-10)

NHS Future Forum (2012). NHS Future Forum Summary report – second phase. Retrieved 7 February, 2014, from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216422/dh_13208_5.pdf

Nicholas, P., Hefford, C., & Tumilty, S. (2012). The use of patient-specific functional scale to measure rehabilitative progress in physiotherapy setting. *Journal of Manipulative Therapy*, 20(3), 147-152.

Nicholls, J., Lawlor, E., Neitzert, E., Goodspeed, T., & Cupitt, S. (eds) (2009). *Guide to social return on investment*. Scotland: The Cabinet Office of the Third Sector (OTS).

Nielsen, M.B.D., Madsen, I.E.H., Bultmann, U., Christensen, U., Diderichsen, F. M., & Rugulies, R. (2010). Predictors of return to work in employees sick-listed with mental health problems: findings from a longitudinal study. *European Journal of Public Health*, 21, 806-811. doi: <https://doi.org/10.1093/eurpub/ckq171>

Nieuwenhuijsen, K., Faber, B., Verbeek, J.H., Neumeier-Gromen, A., Hees, J.L., Verhoeven, A.C., ... Bultmann, U. (2014). Interventions to improve return to work in depressed people. *Cochrane Database of Systematic Reviews*, 12, CD006237. doi: 10.1002/14651858.CD006237.pub3.

Noben, C. Y. G., Nijhuis, F. J. N., de Rijk, A.E., & Evers, S.M.A.A. (2012). Design of a trial-based economic evaluation on the cost-effectiveness of employability interventions among work disabled employees or employees at risk of work disability: the CASE-study. *BMC Public Health*, 12, 43-43.

Noben, C.Y.G., Evers, S.M.A.A., Nijhuis, F.J., & de Rijk, A.E. (2014). Quality appraisal of generic self-reported instruments measuring health-related productivity changes: a systematic review. *BMC Public Health*, 14, 115. doi:10.1186/1471-2458-14-115.

Noordik, E., van der Klink, J.J., Geskus, R.B., de Boer, M.R., van Dijk, F.J.H., & Nieuwenhuijsen, K. (2013). Effectiveness of an exposure-based return-to-work program for workers on sick leave due to common mental disorders: a cluster-randomized controlled trial. *Scandinavian Journal of Work, Environment and Health*, 39(2), 144-154. doi:10.5271/sjweh.3320

Norrefalk, J.-R., Ekholm, K., Linder, J., Borg, K., & Ekholm, J. (2008). Evaluation of a multiprofessional rehabilitation programme for persistent musculoskeletal-related pain: economic benefits of return to work. *Journal of Rehabilitation Medicine: Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine*, 40(1), 15-22.

Nurminen, E., Malmivaara, A., Ilmarine, J., Ylostalo, P., Mutanen, P., Ahonen, G., & Aro, T. (2002). Effectiveness of a worksite exercise program with respect to perceived work ability and sick leaves among women with physical work. *Scandinavian Journal of Work, Environment & Health*, 28(2), 85-93. doi: 10.5271/sjweh.652

Nyman, C.S., Andersson, L., Spak, F., & Hensing, G. (2009). Exploring consequences of sickness absence – a longitudinal study on changes in self-rated physical health. *Work*, 34, 315-324.

Nystuen, P. & Hagen, K.B. (2003). Feasibility and effectiveness of offering a solution-focused follow-up to employees with psychological problems or muscle skeletal pain: a randomised controlled trial. *BMC, Public Health*, 3, 19.

Oakman, J., Keegel, T., Kinsman, N., & Briggs, A.M. (2016). Persistent musculoskeletal pain and productive employment; a systematic review of interventions, *Occupational & Environmental Medicine*, 73, 206-214. doi: 10.1136/oemed-2015-103208

Odeen, M., Magnussen, L.H., Maeland, S., Larun, L., Eriksen, H.R., & Tveito, T.H. (2013). Systematic review of workplace interventions to reduce sickness absence. *Occupational Medicine*, 63(1), 7-16. doi.org/10.1093/occmed/kqs198

O'Donnell, M., & Reymond, J. (2009). Vocational rehabilitation: a complementary service, *Occupational Health*, October, 19 – 21.

Oemar, M., & Janssen, B. (2013). *EQ-5D-5L User guide. Basic information on how to use the EQ-5D-5L instrument. Version 2*. The EuroQol Group. Retrieved 7 March, 2015, from <http://www.euroqol.org/about-eq-5d/publications/user-guide.html>

- a) Office for National Statistics (2012). *Gross domestic product: preliminary estimate, Q1 2012, statistical bulletin*. UK: ONS.
- b) Office for National Statistics (2012) *Sickness absence in the labour market, April 2012, Labour Force Survey*. UK: ONS.

Office for National Statistics (2014). *Full report: sickness absence in the labour market, February 2014*. UK: ONS.

Office for National Statistics (2016). *Article: sickness absence in the labour market*. UK: ONS. Retrieved 28 September 2017, from <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/articles/sicknessabsenceinthelabourmarket/2016>

Office for National Statistics (2017). Statistical bulletin: UK Labour Market: July 2017. Estimates of employment, unemployment, economic inactivity, and other employment related statistics for the UK. Retrieved 28 September 2017, from <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/uklabourmarket/july2017>

Oldham, G. R., & Rotchford, N. L. (1983). Relationship between office characteristics and employee reactions: a study of the physical environment. *Administrative Science Quarterly*, 28, 542-556.

Olsen, O., Albertson, K., Nielsen, M. L., Poulsen, K. B., Gron, S. M., & Brunnberg, H. L. (2008). Workplace restructurings in intervention studies - a challenge for design, analysis and interpretation. *BMC Medical Research Methodology*, 8, 39. doi: 10.1186/1471-2288-8-39

Organisation for Economic Co-operation and Development (OECD) (2017). United Kingdom-Economic forecast summary (June 2017). Retrieved from <http://www.oecd.org/eco/outlook/united-kingdom-economic-forecast-summary.htm>

Oxenburgh, M., & Marlow, P. (2005). The Productivity Assessment Tool: computer-based cost benefit analysis model for the economic assessment of the occupational health and safety interventions in the workplace. *Journal of Safety Research – ECON Proceedings*, 36, 209-214. doi: 10.1016/j.jsr.2005.06.002

Pannell, D.J. (1997). Sensitivity analysis of normative economic models: Theoretical framework and practical strategies. *Agricultural Economics*, 16, 139-152.

Palmer, K.T, Harris, E.C., Linaker, C., Barker, M., Lawrence, W., Cooper, C., & Coggon, D. (2012). Effectiveness of community and workplace-based interventions to manage musculoskeletal-related sickness absence and job loss: a systematic review. *Rheumatology*, 51, 230 – 242.

Pare, P., Gray, J., Lam, S., Balshaw, R., Khorasheh, S., Barbeau, M., ... McBurney, C.R. (2006). Health-related quality of life, work productivity, and health care resource utilization of subjects with irritable bowel syndrome: baseline results from logic (longitudinal outcomes study of gastrointestinal symptoms in Canada), a naturalistic study. *Clinical Therapeutics*, 28(10), 1726-1735.

Parker, A., & Tritter, J. (2006). Focus group method and methodology: current practice and recent debate. *International Journal of Research & Method in Education*, 29(1), 23-37. doi: 10.1080/01406720500537304

Parkin, D. (2009). *Health economics: 5 - Techniques of economic appraisal*. UK: Public Health Action Support Team, Department of Health. Retrieved 7 March, 2013, from <http://www.healthknowledge.org.uk/public-health-textbook/medical-sociology-policy-economics/4d-health-economics/economic-appraisal>

- a) Parliament.UK (2014). Universal Credit implementation: monitoring DWP's performance in 2012-13 - Work and Pensions Committee. Retrieved 30 November, 2014, from <http://www.publications.parliament.uk/pa/cm201314/cmselect/cmworpen/1209/120905.htm>
- b) Parliament.UK (2014). House of Commons. Oral answers to questions. Work and Pensions. Retrieved from <http://www.publications.parliament.uk/pa/cm201415/cmhansrd/cm140623/debtext/140623-0001.htm>

Parliament.UK (2017). House of Commons Hansard. Universal credit roll out. Retrieved from: <https://hansard.parliament.uk/commons/2017-10-24/debates/81F68207-B696-4D36-92FB-1A00AFD3817F/UniversalCreditRoll-Out>

Patton, M.Q. (1987). *How to use qualitative methods in evaluation*. London: Sage.

Pauly, M.V., Nicholson, S., Polsky, D., Berger, M. L., & Shard, C. (2008). Valuing reductions in on-the-job illness: 'presenteeism' from managerial and economic perspectives. *Health Economics*, 17, 469–485

Pengel, L., Refshauge, K.M., & Maher, C.G. (2004). Responsiveness of pain, disability, and physical impairment outcomes in patients with low back pain. *Spine*, 29(8), 879-83.

Phillips, J.J. (2011). *Return on investment in training and performance improvement programs*. New York: Routledge.

Phillips, K.A., Veenstra, D., Van Bebber, S., & Sakowski, J. (2003). An introduction to cost-effectiveness and cost-benefit analysis of pharmacogenomics. *Pharmacogenomics*, 4(3), 231-239.

Pichler, S. (2014). Sickness absence, moral hazard, and the business cycle. *Health Economics*, 24(6), 692-710.

Pilette, P. (2005). Presenteeism in nursing: a clear and present danger to productivity. *Journal of Nursing Administration*, 35(6), 300–303.

Pilgrim, H., Carroll, C., Rick, J., Jagger, N., & Hillage, J. (2008). *Modelling the cost effectiveness of interventions, strategies, programme and policies to reduce the number of employees on sickness absence*. Brighton: Institute for Employment Studies.

Ponterroto, J.G. (2005). Qualitative research in counselling psychology: A primer on research paradigms and philosophy of science. *Journal of Counselling Psychology*, 52(2), 126- 136.

Price, M. (2013). *Convenience samples: what they are and what they should (and should not) be used for*. Human Rights Data Analysis Group. Retrieved 14 April, 2015, from <https://hrdag.org/convenience-samples-what-they-are/>

Price Waterhouse Coopers (PwC) (2008). *Building the case for wellness, February 2008*. London: PriceWaterhouseCoopers.

Pruett, S.R., Swett, E.A., Chan, F., Rosenthal, D.A., & Lee, G.K. (2008). Empirical evidence supporting the effectiveness of VR. *Journal of rehabilitation*, 74(1), 56 – 63.

Pugner, K. M., Scott, D. I., Holmes, J. W., & Hieke, K. (2000). The costs of rheumatoid arthritis: an international long-term view. *Seminars in Arthritis and Rheumatism*, 29, 305-320.

Rabarison, K.M., Bish, C.L., Massoudi, M.S., & Giles, W.H. (2015). Economic evaluation enhances public health decision making. *Front Public Health*, 3, 164. doi: [10.3389/fpubh.2015.00164](https://doi.org/10.3389/fpubh.2015.00164)

Rail Safety and Standards Board (2014). *Costs of impaired health across the network. The workforce health and wellbeing project*. UK: Rail Safety and Standards Board.

Razali, N. M., & Wah, Y.B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. *Journal of Statistical Modelling and Analytics*, 2(1), 21-33.

Rebergen, D.S., Bruinvels, D.J., van Tulder, M.W., van der Beek, A.J., & van Mechelen, W. (2009). Cost-effectiveness of guideline-based care for workers with mental health problems. *Journal of Occupational and Environmental Medicine*, 51(3), 313-322.

Reetoo, N., Burrows, J., & Macdonald, E. (2009). *Managing sickness absence and return to work. Trial and assessment of sickness absence recording tool*. London: Prepared by the University of Glasgow for the Health and Safety Executive.

Roelen, C.A.M., Koopmans, P.C., Anema, J.R., & van der Beek, A.J. (2010). Recurrence of Medically Certified Sickness Absence According to Diagnosis: A Sickness Absence Register Study. *Journal of Occupational Rehabilitation*, 20(1), 113-121. doi: 10.1007/s10926-009-9226-8

Rose, N. (2013). *The benefit of cost analysis?* Manchester Community Central. Retrieved 6 March, 2018, from <https://manchestercommunitycentral.org/benefit-cost-benefit-analysis>

Rost, K.M., Meng, H., & Xu, S. (2014). Work productivity loss from depression: evidence from an employer survey. *BMC Health Services Research*, 14, 597. doi: 10.1186/s12913-014-0597-y

Rout, U., & Rourt, J.K. (1997). A comparative study on occupational stress, job satisfaction and mental health in British general practitioners and Canadian family physicians. *Psychology, Health & Medicine*, 2(2), 181-190. doi: 10.1080/13548509708400575

Royal Australasian College of Physicians (2011). Position statement on realising the health benefits of work. Retrieved from <https://www.racp.edu.au/docs/default-source/advocacy-library/realising-the-health-benefits-of-work.pdf>

Rumsey, D.J. (2011). *Statistics for dummies*. London: John Wiley & Sons.

Sale, J.E.M., Lohfeld, L.H., & Brazil, K. (2002). Revisiting the quantitative-qualitative debate: implications for mixed-methods research. *Quality & Quantity*, 36, 43-53.

Salling, K.B., & Banister, D. (2010). Feasibility risk assessment of transport infrastructure projects: the CBA-DK Decision support model. *European Journal of Transport and Infrastructure Research*, 10(1), 103-120.

Sainsbury Centre for Mental Health (2003). *Economic and social costs of mental illness in England*. London: Sainsbury Centre for Mental Health.

Saunders, M., Lewis, P., & Thornhill, A. (2015). *Research methods for business students. Seventh edition*. New York: Pearson Education.

Schaafsma, F., Schonstein, E., Whelan, K.M., Ulvestad, E., Kenny, D.T., & Verbeek, J.H. (2010). Physical conditioning programs for improving work outcomes in workers with back pain. *Cochrane Database Systematic Reviews*, 1, CD001822.

Schaafsma, F.G., Whelan, K., van der Beek, A.J., van der Es-Lambeek, L.C., Ojajärvi, A., & Verbeek, J.H. (2013). Physical conditioning as part of a return to work strategy to reduce sickness absence for workers with back pain. *Cochrane Database of Systematic Reviews*, 8, CD001822. doi: 10.1002/14651858.CD001822.pub3.

Schandelmaier, S., Ebrahim, S., Burkhardt, S. C. A., de Boer, W.E. L., Zimbrunn, T., Guyatt, G. H., ... Kunz, R. (2012). Return to work coordination programmes for work disability: a meta-analysis of randomised controlled trials. *PLOS ONE*, 7(11), e49760.

Schene, A.H., Koeter, M.W., Kikkert, M.J., Swinkels, J.A., & McCrone, P. (2007). Adjuvant occupational therapy for work-related major depression works: randomized trial including economic evaluation. *Psychological Medicine*, 37, 351–362. doi:10.1017/S0033291706009366

Schultz, A., & Edington, D.W. (2007). Employee health and presenteeism: a systematic review. *Journal of Occupational Rehabilitation*, 17(3), 547–579.

Schultz, A., Chen, C-Y., & Edington, D.W. (2009). The Cost and Impact of Health Conditions on Presenteeism to Employers A Review of the Literature. *Pharmacoeconomics*, 27(5), 365-378.

Scotland, J. (2012). Exploring the philosophical underpinnings of research: relating ontology and epistemology to the methodology and methods of the scientific, interpretive and critical paradigms. *English Language Teaching*, 5(9), 9- 16. doi:10.5539/elt.v5n9p9

Scottish Intercollegiate Guidelines Network (SIGN) (2000). *Management of early rheumatoid arthritis*. Scotland: SIGN publication 48.

Sculpher, M.J., Claxton, K., Drummond, M., & McCabe, C. (2006). Whither trial-based economic evaluation for health care decision making. *Health Economics*, 15(7), 677-687. Doi: 10.1002/hec.1093

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin.

Shapiro, J.Z., & Blackwell, D.L. (1987). Large-scale evaluation on a limited budget: the partnership experience. In J. Nowakowski (ed.), *The client perspective on evaluation: New directions for program evaluation, no. 36*. San Francisco: Jossey-Bass.

Shapiro, S.S. & Wilk, M.B. (1965). An analysis of variance test for normality (complete samples). *Biometrika*, 52(3/4), 591-611.

Shaw, W.S., Bese, E., Pransky, G., Boot, C.R.L., Nicholas, M.K., & McLellan, R.K. (2014). Manage at work: a randomized, controlled trial of a self-management group intervention to overcome workplace challenges associated with chronic physical health conditions. *BMC Public Health*, 14, 515. doi:10.1186/1471-2458-14-515

Shehabi, A. (2017). *Addressing the health obstacles to employability. A mid-term evaluation of the Bridging the Gap programme*. London: The Work Foundation.

Shemilt, I., Mugford, M., Byford, S., Drummond, M., Eisenstein, E., Knapp, M., ... Walker, D. (2008). Incorporating economics evidence. *Cochrane handbook for systematic reviews of interventions*. 449-480.

Shepard, D.S., & Reif, S. (2004). The value of vocational rehabilitation in substance user treatment: a cost-effectiveness framework. *Substance Use and Misuse*, 39(13-14), 2581-2609

Sheppard, D.M., & Frost, D. (2016). A new vocational rehabilitation service delivery model addressing long-term sickness absence. *British Journal of Occupational Therapy*, 79(11), 677-681. doi: 10.1177/0308022616648173

Shiell, A., Donaldson, C., Mitton, C., & Currie, G. (2002). Health economic evaluation. *Journal of epidemiology and community health*. 56(2), 85-88.

Shikiar, R., Halpern, M.T., Rentz, A.M., & Khan, Z.M. (2004). Development of the Health and Work Questionnaire (HWQ): an instrument for assessing workplace productivity in relation to worker health. *Work*, 22(3), 219–229.

Sikes, P. (2004). Chapter 2. Methodology procedures and ethical concerns. In C. Opie (Ed.), *Doing educational research*. London: Sage.

Smith, J.A. (Eds) (2008). *Qualitative psychology. A practical guide to research methods. Second Edition*. London: Sage Publications.

Snell, M. (2011). *Cost benefit analysis, a practical guide: 2nd edition*. London: Thomas Telford.

Snipes, R. L., Oswald, S.L., Latour, M., & Armenakis, A.A (2005). The effects of specific job satisfaction facets on customer perceptions of service quality: an employee-level analysis. *Journal of Business Research*, 58(10), 1330-1339.

Sogaard, H.J., & Bech, P. (2009). The effect on length of sickness absence by recognition of undetected psychiatric disorder in long-term sickness absence. A randomized controlled trial. *Scandinavian Journal of Public Health*, 37, 864-871

Spekle, E.M., Heinrich, J., Hoozemans, M.J.M., Blatter, B.M., van der Beek, A.J., Dieen, J.H., & van Tulder, M.W. (2010). The cost-effectiveness of the RSI Quick Scan intervention programme

for computer workers: results of an economic evaluation alongside a randomised controlled trial. *BMC Musculoskeletal Disorders*, 11, 259. doi: 10.1186/1471-2474-11-259

Spitzer, R.L., Kroenke, K., & Williams, J.B.W. (1999). Validation and utility of a self-report of PRIME-MD – the PHQ primary care study. *JAMA*, 282, 1737-1744.

Squires, H., Rick, J., Carroll, C., & Hillage, J. (2012). Cost-effectiveness of intervention to return employees to work following long-term sickness absence due to musculoskeletal disorders. *Journal of Public Health*, 34(1), 115-124. doi: 10.1093/pubmed/fdr057

Staal, J.B., Hlobil, H., Twisk, J.W.R., Smid, T., Koke, A.J.A., & van Mechelen, W. (2004). Graded activity for low back pain in occupational health care. A randomized, controlled trial. *Annals of Internal Medicine*, 140, 77-84.

Staples, M. & Niazi, M. (2007). Experiences using systematic review guidelines. *Journal of Systems and Software*, 80, 1425- 1437. doi: [10.1016/j.jss.2006.09.046](https://doi.org/10.1016/j.jss.2006.09.046)

Steenstra, I. A., Anema, J.R., van Tulder, M.W., Bongers, P.M., deVet, H.C.W., & van Mechelen, W. (2006). Economic evaluation of a multi-stage return to work programme for workers on sick-leave due to low back pain. *Journal of Occupational Rehabilitation*, 16(4), 557-578.

Steinke, E. (2004). Research ethics, informed consent and participant recruitment. *Clinical Nurse Specialist*, 18(2), 88-97.

Stevenson, D., & Farmer, P. (2017). Thriving at work: the independent review of mental health and Employer. Retrieved 6 March, 2018, from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/658145/thriving-at-work-stevenson-farmer-review.pdf

Stirman, S.W., Kimberley, J., Cook, N., Calloway, A., Castro, F., & Charns, M. (2012). The sustainability of new programs and innovations: a review of the empirical literature and

recommendations for future research. *Implementation Science*, 7, 17. <https://doi.org/10.1186/1748-5908-7-17>

Stone, G. (no date). Chapter 11: Understanding the economic evidence, Methodological background. Retrieved 28 August, 2014, from <http://www.thecommunityguide.org/library/economics.pdf>

Stratford, P., Gill, C., Westaway, M., & Binkley, J., (1995). Assessing disability and change on individual patients: a report of a patient specific measure. *Physiotherapy Canada*. 47, 258-26.

Stride, C., Wall, T.D., & Catley, N. (2007). *Measures of job satisfaction, organisational commitment, mental health and job-related wellbeing*, 2nd Ed. Chichester: John Wiley & Sons.

Stromberg, C., Aboagye, E., Hagberg, J., Bergstrom, G., & Lohela-Karlsson, M. (2017). Estimating the effect and economic impact of absenteeism, presenteeism, and work environment-related problems on reductions in productivity from a managerial perspective. *Value in Health*, 20(8), 1058 – 1064. <https://doi.org/10.1016/j.jval.2017.05.008>

Stroup, S.F., Berlin, J.A., Morton, S., Olkin, I., Williamson, D., Rennie, D., ... Thacker, S.B. (2000). Consensus statement. Meta-analysis of observational studies in epidemiology. A proposal for reporting. *JAMA*, 283(15), 2008 – 2012. doi:10.1001/jama.283.15.2008

Suk, M., Hanson, B.P., Norvell, D.C., & Helfet, D.L. (2005). *Musculoskeletal outcome measures and instruments*. New York: Thieme.

Sundstrup, E., Hansen, A., Mortensen, E., Poulsen, O., Clausen, T., Rugulies, R., ... Andersen, L. (2018). Retrospectively assessed psychosocial working conditions as predictors of prospectively assessed sickness absence and disability pension among older workers. *BMC Public Health*, 18(1).

Suri, H. (2011). Purposeful Sampling in Qualitative Research Synthesis. *Qualitative Research Journal*, 11(2), 63-75. <https://doi.org/10.3316/QRJ1102063>

Sutton, A.J., Breheny, K., Deeks, J., Khunti, K., Sharpe, C., Ottridge, R.S., ... eGFR-C study group. (2015). Methods used in economic evaluations of chronic kidney disease testing—a systematic review. *PloS one*. 10(10), e0140063.

Sutton, S., Baum, A., & Johnston, M. (2005). *The SAGE handbook of health psychology*. London: SAGE Publications.

Tamminga, S.J., Verbeek, J.H.A.M., Frings-Dresen, M.H.W, & de Boer, A.G.E.M. (2014). Measurement properties of the Work Limitations Questionnaire were sufficient amongst cancer survivors. *Quality of Life Research*, 23, 515.

Taylor, P., Baldry, C., Bain, B., & Ellis, V. (2003). A unique working environment: health, sickness and absence management in UK call centers. *Work, Employment and Society*, 17(3), 435–458.

Taylor, P. Cunningham, I., Newsome, K., & Scholarios, D. (2010). ‘Too scared to go sick’ – reformulating the research agenda on sickness absence. *Industrial Relations Journal*, 41(4), 270-288. doi: 10.1111/j.1468-2338.2010.00569.x

Taylor, M., Marsh, G., Nicol, D., & Broadbent, P. (2017). Good work: the Taylor review of modern working practices. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf

Terry, P. E. & Min, Xi. (2010). An examination of presenteeism measures: the association of three scoring methods with health, work life, and consumer activation. *Population Health Management*, 13, 297–307.

The Council for Work and Health (2014). *Planning the future: delivering a vision of occupational health and its workforce for the UK for the next 5-20 years*. Syngentis. Retrieved 30 November, 2014, from http://www.cohpa.co.uk/files/Planning_the_Future.pdf

Theodossiou, I., & Zangelidis A. (2009). Career prospects and tenure–job satisfaction profiles: Evidence from panel data. *Journal of Socio-Economics*, 38(4), 648-657.

Tompa, E., Verbeek, J., van Tulder, M., & de Boer, A. (2010). Developing guidelines for good practice in the economic evaluation of occupational safety and health interventions. *Scandinavian Journal of Work Environmental Health*, 36(4), 313-8.

Tompa, E., de Oliveira, C., Dolinshic, R., & Irvin, E. (2008). A systematic review of disability management interventions with economic evaluations. *Journal of Occupational Rehabilitation*, 18, 16 – 26.

Tompa, E., Dolinschi, R., & de Oliveira, C. (2006). Practice and potential of economic evaluation of workplace-based interventions for occupational health and safety. *Journal of Occupational Rehabilitation*, 16, 367–392.

Towse, A., & Drummond, M. (1997). *OHE briefing, the pros and cons of modelling in economic evaluation*. No 33. Summary of a session on ‘Modelling in Economic Evaluation’ at the Conference of the International Society for Technology Assessment in Health Care’ in San Francisco, June, 26, 1996.

Treasury Board of Canada Secretariat (1998). *Benefit-cost analysis guide*. Ottawa.

Trueman, P., & Anokye, N.K. (2012). Applying economic evaluation to public health interventions: the case of interventions to promote physical activity. *Journal of Public Health*, 1-8.

Uegaki, K., de Bruijne, M.C., van Tulder, M.W., & van Mechelen, W. (2007). Consensus-based findings and recommendations for estimating the costs of health-related productivity loss from a company’s perspective. *Scandinavian Journal of Work Environmental Health*, 33(22), 122-130.

Uegaki, K., de Bruijne, M.C., Lambeek, L., Anema, A.J., van der Beek, W. & van Mechelen, W. (2010). Economic evaluations of occupational health interventions from a corporate perspective—a systematic review of methodological quality. *Scandinavian Journal of Work Environmental Health*, 36, 273–288.

Uegaki, K., Stomp-van den Berg, S.G.M., de Bruijne, M.C., van Poppel, M.N.M., Heymands, M.W., van Mechelen, W., & van Tulder, M.W. (2011). Cost-utility analysis of a one-time supervisor telephone contact at 6-weeks post-partum to prevent extended sick leave following maternity leave in the Netherlands: results of an economic evaluation alongside a randomised controlled trial. *BMC Public Health*, 11, 57. doi: 10.1186/1471-2458-11-57

Uegaki, K. de Bruijne, M.C., van der Beek, A.J., van Mechelen, W., & van Tulder, M.W. (2011). Economic evaluations of health interventions from a company's perspective: a systematic review of methods to estimate the cost of health-related productivity loss. *Journal of Occupational Rehabilitation*, 21(1), 90-99.

UK Commission for Employment and Skills (2014). *The labour market story: the UK following recession. Briefing paper*. UK: UK Commission for Employment and Skills.

US National Library of Medicine (2014). Health economics information resources: a self-study course. Retrieved 28 August, 2014, from <http://www.nlm.nih.gov/nichsr/edu/healthecon/glossary.html>

Van Asselt, A., Dirksen, C.D., Arnt, A., & Severns, J.L. (2008). Difficulties in calculating productivity costs: work disability associated with borderline personality disorder. *Value in Health*, 11(4), 637-644.

Van den Hout, W.B., De Bucj, P.D.M., & Vlieland, T.P..M.V. (2007). Cost-utility analysis of a multidisciplinary job retention vocational rehabilitation program in patients with chronic arthritis at risk of job loss. *Arthritis & Rheumatism*, 57(5), 778-786.

Van Den Hout, J.H.C., Vlaeyen, J.W.S., Heuts, P.H.T.G., Zijlema, J.H.L., & Wijnen, J.A.G. (2003). Secondary prevention of work-related disability in nonspecific low back pain: does problem-solving therapy help? A randomized clinical trial. *The Clinical Journal of Pain*, 19(2), 18-96.

Van Dongen, J.M., van Wier, M.F., Tompa, E., Bongers, P.M., van der Beek, A.J., van Tulder, M.W., & Bosmans, J.E. (2014). Trail-based economic evaluations in occupational health. *Journal of Occupational Environmental Medicine*, 56(6), 563 – 572. doi: [10.1097/JOM.0000000000000165](https://doi.org/10.1097/JOM.0000000000000165)

Van Dongen, J.M., Tompa, E., Clune, L., Sarnocinska-Hart, A., Bongers, P.M., van Tulder, M.W., ... van Wier, M.F. (2013). Bridging the gap between economic evaluation literature and daily practice in occupational health: a qualitative study among decision-makers in the healthcare sector. *Implementation Science*, 8, 57. doi: [10.1186/1748-5908-8-57](https://doi.org/10.1186/1748-5908-8-57)

Van Dongen, J.M., Proper, K.I., van Wier, M.F., van der Beek, A.J., Bongers, P.M., van Mechelen, W., ... Maurits, W. (2012). A systematic review of the cost-effectiveness of worksite physical activity and/or nutrition programs. *Scandinavian Journal of Work Environmental Health*, 38, 393–408.

Van Dongen, J.M., Proper, K.I., van Wier, M.F., van der Beek, A.J., Bongers, P.M., van Mechelen, W. & van Tulder, M.W. (2011). Systematic review on the financial return of worksite health promotion programmes aimed at improving nutrition and/or increasing physical activity. *Obesity Reviews*, 12, 1031–1049

Van Holland, B.J., de Boer, M.R., Brouwer, S., Soer, R., & Reneman, M.F. (2012). Sustained employability of workers in a production environment: design of a stepped wedge trial to evaluate effectiveness and cost-benefit of the POSE program. *BMC Public Health*, 12, 1003. doi: [10.1186/1471-2451-12-1003](https://doi.org/10.1186/1471-2451-12-1003)

Van Oostrom, S.H., Anema, J.R., Terluin, B., de Vet, H.C.W., Knol, D.L., & van Mechelen, W. (2008). Cost-effectiveness of a workplace intervention for sick-listed employees with common mental disorders: design of a randomized controlled trial. *BMC Public Health*, 8, 12. doi:10.1186/1471-2458-8-1

Van Oostrom, S.H., Heymans, M.W., de Vet, H.C., van Tulder, M.W., van Mechelen, W., & Anema, J. (2010). Economic evaluation of workplace intervention for sick-listed employees with distress. *Journal of Occupational Environmental Medicine*, 67, 603-610.

Van Velden, M.E., Severens, J.L., & Novak, A. (2005). Economic evaluations of healthcare programmes and decision making. The influence of economic evaluations on different health-care decision making levels. *Pharmacoeconomics*, 23(11), 1075-1082.

Van Vilsteren, M., van Oostrom, S.H., de Vet, H.C.W., Franche, R.L., Boot, C.R.L., & Anema, J.R. (2015). Workplace interventions to prevent work disability in workers on sick leave. *Cochrane Database of Systematic Reviews*, 10, CD006955. doi: 10.1002/14651858.CD006955.pub3.

Varekamp, I, Verbeek, J.H.A.M., & van Dijk, F.J.H. (2006). How can we help employees with chronic diseases to stay at work? A review of interventions aimed at job retention and based on an empowerment perspective. *International Archives of Occupational and Environmental Health*, 80, 87-97.

Verbeek, J., Pulliainen, M., & Kankaanpaa, E. (2009). A systematic review of occupational safety and health business cases. *Scandinavian Journal of Work Environmental Health*, 35, 403–412.

Vingard, E., Alexanderson, K., & Norlund, A. (2004). Sickness presence. *Scandinavian Journal of Public Health*, 32(63), 216-221.

Vocational Rehabilitation Association (VRA) (2013). *Standards of Practice and Code of Ethics for Vocational Rehabilitation Practitioners*. UK: VRA.

Vogel, N., Schangelmaier, S., Zumbrunn, T., de Boer, W.E.L., Busse, J.W., & Kunz, R. (2017). Return-to-work coordination programmes for improving return to work in workers on sick leave (review). *Cochrane Database of Systematic Reviews*, 3, CD011618. doi: 10.1002/14651858.CD011618.pub.2

Volkov, B. B., & Baron, M. E. (2011). Issues in internal evaluation: Implications for practice, training, and research. *New Directions for Evaluation*, 132, 101–111. doi: 10.1002/ev.399

Von Thiele, S.U., Lindfors, P., & Lundberg, U. (2008). Health-related effects of worksite interventions involving physical exercise and reduced work hours. *Scandinavian Journal of Work, Environment & Health*, 34(3), 179-188.

Waddell, G. (2002). *Models of disability: using low back pain as an example*. London: Royal Society of Medicine Press.

Waddell, G., & Burton, K. (2006). *Is work good for your health and wellbeing?* London: The Stationery Office.

Waddell, G., Burton, A.K., & Kendall, N.A.S. (2008). *Vocational Rehabilitation, what works, for whom and when?* London: The Stationery Office.

Wagner, S.L., Koehn, C., White, M.I., Harder, H.G., Schultz, I.Z., Williams-Whitt, K., ... Wright, M.D. (2016). Mental health interventions in the workplace and work outcomes; a best-evidence synthesis of systematic reviews. *The International Journal of Occupational and Environmental Medicine*, 7, 14.

Wales Audit Office (no date). Occupational Health, tools, policy and guidance, the good practice exchange. Retrieved 30 November, 2014, from http://www.wao.gov.uk/sites/default/files/download_documents/Occupational%20Health%20Good%20Practice%20Guide.pdf

Walker, D., & Fox-Rushby, J.A. (2001). Allowing for uncertainty in economic evaluations: qualitative sensitivity analysis. *Health and Policy Planning*, 16(4), 435-443. <https://doi.org/10.1093/heapol/16.4.435>

Walter, E., Zehetmayr, S., Consensus group: Bencic, W., Bucsics, A., Dressler, H., Gerold, W., Hartinger., ... Windischbauer, A. (2006). *Guidelines on health economic evaluations: consensus paper*. Vienna: Institute for Pharmacoeconomic Research.

Wang, L., & Lin, W. (2011). Wording effect and the dimensionality of the General Health Questionnaire (GHQ-12). *Personality and Individual Differences*, 50(7), 1056-1061.

Warr, P., Cook, J., & Wall, T., (1979). Scales for the measurement of some work attitudes and aspects of psychological wellbeing. *Journal of Occupational Psychology*, 52, 129-148.

Watson, R. (2014). Quantitative research. *Nursing Standard*. 29(31), 44-48. doi: 10.7748/ns.29.31.44.e8681

Watts, J. (2017). Universal Credit : Dame Louise Casey says rolling out new system 'like jumping over a cliff'. *Independent*, 29th September.

Wegge, J., Schmidt, K. H., Parkes, C., & Van Dick, R. (2007). Taking a sickie: job satisfaction and job involvement as interactive predictors of absenteeism in a public organisation. *Journal of Occupational and Organisational Psychology*, 80(1), 77-89. doi: 10.1348/096317906x99371

Weinberg, A., & Creed, F. (2000). Stress and psychiatric disorder in healthcare professionals and hospital staff. *Lancet*, 355(9203), 533-537. doi: 10.1016/s0140-6736(99)07366-3

Weinstein, M.C., & Stason, W.B. (1977). Foundations of cost-effectiveness analysis for health and medical practices. *New England Journal of Medicine*, 296, 716-21.

Wells, J. (2016). The emergence of indicators of integrated vocational rehabilitation in Sweden: how working through coordination agencies made all the difference. *International Journal of Integrated Care*, 16(6), A358. doi: <http://doi.org/10.5334/ijic.2906>

Weyman, A., Wainwright, D., O'Hara, R., Jones, P., & Buckingham, A. (2012). *Extending working life: Behaviour change interventions, Research Report No 809*. UK: Department for Work and Pensions. Retrieved from <http://research.dwp.gov.uk/asd/asd5/rports2011-2012/rrep809.pdf>

Whitaker, S.C. (2001). The management of sickness absence. *Occupational and Environmental Medicine*, 58, 420-424.

Williams, I., Bryan, S., McIver, S., Moore, D., & Hendorn, C. (2008). The use of economic evaluations in NHS decision-making: a review and empirical investigation. *Health Technology Assessment*, 12, 7, 1-175.

Willig, C. (2001). *Introducing qualitative research in psychology. Adventures in theory and method*. Maidenshaw: Open University Press.

World Health Organisation (2018). Mental health: a state of wellbeing. Retrieved 7 April, 2018, from http://www.who.int/features/factfiles/mental_health/en/

World Health Organisation (2007). *Workers' health: global plan of action*. World Health Organisation, Sixtieth World Health Assembly. Retrieved from http://www.who.int/occupational_health/WHO_health_assembly_en_web.pdf?ua=1.

World Health Organisation (2009). *WHO guide to identifying the economic consequences of disease and injury*. Geneva: World Health Organisation.

World Health Organisation Scientific Group (2003). *The burden of musculoskeletal conditions at the start of the new millennium*. Geneva: World Health Organisation.

World Health Organisation (1998). *Wellbeing measures in primary health care/the Depcare Project*. Copenhagen: WHO Regional Office for Europe.

Wright, M., Beardswell, C., & Marsden., S. (2005). *Rehabilitation capacity in the UK: report 2 final report*. Reading: Greenstreet Berman Ltd.

Wynne-Jones, G., Artus, M., Bishop, A., Lawton, S., Lewis, M., Jowett, S. ... the SWAP Study Team (2018). Effectiveness and costs of a vocational advice service to improve work outcomes in patients with musculoskeletal pain in primary care: a cluster randomised trial (SWAP trial ISRCTN 52269669). *Pain*, 159, 128-138.

Yeomans, L. (2011). *An update of the literature on age and employment*. London: Prepared by the Health and Safety Laboratory for the Health and Safety Executive.

Zhang, W., Bansback, N., & Anis, A.H. (2011). Measuring and valuing productivity loss due to poor health: A critical review. *Social Science Medicine*, 72(2), 185-192.

8. Appendix

Appendix 1: EQ-5D-5L

(English version for the UK)

UK (English) v.2 © 2009 EuroQol Group. EQ-5D™ is a trade mark of the EuroQol Group
Under each heading, please tick the ONE box that best describes your health TODAY

MOBILITY

- I have no problems in walking about
- I have slight problems in walking about
- I have moderate problems in walking about
- I have severe problems in walking about
- I am unable to walk about

SELF-CARE

- I have no problems washing or dressing myself
- I have slight problems washing or dressing myself
- I have moderate problems washing or dressing myself
- I have severe problems washing or dressing myself
- I am unable to wash or dress myself

USUAL ACTIVITIES (e.g. work, study, housework, family or leisure activities)

- I have no problems doing my usual activities
- I have slight problems doing my usual activities
- I have moderate problems doing my usual activities
- I have severe problems doing my usual activities
- I am unable to do my usual activities

PAIN / DISCOMFORT

- I have no pain or discomfort
- I have slight pain or discomfort
- I have moderate pain or discomfort
- I have severe pain or discomfort
- I have extreme pain or discomfort

ANXIETY / DEPRESSION

- I am not anxious or depressed
- I am slightly anxious or depressed

I am moderately anxious or depressed

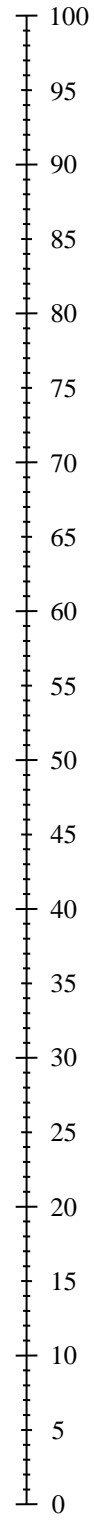
I am severely anxious or depressed

I am extremely anxious or depressed

UK (English) v.2 © 2009 EuroQol Group. EQ-5D™ is a trade mark of the EuroQol Group

- We would like to know how good or bad your health is

The best health
you can imagine



The worst health
you can imagine

TODAY.

- This scale is numbered from 0 to 100.
- 100 means the best health you can imagine.
0 means the worst health you can imagine.
- Mark an X on the scale to indicate how your health is TODAY.
- Now, please write the number you marked on the scale in the box below.

YOUR HEALTH TODAY =

UK (English) v.2 © 2009 EuroQol Group. EQ-5D™ is a trade mark of the EuroQol Group

Appendix 2 : Work Limitations Questionnaire

CONFIDENTIAL

Work Limitations Questionnaire[©]
Self-Administered Online Long-Form

Work Limitations Questionnaire, © 1998, The Health Institute, Tufts Medical Center f/k/a New England Medical Center Hospitals, Inc.; Debra Lerner, Ph.D.; Benjamin Amick III, Ph.D.; and GlaxoWellcome, Inc. All Rights Reserved.

Instructions

Health problems can make it difficult for working people to perform certain parts of their jobs. We are interested in learning about how your health may have affected you at work during the past 2 weeks.

- (1) The questions will ask you to think about your physical health or emotional problems. These refer to any ongoing or permanent medical conditions you may have and the effects of any treatments you are taking for these. Emotional problems may include feeling depressed or anxious.
- (2) Most of the questions are multiple choice. They ask you to answer by placing a mark in a box.

For example:

- a. How satisfied are you with your local schools?

(Mark one box.)

Not At All Satisfied

Moderately Satisfied

Very Satisfied

- b. How satisfied are you with your local police department?

(Mark one box.)

Not At All Satisfied

Moderately Satisfied

Very Satisfied

These marks tell us you are very satisfied with your local schools and moderately satisfied with your local police department.

OPTIONAL PAGE

3. Before you begin answering any questions, we would like you to write some information on the calendar.

- Find today's date. Mark that box.
- Count back 2 weeks and mark that box too.

This 2-week period is the subject of most of the questions. Feel free to mark other important dates such as birthdays, family events, or work deadlines. Please use the calendar to help you answer correctly.

Insert calendar here.

These questions ask you to rate the amount of time you had difficulty handling certain parts of your job. Please read and answer every question. Then choose a response.

- *Mark the “Does Not Apply to My Job” box only if the question describes something that is not part of your job.*
- *If you have more than one job, report on your **main** job only.*

1a. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to work the required number of hours?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

1b. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to get going easily at the beginning of the workday?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

1c. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to start on your job as soon as you arrived at work?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

1d. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to do your work without stopping to take breaks or rests?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

1e. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to stick to a routine or schedule?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

PLEASE READ CAREFULLY

These questions ask you to rate the amount of time you were able to handle certain parts of your job without difficulty.

2a. In the past 2 weeks, how much of the time were you **able** to walk or move around different work locations (for example, go to meetings), without difficulty caused by physical health or emotional problems?

(Mark one box.)

Able all of the time (100%)

Able most of the time

Able some of the time (about 50%)

Able a slight bit of the time

Able none of the time (0%)

Does not apply to my job

2b. In the past 2 weeks, how much of the time were you **able** to lift, carry, or move objects at work weighing more than 10 lbs., without difficulty caused by physical health or emotional problems?

(Mark one box.)

Able all of the time (100%)

Able most of the time

Able some of the time (about 50%)

Able a slight bit of the time

Able none of the time (0%)

Does not apply to my job

2c. In the past 2 weeks, how much of the time were you **able** to sit, stand, or stay in one position for longer than 15 minutes while working, without difficulty caused by physical health or emotional problems?

(Mark one box.)

Able all of the time (100%)

Able most of the time

Able some of the time (about 50%)

Able a slight bit of the time

Able none of the time (0%)

Does not apply to my job

2d. In the past 2 weeks, how much of the time were you **able** to repeat the same motions over and over again while working, without difficulty caused by physical health or emotional problems?

(Mark one box.)

Able all of the time (100%)

Able most of the time

Able some of the time (about 50%)

Able a slight bit of the time

Able none of the time (0%)

Does not apply to my job

2e. In the past 2 weeks, how much of the time were you **able** to bend, twist, or reach while working, without difficulty caused by physical health or emotional problems?

(Mark one box.)

Able all of the time (100%)

Able most of the time

Able some of the time (about 50%)

Able a slight bit of the time

Able none of the time (0%)

Does not apply to my job

2f. In the past 2 weeks, how much of the time were you **able** to use hand-held tools or equipment (e.g., a phone, pen, keyboard, computer mouse, drill, hairdryer, or sander), without difficulty caused by physical health or emotional problems?

(Mark one box.)

Able all of the time (100%)

Able most of the time

Able some of the time (about 50%)

Able a slight bit of the time

Able none of the time (0%)

Does not apply to my job

PLEASE READ CAREFULLY

These questions ask about difficulties you may have had at work.

3a. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to keep your mind on your work?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

3b. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to think clearly when working?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

3c. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to do work carefully?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

3d. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to concentrate on your work?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

3e. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to work without losing your train of thought?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

3f. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to easily read or use your eyes when working?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

The next questions ask about difficulties in relation to the people you came in contact with while working. These may include employers, supervisors, co-workers, clients, customers, or the public.

4a. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to speak with people in-person, in meetings or on the phone?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

4b. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to control your temper around people when working?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

4c. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to help other people to get work done?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

These questions ask about how things went at work overall.

5a. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to handle the workload?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

5b. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to work fast enough?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

5c. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to finish work on time?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

5d. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to do your work without making mistakes?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

5e. In the past 2 weeks, how much of the time did your physical health or emotional problems make it **difficult** for you to feel you've done what you are capable of doing?

(Mark one box.)

Difficult all of the time (100%)

Difficult most of the time

Difficult some of the time
(about 50%)

Difficult a slight bit of the time

Difficult none of the time (0%)

Does not apply to my job

Appendix 3: WLQ Time Loss Module

WLQ 4-Question Time Loss Module©

Copyright 2002, Debra Lerner, MS, PhD and The Institute for Clinical Research and Health Policy Studies, Tufts Medical Center

1. How many hours do you usually work **each week** in your **main** job?

 (Fill in Hours.)

2. How many hours do you usually work **each day** in your **main** job?

 (Fill in Hours.)

Questions 3 and 4 ask about time missed from work during the **past two weeks**. If you are self-employed or work at home, think about the time you missed on days you expected to work.

Report on your **main** job only.

3. In the past 2 weeks, how many **full workdays** did you miss because of your health or medical care? Health includes physical health and emotional problems. (Mark one box.)

None 1 2 3 4 5 6 7 8 9 10 11 or More

4. In the past 2 weeks, what was the total number of days on which you missed **part of a workday** because of your health or medical care (for example, you came in late or left early)? Health includes physical health and emotional problems. (Mark one box.)

None 1 2 3 4 5 6 7 8 9 10 11 or More

Appendix 4: General Health Questionnaire (GHQ-12), Job Satisfaction Scale (JSS), and Patient-Specific Functional Scale (PSFS)

General Health Questionnaire

Please answer all the following questions by putting a circle around the answer that you feel is the closest to the way you feel at the moment, or have been feeling for the past few weeks.

Have you recently:

Been able to concentrate on whatever you're doing?	better than Usual	same as usual	less than usual	much less than usual
Lost much sleep over worry?	not at all than usual	no more than usual	rather more than usual	much more than usual
Felt that you are playing a useful part in things?	more so than usual	same as usual	less so than usual	much less capable
Felt capable over making decisions about things?	more so than usual	same as usual	less so than usual	much less capable
Felt constantly under strain?	not at all	no more than usual	rather more than usual	much more than usual
Felt you could not overcome your difficulties?	not at all	no more than usual	rather more than usual	much more than usual
Been able to enjoy your normal day to day activities?	more so than usual	same as usual	less so than usual	much less than usual
Been able to face up to your problems?	more so than usual	same as usual	less able than usual	much less able
Been feeling unhappy and depressed?	not at all	no more than usual	rather more than usual	much more than usual
Been losing confidence in yourself?	not at all	no more than usual	rather more than usual	much more than usual
Been thinking of yourself as a worthless person?	not at all	no more than usual	rather more than usual	much more than usual
Been feeling reasonably happy all things considered?	more so than usual	same as usual	less so than usual	much less than usual

Job Satisfaction

Please rate how satisfied you are with each item by circling the number that corresponds most closely with how you feel.

- I'm extremely dissatisfied 1
- I'm very dissatisfied 2
- I'm moderately dissatisfied 3
- I'm not sure 4
- I'm moderately satisfied 5

- I'm very satisfied 6
- I'm extremely satisfied 7

The physical work conditions (noise/temp etc.) 7	1	2	3	4	5	6
The freedom to choose your own method of working 7	1	2	3	4	5	6
Your fellow workers 7	1	2	3	4	5	6
The recognition you get for good work 7	1	2	3	4	5	6
Your immediate boss 7	1	2	3	4	5	6
The amount of responsibility you are given 7	1	2	3	4	5	6
Your rate of pay 1	2	3	4	5	6	7
Your opportunity to use your abilities 7	1	2	3	4	5	6

Industrial relations between management

and workers 7	1	2	3	4	5	6
Your chance of promotion 7	1	2	3	4	5	6
The way your firm is managed 7	1	2	3	4	5	6
The attention paid to suggestions you make 7	1	2	3	4	5	6
The hours of work 7	1	2	3	4	5	6
The amount of variety in your job 1	2	3	4	5	6	7
Your job security 7	1	2	3	4	5	6

The Patient-Specific Functional Scale

The Patient-Specific Functional Scale

This useful questionnaire can be used to quantify activity limitation and measure functional outcome for patients with any orthopaedic condition.

Clinician to read and fill in below: Complete at the end of the history and prior to physical examination.

Initial Assessment:

I am going to ask you to identify up to three important activities that you are unable to do or are having difficulty with as a result of your _____ problem. Today, are there any activities that you are unable to do or having difficulty with because of your _____ problem? (Clinician: show scale to patient and have the patient rate each activity).

Follow-up Assessments:

When I assessed you on (state previous assessment date), you told me that you had difficulty with (read all activities from list at a time). Today, do you still have difficulty with: (read and have patient score each item in the list)?

Patient-specific activity scoring scheme (Point to one number):

0	1	2	3	4	5	6	7	8	9	10
Unable to perform activity										Able to perform activity at the same level as before injury or problem

(Date and Score)

Activity	Initial									
1.										
2.										
3.										
4.										
5.										
Additional										
Additional										

Total score = sum of the activity scores/number of activities

Minimum detectable change (90%CI) for average score = 2 points

Minimum detectable change (90%CI) for single activity score = 3 points

PSFS developed by: Stratford, P., Gill, C., Westaway, M., & Binkley, J. (1995). Assessing disability and change on individual patients: a report of a patient specific measure. *Physiotherapy Canada*, 47, 258-263.

Reproduced with the permission of the authors.

Appendix 5: Search terms:

5.1 Sickness absence due to MSDs reference and intervention case search strategy

Sickness absence OR sick leave OR attitude to sickness OR sick role OR sickness impact profile OR RTW OR sick listed employee OR job re-entry OR time to RTW OR stay at work

AND

Musculoskeletal OR musculoskeletal disorders OR musculoskeletal conditions OR musculoskeletal injuries OR musculoskeletal diseases OR musculoskeletal system diseases OR musculoskeletal problems

AND

Cost OR economic cost OR economic evaluation OR cost benefit ratio OR economic aspect of illness OR cost benefit analysis OR cost and cost analysis OR health care costs OR cost control OR cost savings OR cost of living

AND

Vocational rehabilitation OR Workplace intervention

5.2 Sickness absence due to mental health conditions reference and intervention case search strategy

Sick\$ OR "Sick\$ absence".mp. OR "Sickness impact profile" OR Employment OR Absenteeism OR "Attitude to sickness" OR Sick role OR "Return to work" OR "Sick listed employee" OR "Job re-entry" OR "Stay at work" OR "Sickness absence" OR Ill-health OR "Workers compensation" OR "Insurance disability" OR "Sick leave "OR Work*.mp OR "Work disability".mp

AND

"Mental health" OR "mental health condition\$.mp." OR Depression OR "Affective disorders" OR Stress OR "Anxiety disorders" OR Psychological OR Burnout OR "Common mental health condition" OR "Occupational Diseases" OR "Adjustment disorders" OR "mental function\$.mp." OR "mental stress\$.mp." OR "depressed worker\$.mp." OR "Depressed employee\$.mp." OR Psychosocial.mp. OR "Emotional problem\$.mp."

AND

Cost OR economic cost OR economic evaluation OR cost benefit ratio OR economic aspect of illness OR cost benefit analysis OR cost and cost analysis OR health care costs OR cost control OR cost savings OR cost of living

AND

Work\$ OR “Work capacity evaluation” OR “Occupational health” OR “Vocational rehabilitation” OR “diagnostic services” OR “Occupational Health services” OR “Disability management” OR “occupational therapy” OR “occupational medicine” OR “Attendance management” OR Vocational OR “vocational guidance” OR “Occupational therapist\$.mp.” OR “Occupational intervention\$.mp.” OR “Job intervention\$.mp.” OR “Job accommodation\$.mp.” OR “Work intervention\$.mp.” OR Rehabilitation OR “Workplace adjustments” OR “Psychosocial rehabilitation.mp.” OR “Work rehabilitation.mp.” OR “Occupational rehabilitation.mp.” OR “Case manage\$.mp.” OR “Return to work.mp.” OR “stay at work.mp.” OR “occupational physician\$.mp.” OR “modified work.mp.” OR “modified dut\$.mp.” OR “disability prevention.mp.” OR “alternative work\$.mp.” OR “alternative dut\$.mp.” OR “stress management.mp.” OR “early contact.mp.” OR “self management.mp.” OR “work re-design.mp.”

5.4 Turnover reference and intervention case

Inclusion / exclusion criteria

* Inclusion criteria: a population of employed individuals who are off work due to a common mental health condition or a musculoskeletal condition, a return to work intervention, turnover as an outcome measure, the inclusion of a control or comparator group.

*Exclusion criteria: individuals off work for any condition that is not mental health or musculoskeletal i.e. cancer, stroke, brain injury, trauma; studies which do not include a control or comparator group, interventions which are not helping individuals who are off sick return to work.

Key concepts:

Concept 1	Concept 2	Concept 3	Concept 4	Concept 5
Workplace health intervention	Employees off work due to ill-health	Common mental health condition	Musculoskeletal	Turnover
Keywords used to search for each concept				
“Workplace health intervention”	Sick	“Mental health”	Musculoskeletal (use adj)	Turnover

“Work capacity evaluation”	“Sick absence”.mp.	“mental health condition”.mp.	“musculoskeletal system diseases”	“Employee turnover”
“Occupational health”	“Sickness impact profile”	“Mental ill health”	“Back pain”	“Staff turnover”
“Vocational rehabilitation”	Employment	Depression	“musculoskeletal disorders”	“Personnel turnover”
“diagnostic services”	Absenteeism	“Affective disorders”	“musculoskeletal diseases”	“Ill-health retirement”
“Occupational Health services”	“Attitude to sickness”	Stress	“musculoskeletal conditions”	Retention
“Disability management”	“Sick role”	“Anxiety disorders”	“musculoskeletal injuries”	“job loss”
“occupational therapy”	“Occupational therapist”.mp.	Ill-health	“musculoskeletal problems”	
“occupational medicine”	“Sick listed employee”	Burnout		
“Attendance management”	“Job re-entry”	“Common mental health condition”		
Vocational	“Sick leave”	“Occupational Diseases”		
“vocational guidance”	“Sickness absence”	“Adjustment disorders”		
“Workplace adjustments”	“Insurance disability”	“mental function.mp.”		
“Occupational intervention”.mp	“Workers compensation”	“mental stress.mp.”		
“Job intervention”.mp.	“Work disability”.mp	“depressed worker.mp.”		
“Job accommodation.mp.”		“Depressed employee.mp.”		
“Work intervention.mp.”		Psychosocial.mp.		
Rehabilitation		“Emotional problem”.mp.		
“work re-design”.mp.				
“Psychosocial rehabilitation”.mp.				
“Work rehabilitation”.mp.				
“Occupational rehabilitation”.mp.				
“Case manage”.mp.				
“Return to work”.mp.				
“stay at work”.mp.				
“occupational physician\$.mp.				
“modified work”.mp.				
“modified dut”.mp.				
“disability prevention”.mp.				
“alternative work.mp.				
“alternative dut”.mp.				
“stress management”.mp.				

"early contact".mp.				
"self management".mp.				

Search statement 1 (Truncation may vary according to database \$, *, !, ?, #)

Work\$ OR "Work capacity evaluation" OR "Occupational health" OR "Vocational rehabilitation" OR "diagnostic services" OR "Occupational Health services" OR "Disability management" OR "occupational therapy" OR "occupational medicine" OR "Attendance management" OR Vocational OR "vocational guidance" OR "Occupational therapist\$".mp. OR "Occupational intervention\$".mp. OR "Job intervention\$".mp. OR "Job accommodation\$".mp. OR "Work intervention\$".mp. OR Rehabilitation OR "Workplace adjustments" OR "Psychosocial rehabilitation.mp." OR "Work rehabilitation".mp. OR "Occupational rehabilitation".mp. OR "Case manage\$".mp. OR "Return to work".mp. OR "stay at work".mp. OR "occupational physician\$".mp. OR "modified work".mp. OR "modified dut\$".mp. OR "disability prevention".mp. OR "alternative work\$.mp. OR "alternative dut\$".mp. OR "stress management".mp. OR "early contact".mp. OR "self management".mp. OR "work re-design".mp.

AND

Sick\$ OR "Sick\$ absence".mp. OR "Sickness impact profile" OR Employment OR Absenteeism OR "Attitude to sickness" OR Sick role OR "Return to work" OR "Sick listed employee" OR "Job re-entry" OR "Stay at work" OR "Sickness absence" OR Ill-health OR "Workers compensation" OR "Insurance disability" OR "Sick leave "OR Work*.mp OR "Work disability".mp

AND

Turnover OR "employee turnover" OR "staff turnover" OR "personnel turnover" OR "Ill-health retirement" OR Retention OR "job loss"

AND

"Musculoskeletal*" OR "musculoskeletal system diseases" OR "Back pain" OR "musculoskeletal disorders" OR "musculoskeletal diseases" OR "musculoskeletal conditions" OR "musculoskeletal injuries" OR "musculoskeletal problems"

Search statement 2 (Truncation may vary according to database \$, *, !, ?, #)

Work\$ OR "Work capacity evaluation" OR "Occupational health" OR "Vocational rehabilitation" OR "diagnostic services" OR "Occupational Health services" OR "Disability management" OR "occupational therapy" OR "occupational medicine" OR "Attendance

management” OR Vocational OR “vocational guidance” OR “Occupational therapist\$”.mp. OR “Occupational intervention\$”.mp. OR “Job intervention\$”.mp. OR “Job accommodation\$”.mp. OR “Work intervention\$”.mp. OR Rehabilitation OR “Workplace adjustments” OR “Psychosocial rehabilitation.mp.” OR “Work rehabilitation”.mp. OR “Occupational rehabilitation”.mp. OR “Case manage\$”.mp. OR “Return to work”.mp. OR “stay at work”.mp. OR “occupational physician\$”.mp. OR “modified work”.mp. OR “modified dut\$”.mp. OR “disability prevention”.mp. OR “alternative work\$.mp. OR “alternative dut\$”.mp. OR “stress management”.mp. OR “early contact”.mp. OR “self management”.mp. OR “work re-design”.mp.

AND

Sick\$ OR “Sick\$ absence”.mp. OR “Sickness impact profile” OR Employment OR Absenteeism OR “Attitude to sickness” OR Sick role OR “Return to work” OR “Sick listed employee” OR “Job re-entry” OR “Stay at work” OR “Sickness absence” OR Ill-health OR “Workers compensation” OR “Insurance disability” OR “Sick leave “OR Work*.mp OR “Work disability”.mp

AND

Turnover OR “employee turnover” OR “staff turnover” OR “personnel turnover” OR “Ill-health retirement” OR retention OR “job loss”

AND

“Mental health” OR “mental health condition\$.mp.” OR Depression OR “Affective disorders” OR Stress OR “Anxiety disorders” OR Psychological OR Burnout OR “Common mental health condition” OR “Occupational Diseases” OR “Adjustment disorders” OR “mental function\$.mp.” OR “mental stress\$.mp.” OR “depressed worker\$.mp.” OR “Depressed employee\$.mp.” OR Psychosocial.mp. OR “Emotional problem\$”.mp.

5.5 Presenteeism reference and intervention case

In order to determine the reference and intervention case, for presenteeism, the following search strategy was followed.

A search of the following databases was conducted: Cinahl, Medline (EBSCO, OVID, Web of Science (WoS)), Cochrane and Business Source Premium (BSP). In addition, citation tracking was utilised.

The following terms were used and exploded.

Presenteeism AND workplace interventions OR vocational rehabilitation

This resulted in no articles been identified. Thus a second search was conducted, using the term Presenteeism

Appendix 6: Focus group questions

Title: The revision of a cost-benefit analysis model in order for it to be capable of analysing the effects of Vocational Rehabilitation: monetising outcomes and testing the CBA tool.

Objective of phase 4: To appraise the value of the revised CBA tool to the VR provider and the organisation to which VR is provided.

Introduction – include the following key points:

- Thank you to all of you for taking time to participate in this focus group. Your input will provide a valuable perspective to our analysis and I really appreciate you giving me your time.
- The data from this focus group will be stored securely at the University and will not be shared with any other agency
- I will analyse the transcripts from this session and produce a summary of the findings in my thesis. The information presented in the thesis will be anonymised, direct quotes may be used but individuals will not be identifiable.
- You can withdraw your consent at any time, if you say something in the focus group and then later wish to withdraw it you can contact me and that comment will be taken out of the data set.
- The focus group will be recorded for transcription and data analysis purposes and will be stored securely as outlined earlier.

Ground rules:

- Please treat this focus group as confidential.
- As this is recorded please try to ensure that only one person speaks at a time as it is difficult to transcribe otherwise.
- Please remember that everyone's opinion is important here and should be respected as such
- Does anyone have any additional ground rules they would like to agree before we start?

Focus group questions:

I am exploring to what extent the cost benefit analysis is of value to individuals such as yourselves i.e. responsible for purchasing the Vocational Rehabilitation Service, or as an individual who either collects the data used in the CBA tool, inputs data into the CBA tool, or reviews the results of the CBA tool. As well as identify plans for further improvement and development of the CBA tool. I want your perspective on this so we're going to explore some key areas here:

1. Tell me about your initial responses on reading the cost benefit analysis report?
Did you think it was useful? Were you surprised at the results? Was there anything you felt was missing from the report?
2. From this morning's training on the use of the CBA tool, has this changed any of your views on the usefulness of the cost benefit analysis model?
In what ways?
3. Do you feel that you would be confident to use the CBA tool?
If not, what further information / training would you need to enable you to feel confident in using the CBA tool?
4. Do you feel this model provides useful information? *If not, what further information would you want to be included?*
5. Which features did you feel were useful regarding the CBA tool?
6. In what ways do you think this model could be further developed?
Considering the benefits included? The costs included? The data collected? The health conditions included?
7. What thoughts do you have on the data the organisation collects?
Is this something that the organisation has to look into to ensure it is collecting the correct data in a useable format? What data are you collecting that could be used within the CBA tool? What are the difficulties in collecting this data?
8. In your job role, how would you use the CBA tool or the results from the CBA tool?
Advertising? To improve your service? To make purchasing decisions?
9. Any other comments?

Appendix 7: Ethical approval letters

Appendix 7.1: Ethical approval letters for organisation 1

Ethical approval from the University of Salford 7/4/2010

Academic Audit and Governance Committee

Research Ethics Panel
(REP)



To Christine Parker
cc: Ms Sue Braid
From Tim Clements, Contracts Administrator
Date 7th April 2010

MEMORANDUM

Subject: Approval of your Project by REP

Project Title: WORKING WELL: a feasibility study to identify the benefits of a vocational rehabilitation case management service to improve staff health and wellbeing and reduce sickness absence costs in an NHS Trust.

RGEC Reference: REP10/039

Following your responses to the Panel's queries, based on the information you provided, I can confirm that they have no objections on ethical grounds to your project on the condition that, as some of the data collected may be classed as sensitive, the information sheet and consent form are amended to indicate that participants who choose to withdraw from the study will have the option of withdrawing data collected to this point.

If there are any changes to the project and/or its methodology, please inform the Panel as soon as possible.

Regards,

Tim Clements
Contracts Administrator
TC/JH

For enquiries please contact
Tim Clements
Contracts Administrator
Contracts Office
Enterprise Division
Faraday House
Telephone 0161 295 6907 Facsimile 0161 295 5494
E-mail: t.w.clements@salford.ac.uk

Letter from NHS Salford R&D confirming that ethical approval is not needed 28/5/20109



Greater Manchester **NHS**
Primary Care Research Governance Partnership

NHS Salford+D
Acute & Primary Care Research

NHS Salford+D Director: Professor Bill Ollier
NHS Salford+D Associate Director: Dr Lloyd Gregory
ReGroup Manager: Rachel Georgiou

Enquiries: Email: Salford-Regroup-RD@manchester.ac.uk
Tele: 0161 206 8343
Fax: 0161 206 4205

Salford+D web address: <http://www.nhssalfordrd.org.uk/>
ReGroup web address: <http://www.gmregroup.nhs.uk/index.html>

28th May 2010

Mrs Christine Parker
School of Health, Sport & Rehabilitation Sciences University of Salford,
Allerton C717,
Frederick Road Campus
Salford,
M6 6PU

Dear Christine

Study Title: WORKING WELL: a feasibility study to identify the benefits of a vocational rehabilitation case management service to improve staff health and wellbeing and reduce sickness absence costs in an NHS Trust
R&D No: 2010/158

Thank you for supplying all required documentation in support of the above proposed research study. I am pleased to inform you that your study has been noted by the R&D office and at the following sites:

- Salford PCT

As this study did not require ethical approval, details of the study will remain on the R&D database for 'Notification Only' purposes and no further action will be taken. Please let us know the results of the study to enable us to disseminate these to the participating Trusts.

Yours Sincerely


Rachel Georgiou
ReGroup Manager

Cc file

Research & Development
Clinical Sciences Building, SRFT, Stott Lane, Salford, Manchester, M6 8HD

Appendix 7.2: Ethical approval letters for organisation 2

Ethical approval 9/10/2014



Research, Innovation and Academic
Engagement Ethical Approval Panel

College of Health & Social Care
AD 101 Allerton Building
University of Salford
M6 6PU

T +44(0)161 295 7016
r.shuttleworth@salford.ac.uk

www.salford.ac.uk/

9 October 2014

Dear Tamara,

RE: ETHICS APPLICATION HSCR14/79 – The adaption of a cost-benefit analysis model for vocational rehabilitation: monetising outcomes and testing the model

Based on the information you provided, I am pleased to inform you that application HSCR14/79 has been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible.

Yours sincerely,

Rachel Shuttleworth

Rachel Shuttleworth
College Support Officer (R&I)

Amendment ethical proposal 12/12/2014



Research, Innovation and Academic
Engagement Ethical Approval Panel

College of Health & Social Care
AD 101 Allerton Building
University of Salford
M6 6PU

T +44(0)161 295 7016
r.shuttleworth@salford.ac.uk

www.salford.ac.uk/

12 December 2014

Dear Tamara,

RE: REQUEST TO AMEND ETHICS APPLICATION HSCR14/79 – The adaption of a cost-benefit analysis model for vocational rehabilitation: monetising outcomes and testing the model

Following your request submitted to the Panel on 27th November 2014 to amend this previously approved ethics application, based on the information you provided I am pleased to inform you that this has now been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible.

Yours sincerely,

Rachel Shuttleworth

Rachel Shuttleworth
College Support Officer (R&I)

Appendix 8: SPSS results for normal distribution of mental health sickness absence data

9.1 Pre-sickness absence data normality test results

Case Processing Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
VAR00001	34	100.0%	0	0.0%	34	100.0%

Descriptives

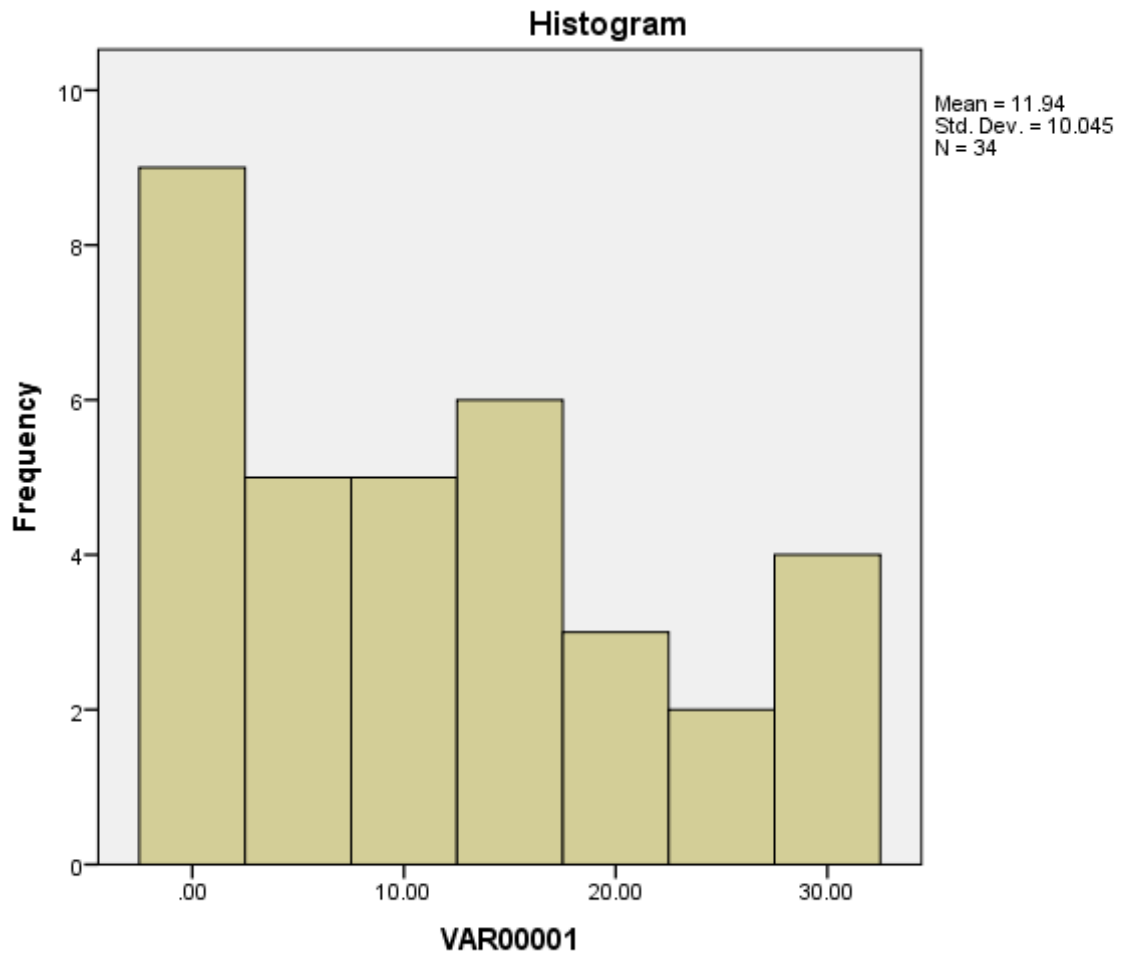
		Statistic	Std. Error
VAR00001	Mean	11.9412	1.72273
	95% Confidence Interval for Mean		
	Lower Bound	8.4362	
	Upper Bound	15.4461	
	5% Trimmed Mean	11.5458	
	Median	11.0000	
	Variance	100.906	
	Std. Deviation	10.04517	
	Minimum	.00	
	Maximum	31.00	
	Range	31.00	
	Interquartile Range	16.50	
	Skewness	.451	.403
	Kurtosis	-.904	.788

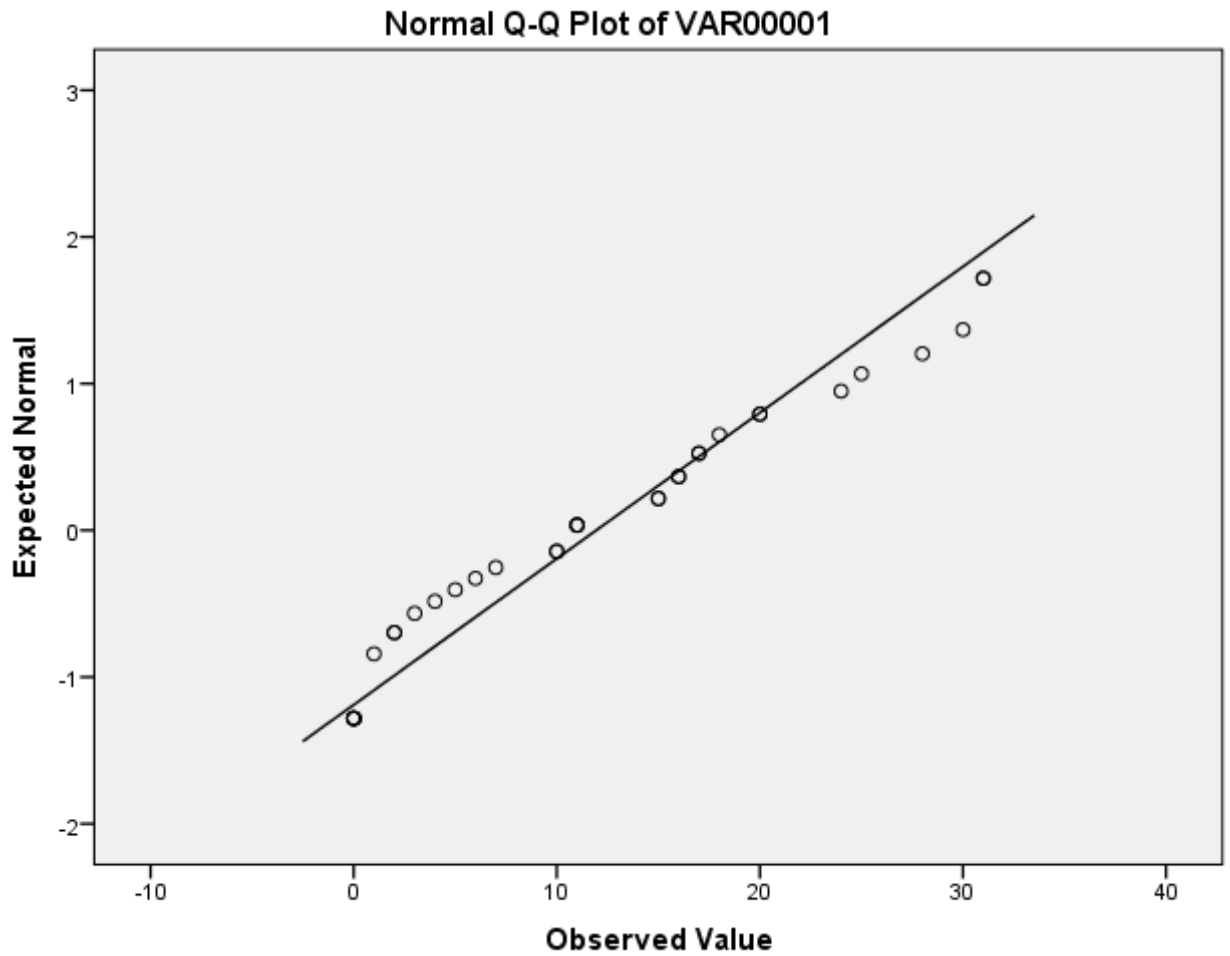
Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VAR00001	.117	34	.200*	.915	34	.012

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

a. Lilliefors Significance Correction





9.2 Post sickness absence data normality test results

Case Processing Summary

	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
VAR00002	34	100.0%	0	0.0%	34	100.0%

Descriptives

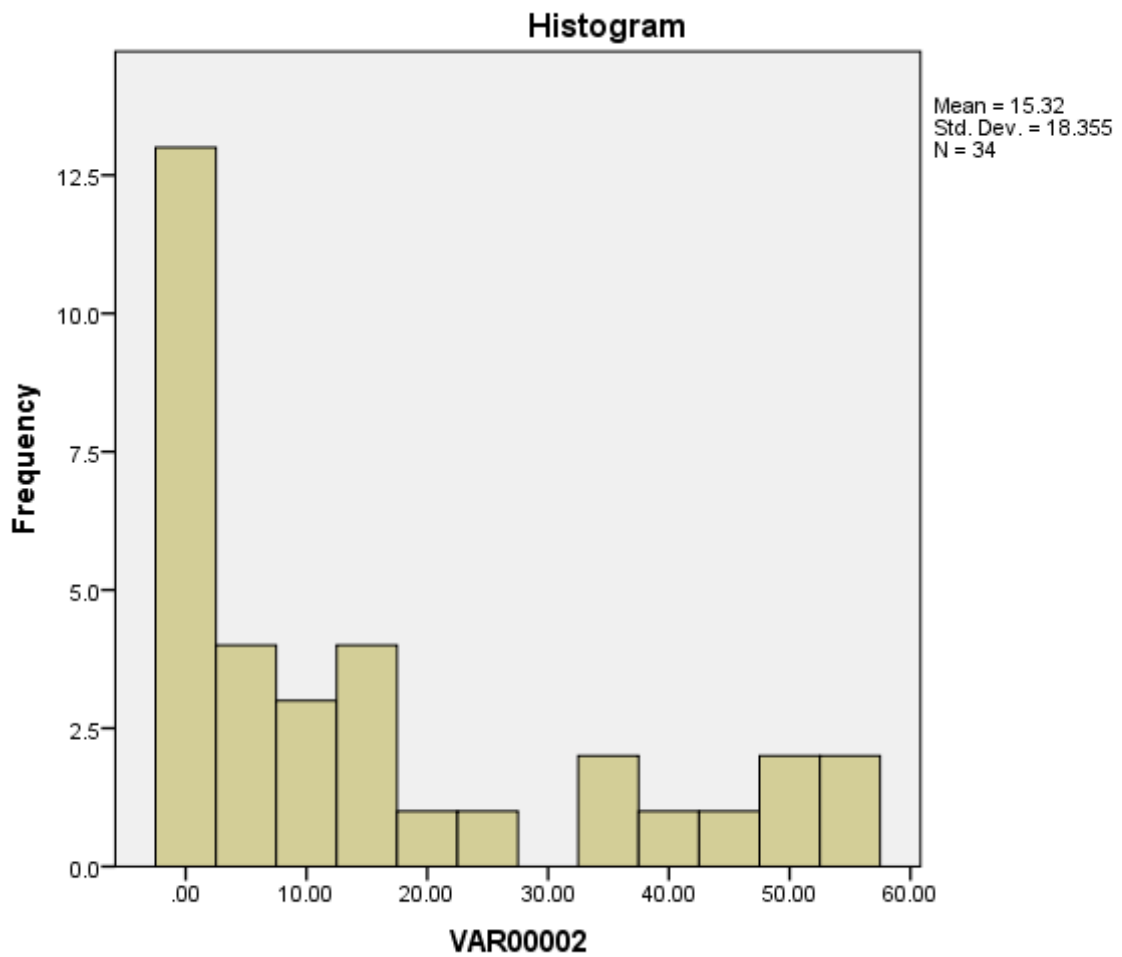
		Statistic	Std. Error
VAR00002	Mean	15.3235	3.14779
	95% Confidence Interval for		
	Lower Bound	8.9193	
	Upper Bound	21.7278	
	5% Trimmed Mean	14.0817	
	Median	8.0000	

Variance	336.892	
Std. Deviation	18.35462	
Minimum	.00	
Maximum	53.00	
Range	53.00	
Interquartile Range	28.25	
Skewness	1.023	.403
Kurtosis	-.387	.788

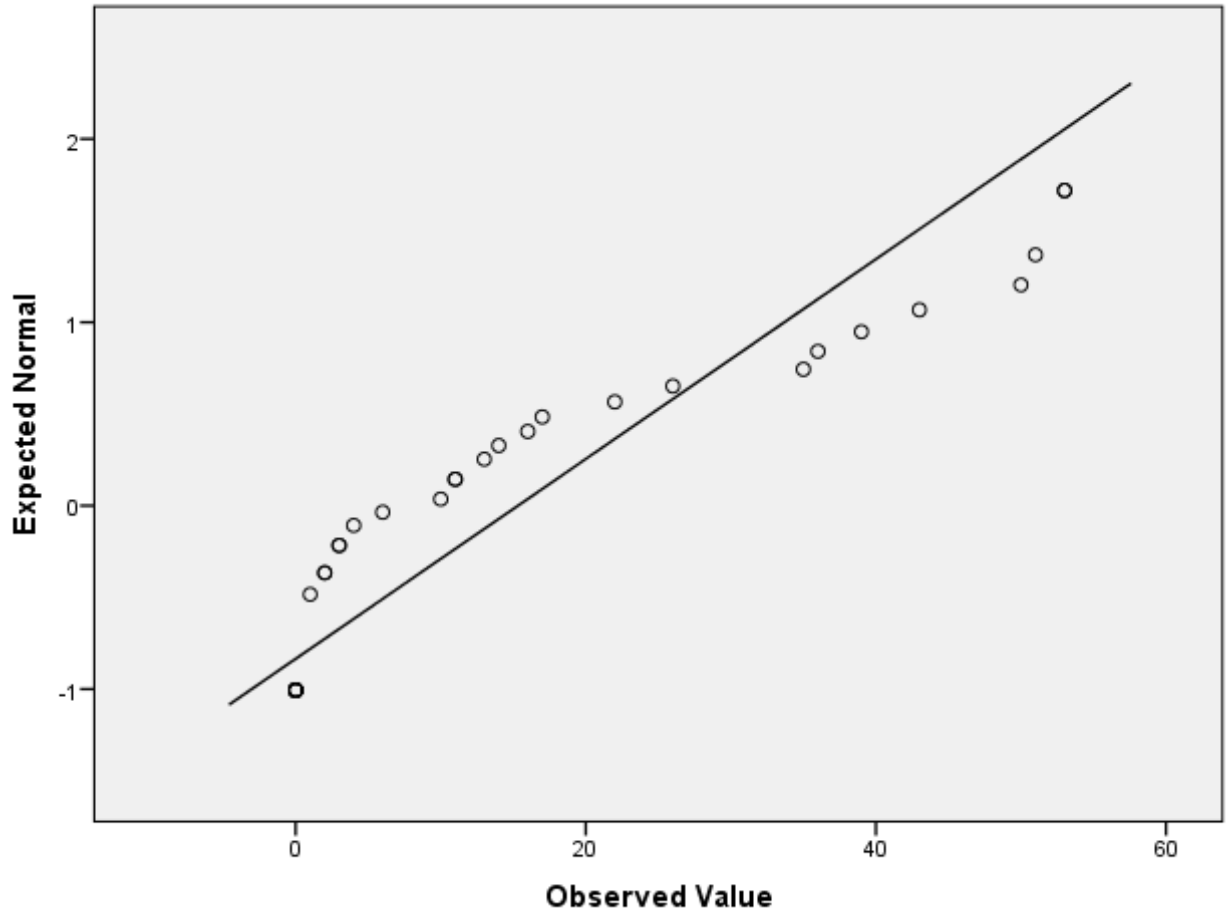
Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VAR00002	.202	34	.001	.794	34	.000

a. Lilliefors Significance Correction



Normal Q-Q Plot of VAR00002



Appendix 9: New CBA tool, case study and glossary of key terms used for the focus group

Screenshots of the new CBA tool, the costs and benefits sheets within the excel workbook

Costs sheet in excel workbook:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Project title: Model with all benefits												
2	Costs												
3													
4	Ref	Cost category	Predicted costs (£)	Predicted costs notes/ assumptions	Offset costs/ efficiencies (£)	Offset costs/ efficiencies notes/ assumptions	Who pays?	Capital/ Revenue/ In-kind	Optimism bias correction %	Total costs		% Costs Yr1	% Costs Yr2
5	C1								15%	£	-	100%	
6	C2								15%	£	-	100%	
7	C3								15%	£	-		
8	C4								15%	£	-		
9	C5								15%	£	-		
45													
46	TOTAL		£ -		£ -					£ -			
47													

Benefits sheet in excel workbook:

Project title: Model with all benefits												
<div style="display: flex; justify-content: space-around;"> Hide unused rows Unhide all rows </div>												
Benefits												
Ref.	Outcomes	Included outcome ?	Benefits	Who does benefit accrue to?	Target population	Pop notes / assumptions	Affected population / Predicted incidents	Affected pop notes / assumptions	Level of engagement with the affected population (%)	% engagement notes / assumptions	Retention rate (%)	% retention notes / assumptions
B19	MSD Sickness absence (s. a.) less than 6 months	Yes	Reduced sickness absence	Company / organisation purchasing the VR intervention								
B20	MSD Sickness absence (s. a.) greater than 6 months	Yes	Reduced sickness absence	Company / organisation purchasing the VR intervention								
B21	Mental health sickness absence (s. a.) less than 6 months	Yes	Reduced sickness absence	Company / organisation purchasing the VR intervention								
B22	Mental health sickness absence (s. a.) greater than 6 months	Yes	Reduced sickness absence	Company / organisation purchasing the VR intervention								
B23	Turnover	Yes	Reduced turnover in employees accessing the VR service	Company / organisation purchasing the VR intervention								
B24	Presenteeism	Yes	Reduced presenteeism in employees accessing the VR service	Company / organisation purchasing the VR intervention								
TOTAL												

Benefits sheet in excel workbook continued:

Project title:		Model with al										
Benefits												
Ref.	Outcomes	Annual turnover %	% impact (effectiveness of changing skills / attitudes / behaviours)	% impact notes / assumptions / sources	Starting point = no. of sickness absence days prior to the intervention	Outcome = total no. of sickness absence days post the intervention	Net effect: % improvement gained by using VR. This is determined from the literature	Counterfactual: assumed outcome without the intervention	% deadweight	% deadweight notes / assumptions	Unit fiscal benefit (£)	Unit public value (fiscal) benefit (£)
B19	MSD Sickness absence (s. a.) less than 6 months	n/a					32.25%	0		See phase 2 in thesis for calculation and assumptions	£	-
B20	MSD Sickness absence (s. a.) greater than 6 months	n/a					0%	0		See phase 2 in thesis for calculation and assumptions	£	-
B21	Mental health sickness absence (s. a.) less than 6 months	n/a					0%	0		See phase 2 in thesis for calculation and assumptions	£	-
B22	Mental health sickness absence (s. a.) greater than 6 months	n/a					0%	0		See phase 2 in thesis for calculation and assumptions	£	-
B23	Turnover		0%	A VR service will reduce the overall yearly turnover by 20%	N/a	N/a	N/a	N/a	0%	See phase 2 in thesis for calculation and assumptions	£ 16,663	£ 16,663
B24	Presenteeism	n/a					0%	0		See phase 2 in thesis for calculation and assumptions	£ 605	£ 605
TOTAL												

Benefits sheet in excel worksheet continued:

Project title:		Model with al												
Benefits		Public Value												
Ref.	Outcomes	Unit public value (fiscal) benefit (£)	Unit public value (economic) benefit (£)	Unit public value (social) benefit (£)	Unit public value (total) benefit (£)	Monetisation evidence financial year	GDP deflator compared to price base year	Unit cost notes /assumptions	Optimism bias correction	Fiscal benefit	Public value benefit	Assumptions on impact lag and drop-off	% Impact year 1	
B19	MSD Sickness absence (s.a.) less than 6 months	£ -			£ -	2014-15	100.000		-15%	#VALUE!	#VALUE!	It is assumed that all benefits will be realised within a year of attending the VR service	100%	
B20	MSD Sickness absence (s.a.) greater than 6 months	£ -			£ -	2014-15	100.000		-15%	#VALUE!	#VALUE!	It is assumed that all benefits will be realised within a year of attending the VR service	100%	
B21	Mental health sickness absence (s.a.) less than 6 months	£ -			£ -	2014-15	100.000		-15%	#VALUE!	#VALUE!	It is assumed that all benefits will be realised within a year of attending the VR service	100%	
B22	Mental health sickness absence (s.a.) greater than 6 months	£ -			£ -	2014-15	100.000		-15%	#VALUE!	#VALUE!	It is assumed that all benefits will be realised within a year of attending the VR service	100%	
B23	Turnover	£ 16,663			£ 16,663	2014-15	100.000	See turnover costs section within thesis	-15%	£ -	£ -	It is assumed that all benefits will be realised within a year of attending the VR service	100%	
B24	Presenteeism	£ 605			£ 605	2014-15	100.000	See presenteeism costs section within thesis	-15%	#VALUE!	#VALUE!	It is assumed that all benefits will be realised within a year of attending the VR service	100%	
TOTAL										#VALUE!				

Fictional case study used to demonstrate the CBA tool

Using the below data, have a play with the model. Once you have entered the data, turn on and off outcomes to see how this impacts on the output metrics.

Case study: an evaluation of a new VR service, that is limited to assisting employees with sickness absence due to musculoskeletal disorders (MSDs) or mental ill-health conditions. The main aims of the service are to reduce sickness absence in employees who are off work with MSDs and mental ill-health, and enable employees who are struggling at work due to an MSD and mental ill-health to stay in work. Additional aims of the service are to decrease levels of presenteeism.

Data collected to populate the cost-benefit analysis model:

Total number of employees in organisation: **n = 2480**

Total number of employees attending the VR service in one year: **n = 200**

Costs:

Type of cost	Spend(total) £
Marketing and Advertising of service	£1,000.00
VR case managers salaries	£66,940.00
Clinical involvement, as appropriate	£333.00
Supply of technical skills	£10,000.00
Travel	£485.00
Total	£70,958.00

Benefits:

- 1) Sickness absence due to MSDS short term and long term:

	No of employees	Total No. of days pre	Total No. of days post	Impact / % reduction	Cost of sickness absence pre	Cost of sickness absence post 1 st appointment	Difference in sickness absence cost pre and post
Sickness absence < 6 months	125	615.4	76.4	87.59%	£54,302.90	£6741.54	£47,561.36
Sickness absence > 6 months	1	196	22	88.78%	£17,295.04	£1,941.28	£15,353.76

* The cost of sickness absence is calculated using the average salary i.e. average employee = £22,942.75, therefore £88.24 daily rate

Additional costs included are the employers national insurance payments, which are calculated at 13.8% of the wage (Gov.UK, 2015), thus, 13.8% of £88.24 = £12.18.

Thus, total value per day of sickness absence = £100.42

2) Sickness absence due to Mental ill-health conditions short term and long term

	No of employees	Total No. of days pre	Total No. of days post	Impact / % reduction	Cost of sickness absence pre	Cost of sickness absence post 1 st appointment	Difference in sickness absence cost pre and post
Sickness absence < 6 months	75	432	107	75.23%	£38,119.68	£9,441.68	£28,678.00
Sickness absence > 6 months	2	392	60	84.69%	£34,590.08	£5,294.40	£29,295.68

* The cost of sickness absence is calculated using the average salary i.e. average employee = £22,942.75, therefore £88.24 daily rate

Additional costs included are the employers national insurance payments, which are calculated at 13.8% of the wage (gov.uk, 2015), thus, 13.8% of £88.24 = £12.18.

Thus, total value per day of sickness absence = £100.42

3) Presenteeism

	No of employees	% of employees with presenteeism
Individuals self-reported presenteeism levels Pre – 1 st VR appointment	200	27% (n =34)
Individuals self-reported presenteeism levels 3- months post 1 st appointment	200	7% (n = 14)
Impact/ % reduction = 74%		

4) Turnover

Annual turnover rate for the organisation is approximately 16%.

Additional data that was collected that was of interest to the investors:

- Quality of life
- Job satisfaction
- General mental health and wellbeing

Results for the above three indicated that all employees attending the service had an improvement in quality of life, job satisfaction and general mental health and wellbeing.

From the above information and using the optimism bias tables the following data can be extracted to be inputted into the model: *(I have put explanations alongside the data for clarity – in some cases when data is not provided one needs to make best evidenced assumptions)*

Costs:

Cost Category: Cost for MSDs **Predicted costs:** £44,042.90 *(126 employees attended the service. It is assumed that the cost of the service is proportional for each employee i.e. £70958.00 is the cost for 203 employees. Thus, the cost for 126 employees is £44,042.90)*

Cost Category: Cost for MENTAL HEALTH **Predicted costs:** £26,915.10 *(77 employees attended the service)*

Who pays: Organisation

Capital / revenue / in-kind: Revenue

Benefits:

Outcome: MSD sickness absence less than 6 months

- **Included outcome?:** If no, turn to yes
- **Target population:** n = 125
- **Affected population / Predicted incidents:** n = 615.4
- **Level of engagement (%):** 100%
- **Retention rate (%):** 92.5%. No data was collected on the retention rate. The UK national average did not attend (DNA) rate for physiotherapy musculoskeletal outpatients is 7.5% (Health and Social Care Information Centre, 2012)
- **Starting point:** = 615.4
- **Outcome:** = 76.4
- **Unit fiscal benefit (Value):** £100.42

Outcome: MSD sickness absence greater than 6 months

- **Included outcome?:** If no, turn to yes
- **Target population:** n = 1
- **Affected population / Predicted incidents:** n = 196

- **Level of engagement (%):** 100%
- **Retention rate (%):** 100%
- **Starting point:** = 196
- **Outcome:** = 22
- **Unit fiscal benefit (Value):** n = £50.21

In this organisation, at 6 months sickness absence pay drops from full to half pay.

Outcome: mental health conditions sickness absence less than 6 months

- **Included outcome?:** If no, turn to yes
- **Target population:** n = 75
- **Affected population / Predicted incidents:** n = 432
- **Level of engagement (%):** 100%
- **Retention rate (%):** 100%
- **Starting point:** = 432
- **Outcome:** = 107
- **Unit fiscal benefit (Value):** n = £100.42

Outcome: mental health conditions sickness absence greater than 6 months

- **Included outcome?:** If no, turn to yes
- **Target population:** n = 2
- **Affected population / Predicted incidents:** n = 392
- **Level of engagement (%):** 100%
- **Retention rate (%):** 100%
- **Starting point:** = 392
- **Outcome:** = 60
- **Unit fiscal benefit (Value):** n = £50.21

Outcome: Turnover

- **Included outcome?:** If no, turn to yes
- **Target population:** n = 200
- **Affected population / Predicted incidents** n = 200
- **Level of engagement (%):** 100%
- **Retention rate (%):** 100%
- **Turnover:** 16%

Outcome: Presenteeism

- **Included outcome?:** If no, turn to yes
- **Target population:** n = 200
- **Affected population / Predicted incidents:** n = 200
- **Level of engagement (%):** 100%
- **Retention rate (%):** 100%
- **Starting point:** = 27
- **Outcome:** = 7

Explanation of key terms and data to be inputted into the model.

Blue columns – organisation to complete	
Pink columns – model will automatically complete	
COSTS tab in excel spreadsheet	
Column name	Definition
Cost Category	What the cost is for
Predicted Costs	How much will that cost
Who pays?	Choose who will pay e.g. organisation
Capital / Revenue / In kind	Capital (once off costs for the service), revenue (costs of managing the service), in-kind (volunteer costs)
Optimism bias correction	This is a correction applied to the data which accounts for the fact that you will be collecting and inputting your own data, as opposed to being independently monitored.
Costs year 1	% of costs to be realised within 1 year
BENEFITS tab in excel spreadsheet	
Target population	Number of employees referred to the service
Affected population / predicted incidents	Predicted total number of sickness absence days due to this condition over a year
Level of engagement	Number of target population attending the service

Retention rate	Number of people completing the intervention
Annual turnover	Organisations annual turnover for all employees
% Impact	Effectiveness of the intervention
Starting point	Number of sickness absence days for the target population for a set time period e.g. 3 months prior to intervention
Outcome	Number of sickness absence days for the target population for a set time period e.g. 3 months post intervention
Net effect	% improvement assumed to be gained by using the VR intervention, this is based on the literature
Deadweight	What would have happened if VR was not in place
Unit fiscal benefit	Cost of the benefit e.g. cost of sickness absence per employee per day
Optimism bias	This is a correction applied to the data which accounts for the fact that you will be collecting and inputting your own data, as opposed to being independently monitored.
OUTPUT METRICS tab in excel spreadsheet	
Economic case	<p>The results page cannot be amended for my model as boxes are locked.</p> <p>The results for this case study are in the economic case box. The net present value of costs and benefits are presented. The figure in the Public Value Return on Investments is in fact a Benefit Cost Ratio (BCR) as opposed to a Return on Investment (ROI). I.e. it shows the benefits / costs.</p> <p>The result for this case study is 1.15 indicating that the benefits are 15% greater than the costs, i.e. for every £100 spent the organisation is getting £115 pounds.</p>

Appendix 10: Focus group consent form



Participant Identification Number for this trial:

CONSENT FORM

Title of Project: The revision of a Cost-benefit Analysis model in order for it to be capable of analysing the effects of Vocational rehabilitation: monetising outcomes and testing the model.

Name of Researcher: Tamara Brown

Please initial box

1. I confirm that I have read and understand the information sheet datedfor the above study and have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. I am aware my contribution to the discussion up to that point will remain part of the data.
3. I understand that all data is anonymised and never shared with any other agency.
4. I understand that all information shared within this focus group is to be kept confidential.
5. I agree to take part in the above study.
6. I agree for the focus group to be audio taped.
7. I agree for anonymised direct quotations to be used.

_____ Name of Participant	_____ Date	_____ Signature
_____ Name of Person taking consent (if different from researcher)	_____ Date	_____ Signature
_____ Researcher	_____ Date	_____ Signature

When completed: 1 for participant; 1 for researcher