Measurement of Physical Activity Levels and Self-Efficacy during Early Recovery after Acute Myocardial Infarction in Jordan

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List of Abbreviations

ACS	Acute Coronary Syndrome
AHA	American Heart Association
AMI	Acute Myocardial Infarction
ANOVA	Analysis of Variance
BHF	British Heart Foundation
BMI	Body Mass Index
BP	Blood Pressure
CABG	Coronary Artery Bypass Graft
CCU	Coronary Care Unit
CDC	Centre for Disease Control and Prevention
cm	Centimetre
CHD	Coronary Heart Disease
CSEQ	Cardiac Self-Efficacy Questionnaire
CVD	Cardiovascular Diseases
CVI	Content Validity Index
df	Degree of Freedom
DM	Diabetes Mellitus
ECG	Electrocardiograph
ESC	European Society of Cardiology
JUH	Jordan University Hospital
HTN	Hypertension
ICC	Intraclass Correlation Coefficient
ICU	Intensive Care Unit

M	Mean
mins	minutes
MoH	Ministry of Health
mmhg	Millimetre of Mercury
N	Number of Participants
NCD	Non-Communicable Diseases
NICE	National Institute for Health and Care Excellence
NSTEMI	Non ST Segment Elevation Myocardial Infarction
PA	Physical Activity
PCI	Percutaneous Coronary Intervention
PIS	Participant Information Sheet
PPCI	Primary Percutaneous Coronary Intervention
RCT	Randomised Controlled Trial
SSC	Social Security Council
SD	Standard Deviation
SPSS	Statistical Package for Social Science
STEMI	ST Segment Elevation Myocardial Infarction
T1	Time 1
T2	Time 2
THROMB	Thrombolytic Therapy
™	Trademark
VO2	Volume of oxygen in ml
WHO	World Health Organization

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Dedications

I dedicate this thesis to the memory of the departed soul of my father "Methqal Shajrawi"; I never forget his prayers and his love, which motivate me forward. His words and feelings keep me working hard to finish this thesis.

Definition of terms

activPAL3™ Monitor: Accelerometer-based activity monitor worn on thigh to quantify physical activity in four categories: stepping, standing, upright and sitting/ lying events (Granat, 2012).

ACS: Acute coronary syndrome (ACS) is an acute condition characterised by chest pain for more than 20 minutes, either with an Electrocardiogram (ECG) changes, ST segment elevation or chest pain without ECG changes encompasses ST elevation myocardial infarction (STEMI) and non ST elevation myocardial infarction (NSTEMI). The main mechanism of ACS initiates through plaque erosion of thrombosis (blood clot), and reduction of blood flow to heart muscle caused by spasm of vascular smooth muscle (Roffi et al., 2016).

AMI: Acute myocardial infarction (AMI) or heart attack is necrosis of myocardial tissue resulting from lack of blood supply to the myocardium, an atherosclerosis results in plaque formation within coronary vessel, if plaque rapture is unstable, the immune systems responds with localised inflammation, fibrin and platelets aggregate at the site of the plaque and a thrombus (blood clot) forms. This results in total occlusion of blood flow in the coronary vessel (Baird, 2015).

BMI: Body mass index (BMI) describes a particular relationship between an individual's body mass and his or her height, determined by the formula: BMI = body mass (in kilograms) / height^2 (in metres). In lay terms, BMI denotes the leanness (low BMI values) or fatness (high BMI values) of an individual (true of the general population, however not necessarily true for an athletically trained individual). A BMI of 20–25 is considered normal, >25 is overweight and >30 is obese (>40 is often termed clinically or morbidly obese) (CDC, 2015).

Body-worn activity monitor: A monitor worn on part of the body, which best reflects total body movement. The more the monitor moves the higher the value of the counts. It includes two broad approaches to the measurement of physical activity and sedentary behaviour those that primarily provide an approximation of energy expenditure (volume of movement) and those that primarily attempt to classify postures (Granat, 2012).

Cardiac rehabilitation programme: “The sum of activities required to influence favourably the underlying cause of the cardiovascular disease, as well as the best possible physical, mental and social conditions, so that they may by their own efforts preserve or resume when lost, as normal a place as possible in the community. Rehabilitation cannot be regarded as an isolated form of therapy but must be integrated with the whole treatment of which it forms only one facet” (WHO, 1993, p. 1)

CVD: Cardiovascular Disease (CVD) is a group of disorders of the heart and blood vessels and they include: Coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis and pulmonary embolism (WHO, 2015a).

CHD: Coronary Heart Disease (CHD) is characterized by episodes of reversible myocardial demand/supply mismatch, related to a narrowing of coronary arteries through a gradual build-up of plaques (atherosclerosis) within coronary vessels walls, which are usually inducible by exercise, emotion or other stress and reproducible and may also be occurring spontaneously (Montalescot et al., 2013).

Exercise: A subcategory of physical activity that is planned, structured, repetitive and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective (WHO, 2013).

Physical Activity: (PA) is Any bodily movement produced by skeletal muscles that requires energy expenditure PA includes exercise and other activities such as aerobic activity, occupation, transportation, housework and social activities (WHO, 2013).

PPCI: Primary Percutaneous Coronary Intervention (PPCI) emergent percutaneous catheter intervention in the setting of STEMI, without previous fibrinolytic treatment—is the preferred reperfusion treatment in patients with STEMI. An interventional cardiologist should perform PPCI expeditiously (for example within guideline-mandated times). PPCI is considered for clinical presentation of STEMI patients within 12 hours of symptom onset and with persistent ST-segment elevation (Steg et al., 2012, p. 2581)

Recovery phase: Phase during which patients restore physical fitness resume daily activities and reduce risk of re-infarction, it depends on many physiological and psychological factors, early recovery phase last up to six weeks. In order to facilitate the early recovery, patients are recommended to engage in cardiac rehabilitation programme, which consists of four phases, phase one starts in-hospital and the remaining phases in cardiac rehabilitation centres (NHS, 2013)

Reliability: The probability of obtaining the same results with a completely new sample of subjects, there are many types of reliability such as internal consistency, which is usually measured with Cronbach's alpha, if Cronbach's alpha ≥ 0.7, internal consistency is considered acceptable (Polit & Beck, 2012)

Secondary prevention: Refer to early detection and screening, aiming to minimize the burden of diseases and associated risk factors, which improves the chances for positive health outcomes. This includes activities such as evidence-based screening programs for early detection of diseases (WHO, 2016a).

Sedentary time: A non-upright posture and not simply inactivity, includes sitting and lying events times (Granat, 2012)**.**

Self-efficacy: "Belief in one's capabilities to organise and execute the course of action required to produce given attainments" (Bandura, 1997, p. 3).

Self-management: The individual's ability to manage symptoms, treatment, physical and psychosocial consequences, and lifestyle changes inherent to living with a chronic vascular condition (Barlow, 2001, p. 178).

Upright time: An upright posture divided into standing events and stepping events

Validity: An assessment of the degree to which a research tool measures what it is intended to measure (Polit & Beck, 2012). There are many different types of validity such as, face validity, content validity.

Abstract

Background: Cardiovascular disease is responsible for over 17.1 million deaths annually worldwide. Secondary prevention plays a key role in reducing the burden of cardiovascular disease. The cardiac rehabilitation programme is an effective intervention that supports lifestyle behaviour change after acute myocardial infarction. Self-efficacy and regular physical activity are particularly important for improving of patients' health outcomes. No studies have measured both cardiac self-efficacy and physical activity levels after acute myocardial infarction during the early recovery phase. **Aims:** To translate and cross-cultural adapt of a cardiac self-efficacy questionnaire into Arabic. To use this questionnaire to assess the changes in self-reported self-efficacy levels at baseline, after two weeks (T1) and after six weeks (T2), to assess changes in physical activity levels and patterns at T1 and T2, and to determine whether there is a relationship between self-efficacy and physical activity among patients with acute myocardial infarction in the early recovery phase. **Study design**: A descriptive study with a repeated measures design. **Methods:** Phase one: the study used a process recommended by the World Health Organisation, to produce an Arabic version of the cardiac self-efficacy questionnaire. Phase two: the study measured self-efficacy by an Arabic version of the self-reported cardiac self-efficacy questionnaire and administered at baseline, T1 and T2. Physical activity was objectively measured by body-worn activity monitor (activPAL3™) for 24 hours a day for a full seven consecutive days at T1 and T2. **Sample and Setting**: The study recruited a convenience sample of 100 patients from a single cardiac centre in Amman, Jordan, between February and December 2015. Participants did not have access to cardiac rehabilitation. **Results:** The study showed successful translation and cross-cultural adaptation of the cardiac self-efficacy questionnaire into Arabic. In addition, the findings showed that the Arabic version of the cardiac self-efficacy questionnaire is a valid and reliable version with Cronbach's alpha of 84.6% and Intraclass Correlation Coefficient of 92.9%. Self-reported cardiac self-efficacy scores improved significantly between baseline and T1, and between T1 and T2 across all subscales ($p<.05$) and specifically for global cardiac self-efficacy ($p<.05$). There was no statistically significant difference in physical activity levels and patterns between T1 and T2. There was no statistically significant relationship between cardiac self-efficacy and physical activity level at T1 and T2. **Conclusion:** The cardiac self-efficacy questionnaire is suitable for administration to patients with coronary heart disease. Study participants had greater amounts of sedentary time than levels reported in healthy populations in the UK or the USA. The step count was below that recommended in guidelines. The health care system in Jordan needs to develop cardiac rehabilitation programmes for patients recovering from myocardial infarction to promote physical activity levels and thereby reduce sedentary time. In addition, this study showed that the increase in self-efficacy levels did not influence physical activity levels. There is a need to further investigation to understand the mechanisms that influence physical activity levels among patients with acute myocardial infarction in the early recovery phase such as socio-cultural context.

Chapter One: Introduction

1.1 Introduction

This chapter presents an overview of the thesis and a brief description of the background to the study. This thesis has two phases. In phase one, the cardiac self-efficacy questionnaire was translated and cross-culturally adapted guided by the World Health Organisation recommendations (WHO, 2014). In phase two, a descriptive design, with repeated measures, was used to investigate self-efficacy and physical activity levels during early recovery in a sample of post-acute myocardial infarction patients; associations between self-efficacy and physical activity levels were also investigated. This chapter consists of two sections. Firstly, the burdens of Coronary Heart Disease risk factors. Secondly, study objectives and the structure of the remainder of the thesis.

1.2 Background

Coronary Heart Disease (CHD) is the leading cause of premature death worldwide (Piepoli et al., 2016). Across the world, Acute Myocardial Infarction (AMI) causes more than seven million deaths per year. Additionally, an estimated 54 million people are suffering from CHD, with chest discomfort known as angina pectoris (WHO, 2015a). The healing process of AMI after receiving treatment depends on two factors: first: the size of the infarction. Second: the rate of gradual microvascular reperfusion of the damaged area (Minicucci et al., 2014). Consequently, the ejection fraction, which is a measure of how well the heart muscle is pumping, will be affected during the first three months following infarction (Pride et al., 2010). Since 1964, revascularisation techniques such as Percutaneous Coronary Intervention (PCI) or Coronary Artery Bypass Graft (CABG) have been deployed in order to improve blood flow through the narrowed coronary arteries to the heart muscle (Windecker et al., 2014). However, these costly interventions do not prevent CHD progression. The only way to slow the progression of CHD is through cardio-protective medication and the

modification of coronary risk factors. This can occur through lifestyle change and compliance with medication, which are the foundation of secondary prevention, and can effectively reduce future risk of cardiac events. Indeed, it has been estimated that 75% of all Cardiovascular Disease (CVD) mortality can be prevented with adequate changes in lifestyle (Windecker et al., 2014).

During the recovery phase, patients recovering from AMI have to restore physical fitness and resume daily activities (NHS, 2016). The success of their recovery depends on many physiological and psychological factors (NHS, 2016), such as self-efficacy, depression, and stress (Maeda, Shen, Schwarz, Farrell, & Mallon, 2013; Neylon et al., 2013). Therefore, to extend the existing literature further investigation of patients with AMI during their early recovery phase is required.

The recovery phase for patients with AMI starts during their stay in hospital and lasts for several-months, depend on the amount of damage to the heart muscle. The early recovery phase is a short period of up to six weeks after hospitalisation (NHS, 2016), and is a temporary and transient period, where the heart function undergoes a dynamic healing process. During the early recovery phase, patients with AMI should demonstrate changes in lifestyle after hospital discharge. Making lifestyle changes in the early recovery phase is a very difficult and complex challenge for patients experiencing AMI as they have different needs (Smith & Liles, 2007) and experiences (Petriček, Buljan, Prljević, Owens, & Vrcić-Keglević, 2015). Therefore, it is recommended that patients recovering from AMI should participate in the second phase of cardiac rehabilitation within ten days of leaving a hospital in order to enhance self-management practices and promote a healthy lifestyle, such as healthy eating habits, regular physical activity (PA) and adherence to cardio-protective medications regimes (NHS, 2016; NICE, 2013c). It is recommended that patients resume their usual daily activities such as driving, sexual activity and returning to work after four to six weeks (NHS, 2016; NICE, 2013c).

Cardiac rehabilitation is considered one of the most effective interventions for secondary prevention among cardiac patients (Dalal, Doherty, & Taylor, 2015; Mampuy, 2012). Cardiac rehabilitation is a complex intervention, where a

multidisciplinary team provides the required skills to patients with CHD (Dalal et al., 2015). It includes exercise/aerobic PA training, education and counselling services as well as psychological intervention, such as stress management (BACPR, 2012). Patients are also educated about cardiac disease complications and healthy lifestyle, weight management, medication compliance, healthy diet and smoking cessation (Dalal et al., 2015). Cardiac rehabilitation programmes are designed as a comprehensive intervention to meet patients' needs. However, many developing countries such as, Jordan do not have cardiac rehabilitation programmes. Further, there is no effective structured education programmes provided for patient with CHD (Eshah, 2013) which make self-management of lifestyle and medicines among patients with AMI a great challenge.

The development of self-management skills is essential after revascularisation treatment for AMI. Self-management refers to "the individual's ability to manage symptoms, treatment, physical and psychosocial consequences, and lifestyle changes inherent to living with a chronic vascular condition" (Barlow, 2001, p. 178). However, self-management is a major challenge for patients recovering from AMI. A previous systematic review demonstrates that self-management programmes are associated with many factors such as improved self-management skills related to increased self-efficacy levels among patients with CVD (Katch, 2010). In this regard, increasing self-efficacy level brings about favourable outcomes in term of improvement to self-management skills.

Self-efficacy is defined by Bandura (1997) as "beliefs in one's capabilities to organise and execute the course of action required to produce given attainments'' (Bandura, 1997, p. 3), which means that individuals with strong self-efficacy set higher goals and show better motivation and commitment to accomplishing them. Particularly for patients diagnosed with AMI, high level of self-efficacy improves self-management skills (Katch, 2010).

An increase in self-efficacy is one of the outcomes of the cardiac rehabilitation programmes, and this has been proven to improve adherence to a healthy cardiovascular lifestyle (Sol, Graaf, Petersen, & Visseren, 2011). Moreover, low levels

of self-efficacy have been found to be associated with frequent re-hospitalisation, reduced quality of life and increased mortality among patients with CHD(Sarkar, Ali, & Whooley, 2007). Over and above this, self-efficacy predicts adverse outcomes after cardiac events (O'Neil, Berk, Davis, & Stafford, 2013).

Psychological factors such as anxiety, depression and stress have been extensively examined during the early recovery phase among patients recovering from AMI (Dickens et al., 2013; Gustad, Laugsand, Janszky, Dalen, & Bjerkeset, 2014). However, there are few studies addressing other factors crucial to the improvement of health outcomes, such as self-efficacy and PA in the early recovery phase for AMI patients. Particularly, in Arabic-speaking countries, where there is no in Arabic language tool available to measure self-efficacy among focuses on cardiac patients.

PA is considered a cost effective self-management practice which has many positive impacts on health outcomes of patients with AMI (WHO, 2013). Improving PA level is an important cardiac rehabilitation outcome (Dalal et al., 2015). International PA guidelines for healthy adults published by the World Health Organisation (WHO, 2013) and the European Society of Cardiology (ESC) (Piepoli et al., 2016) recommend that individuals do one of the following combination of exercise regimes; either 2.5 to 5 hours per week of moderate intensity PA, or aerobic exercise training. Alternatively, 1 to 1.5 hours per week of vigorous PA, or aerobic exercise training. An equivalent combination of moderate intensity and vigorous intensity PA/aerobic exercise training. The longer the total duration of PA or aerobic exercise training performed over the week, the greater the observed benefits (Piepoli et al., 2016; WHO, 2013). In addition, average objective measurements of sedentary time among healthy adults during waking time range from 55–69% (Colley et al., 2011; Matthews et al., 2008). Hence, the upright time represents 30% of the healthy adult's time. More recently, the negative impact of a sedentary lifestyle as a major negative impact on CVD patients has been highlighted (Warren et al., 2010). Accordingly, the sixth joint task force of the ESC on CVD prevention guidelines recognises regular PA as a vital non-pharmacological factor for primary and secondary cardiovascular disease prevention

(Piepoli et al., 2016). For this, increasing PA to reduce coronary risk after AMI is highly recommended following coronary revascularisation.

Unfortunately, the proportion of patients with CHD who successfully achieve the recommended PA level is low. The ESC report, published in 2016, showed that among patients with CHD in Europe, only 34 % reach the recommended PA levels (Piepoli et al., 2016). In the UK, 46 % of patients with AMI participate in an outpatient cardiac rehabilitation programme after hospital discharge (NICE, 2013c). Further, patients with AMI usually wait an average of 53 days to start an outpatient cardiac rehabilitation programme in the UK after hospital discharge (NICE, 2013c).

There are still no cardiac rehabilitation programmes or disease management programmes accessible to patients with AMI in the Middle East (Turk-Adawi & Grace, 2014), where a high prevalence of CVD risk factors has been found to be higher in the Middle East than other countries (Gehani et al., 2014; Motlagh, O'Donnell, & Yusuf, 2009). Moreover, there is no structured, effective education programme for patients with CHD (Eshah, 2011). In consequence, CHD risk factors continue to rise mainly due to inadequate preventive measures (WHO, 2015c). Consequently, patients with AMI and their families are required to take sole responsibility for developing their own self-management skills.

There is currently no evidence regarding changes in self-reported self-efficacy levels and changes in PA levels among patients with AMI after receiving treatment in the early recovery phase. In addition, no previous studies have focused upon connections between cardiac self-efficacy and PA levels among patients with AMI, after receiving treatment in the early recovery phase. Moreover, there is no available data regarding PA level for patients with CHD in Jordan. Thus, this study is the first study to address changes in and the relationship between self-efficacy and PA among patients with AMI in the early recovery phase. Furthermore, to the best of my knowledge, this is first time that use has been made of a body-posture classification device- the activPAL3™ monitor (PAL Technologies.Ltd. Glasgow. Scotland) in the Middle Eastern countries.

1.3 Study Objectives

The overarching aim of the study is implementing the WHO process in order to translate and adapt the Cardiac Self-Efficacy Questionnaire (CSEQ) to Arabic. In addition, it aims to assess the changes in self-efficacy and PA level and pattern among patients with AMI in the early recovery phase and explore whether there is a relationship between self-efficacy and PA. The researcher undertook two key approaches in order to achieve the study aim. First, in order to measure cardiac self-efficacy among patients with AMI, the researcher documented the process of translation and cross-cultural adaptation of the CSEQ into Arabic. Second: The researcher has used a quantitative method, a repeated measures design to collect data from a convenience sample of Jordanian patients, two weeks and six weeks after discharge. In addition, Bandura's self-efficacy theory guided this study.

Implications of the study provide clear evidence regarding self-efficacy levels and PA behaviour in relation to patients with AMI, which will help healthcare professionals and policymakers to promote PA and establish cardiac rehabilitation centres or cardiac disease management programmes. This aims to address the following four objectives:

1. Translate, adapt and validate an Arabic version of the Cardiac Self Efficacy Questionnaire
2. Assess self-reported cardiac self-efficacy levels among patients recovering from acute myocardial infarction using a validated tool at three time points. Baseline, Time 1 (T1: 2 weeks after hospital discharge) and Time 2 (T2: 6 weeks after hospital discharge).
3. Determine the PA levels and patterns of patients with AMI using a body-worn activity monitor for a full seven days at Time 1 (2 weeks) and Time 2 (6 weeks) after hospital discharge.
4. Explore whether there is any relationship between changes in self-reported cardiac self-efficacy levels and changes in PA levels among patients with AMI in the early recovery phase.

1.4 Study Hypotheses

1. There will be an increase in self-efficacy levels among patients with AMI between (time1) 2 weeks after hospital discharge) and (Time 2) 6 weeks after hospital discharge.
2. There will be an increase in the PA levels between Time 1 and Time 2 among patients with AMI, after hospital discharge.
3. There is a relationship between self-reported cardiac self-efficacy levels and changes in PA levels in the early recovery phase among patients with AMI.

1.5 Structure of the Thesis

This thesis consists of seven chapters, including the current introduction chapter. An outline of chapters 2-7 as listed below:

Chapter 2: Literature review

This chapter begins with an overview of AMI definitions and treatment, and a description of the impact of secondary prevention, cardiac rehabilitation, and self-efficacy on CHD. Following that, the chapter explores the importance of the effects of PA on the health outcomes of patients with AMI, alongside the methods of measurement to quantify PA behaviour. The literature shifts to focus on synthesis of research evidence by carrying out a systematic literature review. This review focused upon PA and self-efficacy among patients with CHD after hospitalisation. Implementation of search strategy, an appraisal and quality review of the evidence on the studies included. Further, the review identifies the existing body of research, addresses the research problem, and clarifies the gaps in knowledge that require further investigation. Finally, the chapter expands upon and generates a rationale for the proposed research, its significance and the overarching objectives of this study.

Chapter 3: Self-Efficacy

This chapter presents an overview of the self-efficacy, and related behavioural change theories. In addition, it provides the rationale for the selection of the theoretical framework that underpins the thesis. Next, the chapter provides an explanation of different types of self-efficacy questionnaire, and then, describes the process undertaken to translate and adapt the CSEQ, based on WHO guidelines for translation and cross-cultural adaptation (WHO, 2014). Following this, the chapter outlines objectives and the method of the translation and cross-cultural adaptation of the CSEQ. The study found that the translation and cross-cultural adaptation of the Arabic version of the CSEQ was successful, and demonstrated good validity and reliability outcomes.

Chapter 4: Methodology and Method

This presents the study methodology and the research paradigm. In addition, detail about the study setting, cultural context of the thesis, sampling methods, and information on the data collection tools such as questionnaires and body-worn activity monitors is described along with the data collection procedure and an outline of the pilot study. With reference to data management, the chapter presents ethical considerations, issues including managing missing data, accuracy of input, quality assessment protocols of data, and statistical tests used for data analysis, with the rationale for the choices made.

Chapter 5: Findings

This chapter presents the pilot study results, along with the patients' sociodemographic characteristics, and then, the chapter provides the results of the self-efficacy and PA volume and pattern assessments. A summary of findings completes the chapter.

Chapter 6: Discussion

This chapter of the thesis brings together the key research findings and generates discussion in the context of the wider existing literature. It provides a comprehensive

discussion, a detailed argument regarding the changes and the relationship between self-efficacy and PA levels after hospitalisation, and a potential explanation based on the existing literature for the four study objectives: CSEQ translation and cross-cultural adaptation process, self-efficacy levels and changes, PA levels and patterns, and then, the relationship between self-efficacy and PA level.

Chapter 7: Conclusion

The final chapter presents the conclusion with the suggestions for Health policy changes, study limitations, implications and suggestions for future research.

Chapter Two: Literature Review

2.1 Introduction

This chapter presents background information concerning the definition of AMI, its pathology, diagnosis, and treatment modalities. It then reviews the existing work on secondary prevention of AMI, PA behaviour, and its impact on health outcomes after cardiac rehabilitation among patients with CHD. Moreover, the chapter provides a systematic literature review in order to form a synthesis of research evidence. The purpose of this section is to find the relevant studies that address self-efficacy and PA among patients with AMI after hospitalisation. This informed and directed the emerging study aims. Finally, the chapter presents an explanation of the significance of the proposed study on this topic.

2.2 Coronary Heart Disease and Secondary Prevention

Acute Coronary Syndrome (ACS) refer to any group of clinical symptoms compatible with acute myocardial ischemia and covers the spectrum of clinical conditions ranging from unstable angina to AMI (Timmis, 2015). AMI is classified according to electrocardiographic (ECG) changes as Non-ST-Elevation Myocardial Infarction (NSTEMI) and ST-Elevation Myocardial Infarction (STEMI) (Timmis, 2015). The British Heart Foundation (BHF) reports that ACS remains one of the major causes of premature death in men and women in the UK (Bhatnagar, Wickramasinghe, Williams, Rayner, & Townsend, 2015). The clinical presentation of ACS diagnosis is variable, including many symptoms combined with activation of the autonomic nervous system as listed in Table 2.1

Table 2.1

Signs and Symptoms of AMI (Adopted from (Timmis, 2015, p. 8))

Signs and Symptoms	Mechanisms
Severe myocardial ischaemia:	
Chest pain	Ischaemia
Fourth heart sound	Forceful filling of non-compliant left ventricle
Low grade fever	Inflammation
Leucocytosis and increased levels of inflammatory markers	Inflammation
Increase in troponin levels	Leakage of protein from injured cardiac myocytes
Activation of autonomic nervous system:	
Tachycardia and sweating	Sympathetic activation
Bradycardia, nausea, and vomiting	Vagal activation (especially in inferior acute myocardial infarction)

AMI remains one of the most dramatic presentations of CHD (NICE, 2013b). Every seventh women and every sixth men dies because of AMI in Europe (Thygesen et al., 2012). Atherosclerosis (narrowing of the coronary artery) is the foremost cause of CVD mortality and disability (Reiner et al., 2011). Atherosclerosis occurs when lipid metabolism is disturbed. This can be done in different ways, leading to changes in plasma lipoprotein function and the levels thereof, interaction with CVD risk factors may affect the development of atherosclerosis (Reiner et al., 2011). Atherosclerosis develops by the formation of plaques due to damage to the endothelial lining of the

vessels. Macrophages attach themselves and infiltrate the damaged cell. After that, the macrophages digest Low Density Lipoproteins infiltrate, resulting in the formation of foam cells, in which collections of fats, cholesterol, platelets, and cellular debris accumulate. Then, a protective fibrous cap covers plaques. When the fibrous capsule tears and the contents come into contact with blood, through the secretion of proteolytic enzymes by plaques, the low molecular weight glycoproteins in the cells subsequently initiate clotting (LeMone, Peate, Nair, Hemming, & Wild, 2012).

AMI occurs when blood flow in coronary circulation is completely blocked by a thrombus causing, if occlusion lasts more than 30 minutes, irreversible damage to the myocardium (heart muscle) tissue, leading to the occurrence of necrosis of the myocardium in that area (LeMone et al., 2012). The affected tissue will degenerate and create a non-functional area. The myocardium loses some of its strength, based on the location and size of the infarcted area. In addition, an infarction may interrupt the conduction system of the cardiac muscle and cause sudden death (Tortora & Derrickson, 2015). In 2012, a universal pathological classification of AMI recognized five types: first: spontaneous AMI. Second: AMI secondary to oxygen imbalance between supply and demand of myocardial muscle. Third: AMI because of cardiac death, four: AMI related to PCI or stent thrombosis, and five: AMI related to CABG (Thygesen et al., 2012).

With spontaneous AMI (AMI Type 1) atherosclerotic plaque rupture ulceration occurs in the lumen of the coronary artery, leading to decreased blood flow to the myocardial muscle and distal platelet emboli with ensuing myocyte necrosis (Thygesen et al., 2012). AMI type 2, AMI secondary to an ischaemic imbalance, occurs among patients with non-CHD, such as coronary spasm, bradycardia or tachycardia arrhythmias and respiratory failure. This leads to increased demand on the myocardium tissue, which causes an oxygen imbalance between the myocardial tissue supply and demand. The third type of AMI occurs when a patient suffers from sudden cardiac death because of AMI without any available biomarkers. In these cases, it is common for patients to die suddenly with the clinical features of an AMI or myocardial ischemia (combined with new ischemic ECG changes, but without biomarker values) before it is possible to

collect blood to use in a blood sample as a biomarker. The fourth and fifth types associated with mechanical revascularization procedure (periprocedural myocardial injury or infarction). The fourth type of AMI associated with PCI procedure. Various insults may occur that can lead to myocardial injury with necrosis. Finally, the fifth type of AMI occurs after implementation of the CABG operation (Thygesen et al., 2012).

AMI diagnosis is determined based on patients history, signs and symptoms, changes in the 12 lead ECG (related leads), along with, increases in biomarkers such as troponin T or I (Troponin consists of proteins which are released into the blood when heart muscle has been damaged) (Thygesen et al., 2012). A clinical presentation of CHD includes silent ischemia, unstable and stable angina, AMI and heart failure and sudden cardiac death (Hamm et al., 2011). According to the clinical features criteria of AMI, myocardial necrosis occurs when the patient has an increase in levels of the biomarker cardiac enzyme, Troponin I or T (NICE, 2014). Troponin levels can take 10–12 hours after AMI to rise, so serial troponin tests are needed 10–12 hours apart to observe trends (NICE, 2014). After the onset of myocardial ischaemia, histological cell death is not immediate. However, it takes a limited period of time to develop complete necrosis of myocardial cells at risk requires at least 2 to 4 hours, or longer. It depends on the presence of collateral circulation to the ischaemic area, persistent or intermittent coronary arterial occlusion, the sensitivity of the myocytes to ischaemia, pre-conditioning, and individual demand for oxygen and nutrients. The entire process leading to a healed infarction usually takes at least 5–6 weeks (NICE, 2014).

However, many conditions other than acute AMI that may cause troponin levels to be raised, such as myocarditis, congestive heart failure, severe infections, musculoskeletal conditions and renal disease (NICE, 2014). Therefore, the Troponin test should be considered with at least one of the following changes to confirm AMI: new changes in ECG such as, new significant ST-segment elevation or new left bundle branch block, pathological Q-wave, new loss of myocardial viability evidenced through imaging, and thrombus formation in the coronary arteries confirmed by

coronary angiography (Thygesen et al., 2012). Moreover, non-invasive imaging plays several important roles in the diagnosis and characterisation of AMI among patients with known or suspected AMI, those commonly used including radionuclide ventriculography, magnetic resonance imaging and X-ray computed tomography (Thygesen et al., 2012).

AMI is part of ACS, which includes STEMI, NSTEMI, and unstable angina (Thygesen et al., 2012). These conditions are associated with common symptoms but have different underlying pathologies. STEMI is usually associated with a relatively large amount of damage to the myocardium caused by a major blockage in the coronary artery, such as, the Left Anterior Descending Artery (LAD) or the Right Coronary Artery (RCA). In this case, full thickness damage of the myocardium will occur, resulting in ST-elevation on ECG (Thygesen et al., 2012). By comparison, NSTEMI is often associated with relatively less damage to the myocardium. This is caused by either partial blockage of the coronary artery or blockage of a smaller artery, and here only partial thickness damage of the myocardium will occur, this does not produce ST-elevation on ECG (Thygesen et al., 2012). Angina occurs because of narrowing of the coronary arteries, and a consequent mismatch in supply and demand of oxygenated blood to the heart. Angina is unstable when rest or the medications used, do not relieve the chest pain of stable angina (Thygesen et al., 2012).

2.2.1 Treatment of Patients with AMI Diagnosis

In last few decades, advances in the management of AMI have occurred. This has led to the development of specific revascularisation approaches including thrombolytic drugs and of more invasive treatments such as angioplasty, depending on the type of AMI (Thygesen et al., 2012). The section presents a detailed discussion of the treatment modalities and the main health outcomes after receiving treatment for both patients with STEMI and patients with NSTEMI.

2.2.1.1 Treatment of Patients Diagnosed with STEMI

In the case of Primary-PCI (PPCI) capable centres, the most recent evidence suggests that treatment for STEMI should be given immediately and within 90

minutes of symptom onset (Windecker et al., 2014). If PPCI cannot be performed within this time period, due to delayed presentation at hospital, or where there is no PPCI capable centre within 90 minutes' travel. Then, thrombolytic agents as the first-line reperfusion treatment and involve PPCI within 120 minutes (Windecker et al., 2014). NICE (2013a) recommends implementation of PPCI within 120 minutes of the time when it is feasible to give fibrinolysis. In case of non-capable PPCI centre, if the fibrinolysis therapy is successful, an experienced team implements coronary angiography within 3 to 24 hours. If the fibrinolysis therapy is not successful, a rescue PCI should be implemented (Windecker et al., 2014), as shown in Figure 2.1.

According to Steg et al. (2012, p. 2581) PPCI can be defined as:

> "An emergent percutaneous catheter intervention in the setting of STEMI, without previous fibrinolytic treatment—is the preferred reperfusion strategy in patients with STEMI, provided it can be performed expeditiously (for example within guideline-mandated times), by an experienced team, and regardless of whether the patient presents to a PCI-capable hospital".

In order to implement coronary angiography with either a stent or a balloon, patients with AMI should be admitted to the cardiac intervention centre straight away (Amit, Cafri, Gilutz, Ilia, & Zahger, 2007). Thrombolytic treatment involves the administration of fibrolysis intravenously and aims to dissolve the blood clot formed in the coronary artery. Thrombolytic agents act by promoting the activity of circulating plasminogen, in which their enzyme degrades the fibrin leading to break down of the thrombus so that the blood flow to the heart muscle can be restored to prevent further damage and assist the healing process (NICE, 2014). An experienced team should give thrombolytic treatment for eligible patients as early as possible in the pre-hospital setting, emergency unit, or coronary unit. Bleeding complications are the main risks associated with thrombolysis (NICE, 2014).

The total ischaemic time between symptom on-set and provision of reperfusion therapy, either starting thrombolytic agent or mechanical reperfusion by PPCI, is the most important factor. Therefore, the delay time to diagnosis of the patients with AMI when they first arrive at the hospital should be less than 10 minutes (Steg et al.,

2012), as shown in Figure 2.2. In addition, control of delays in the timely implementation of reperfusion therapy is vital in the management of AMI, as shown in Figure 2.2

Previous studies have shown that PPCI is a more effective treatment than thrombolytic therapy as it reduces the risk of bleeding, re-myocardial infarction, mortality and improve maintenance of coronary artery patency (Keeley, Boura, & Grines, 2003; Nielsen et al., 2010), and the length of hospitalization period (Berger et al., 2008).

2.2.1.2 Treatment of Patients Diagnosed with NSTEMI

According to the ESC guidelines for myocardial revascularization, the treatment of patients with NSTEMI consists of three agents. First: use of anticoagulant agents, such as heparin and low molecular weight heparin; to inhibit thrombin generation and activity, thereby reducing thrombus formation (Figure 2.3). Anticoagulation is effective in addition to platelet inhibition and the combination of the two is more effective than either treatment alone (Hamm et al., 2011). Second: Antiplatelet therapy, three classes of drugs can inhibit platelets aggregation, each of which has a distinct mechanism of action. A: Aspirin (acetylsalicylic acid) targets cyclo-oxygenase (COX-1), inhibiting thromboxane A2 formation and inducing a functional permanent inhibition in platelets B: Glycoprotein IIb/IIIa receptor inhibitors (abciximab, eptifibatide and tirofiban) C: P2Y12 receptor inhibitors (Clopidogrel), as shown in Figure 2.3. Third: Anti-ischaemic to decrease myocardial oxygen demand by decreasing heart rate, lowering blood pressure and increase myocardial oxygen supply by inducing coronary vasodilatation (Hamm et al., 2011).

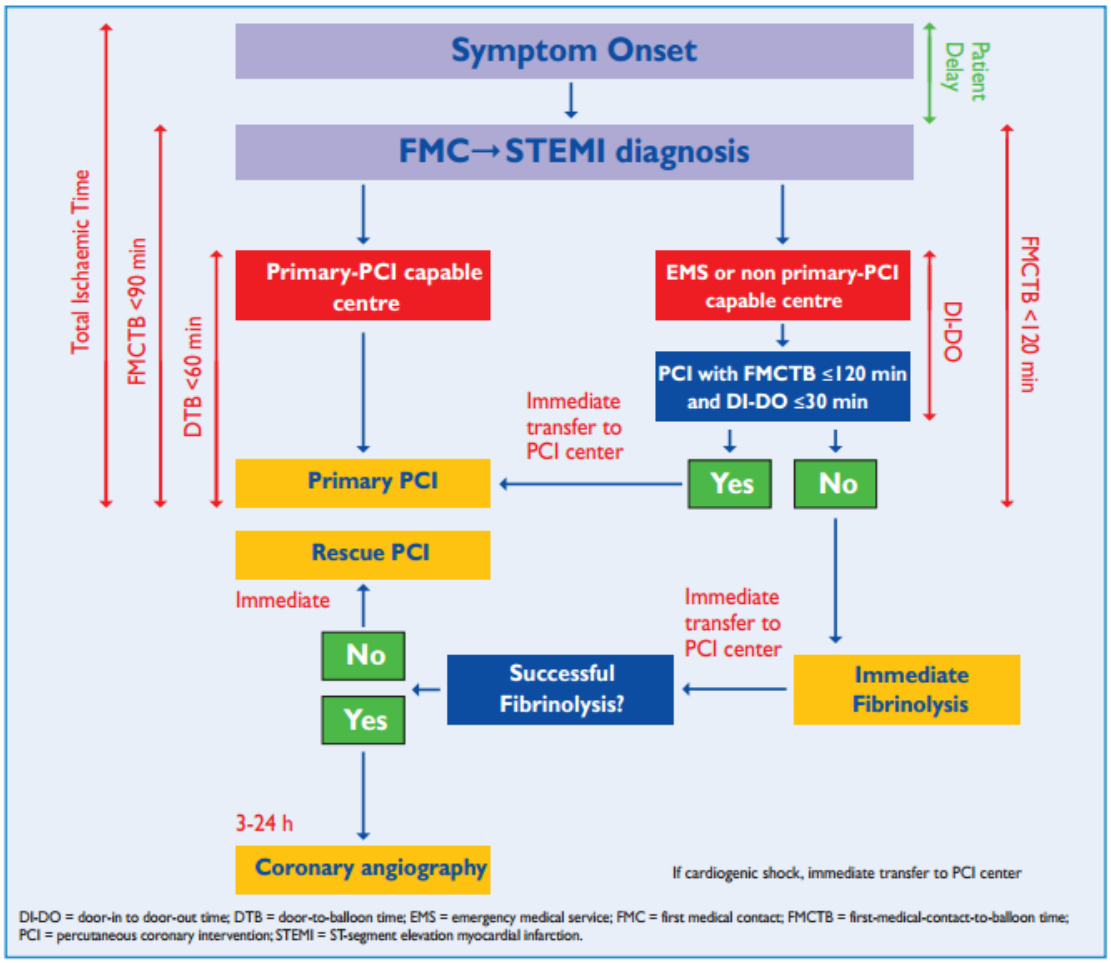


Figure 2.1 STEMI patient treatment with ideal time interval for interventions, adopted from European society of cardiology guideline for myocardial revascularisation (Windecker et al., 2014, p. 2564).

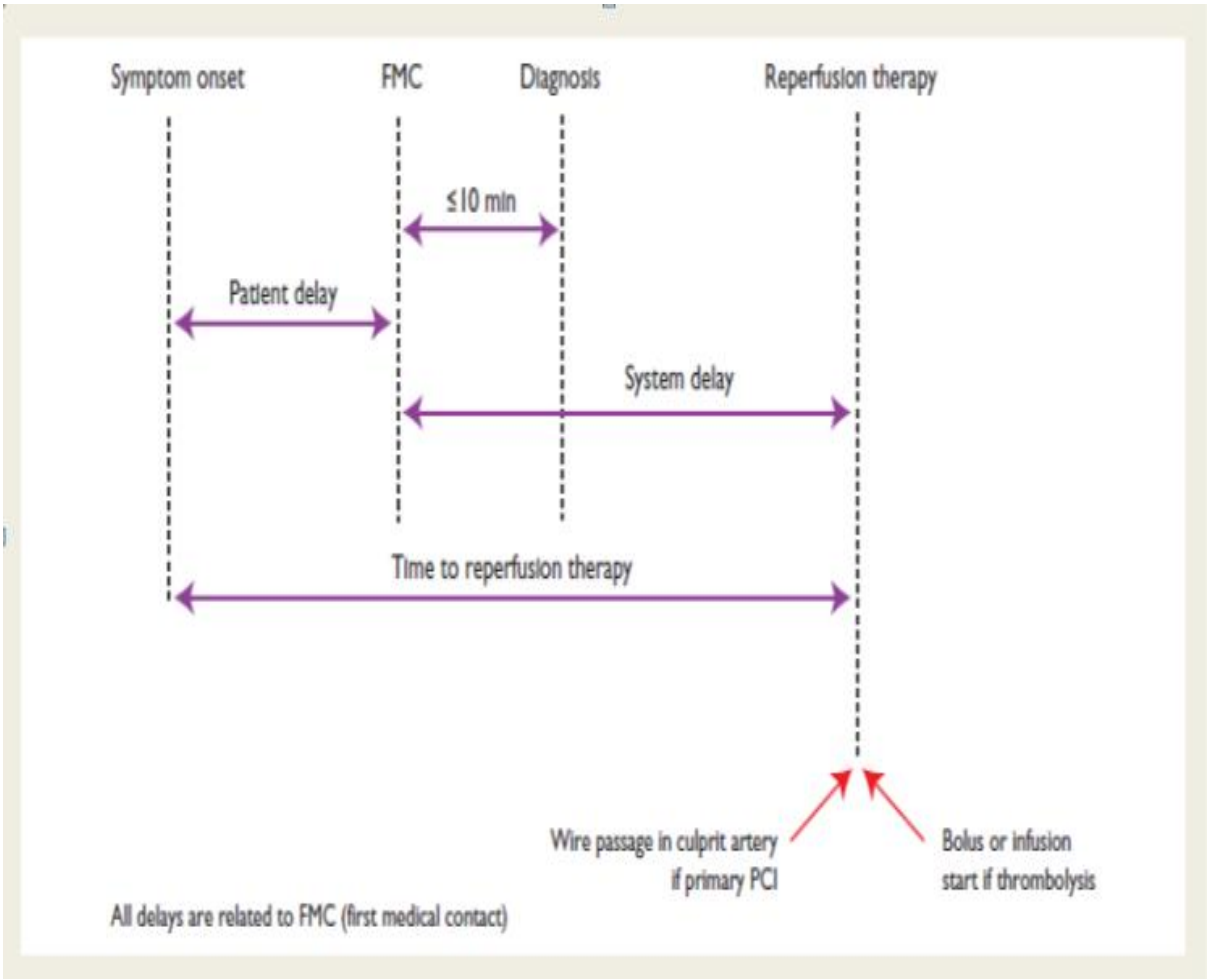


Figure 2.2 Patients with AMI and ideal time interval for intervention, adopted from European society of cardiology, Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation (Steg et al., 2012, p. 2577).

Neither thrombolytic therapy nor PPCI is indicated as an appropriate treatment for patients presenting with NSTEMI (Hamm et al., 2011). In addition, the primary treatment of patients with NSTEMI is focused predominantly on monitoring ECG changes, cardiac biomarkers, cardiac enzymes and symptoms alleviation (Hamm et al., 2011). It is recommended that coronary angiography and related cardiac intervention be performed where suitable with patients with NSTEMI (Hamm et al., 2011).

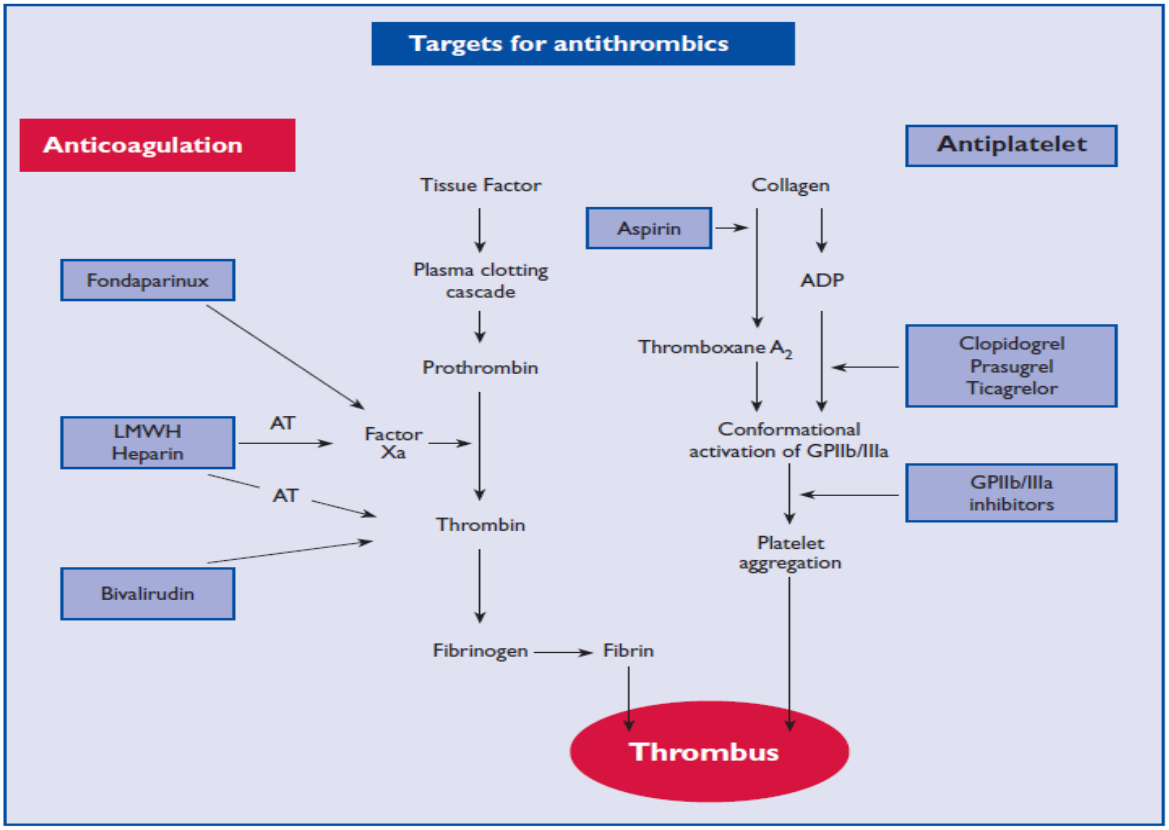


Figure 2.3 Targets for antithrombotic drugs (Hamm et al., 2011, p. 3022)

The timing of coronary angiography and intervention implementation are based on the risk categories of NSTEMI patients (Windecker et al., 2014). Health care professionals use tools for risk assessment such as the Global Registry of Acute Cardiac Events (GRACE) to offer a scoring system to assess and categorise the risk of future adverse cardiovascular events, predicting 6-month mortality (Table 2.2). GRACE is important for determining early management strategies and allows the benefits of treatment to be balanced against the risks of treatment-related adverse events (Windecker et al., 2014).

Coronary angiography should be implemented within 96 hours of first admission to hospital to patients who have an intermediate or higher risk of adverse cardiovascular events (predicted 6-month mortality above 3.0%) if they have no contraindications to angiography such as active bleeding (NICE, 2010). In addition, the interventional cardiologist should implement coronary angiography as soon as possible for patients

who are clinically unstable or at high ischaemic risk. It is recommended that this take place within two hours for the higher risk group, within 24 hours for the moderate risk group, and within 72 hours, and before hospital discharge, for the low risk group (Windecker et al., 2014).

Despite the improvements in treatment modalities of patients with AMI and advanced diagnostics and imaging technology in the last few years, up to 50% of patients with AMI die within 30 days of the event (NICE, 2014). The Myocardial Ischaemia National Audit Project reported data from 2012 showing that 41% of AMI cases categorised as STEMI and 59% were categorised as NSTEMI (NICE, 2014). Patients diagnosed with NSTEMI had a higher rate of in-hospital mortality (13%) than patients with STEMI (9.6%). In addition, patients with NSTEMI had higher mortality (27%) than patients with STEMI (19%) at follow up of 10 months (Nikus et al., 2007). These findings highlight the importance of secondary prevention along with treatment for patients with AMI in order to avoid further AMI and other manifestations of vascular disease.

Table 2.2

GRACE Risk Assessment Categories, Adopted from (Windecker et al., 2014)

Predicted 6-month mortality (Percentage)	Risk of future adverse cardiovascular events
1.5 or below	Lowest
>1.5 to 3.0	Low
>3.0 to 6.0	Intermediate
>6.0 to 9.0	High
Over 9.0	Highest

2.2.2 Secondary Prevention of AMI

AMI is a marker of chronic disease, but presents with acute symptoms. It is necessary to reduce the risk of recurrence by modifying the coronary risk factors. The risk factors associated with CVDs can be categorised into three groups. Firstly, there are behavioural risk factors linked to lifestyle choices, such as tobacco use, unhealthy diet and physical inactivity. Secondly, there are metabolic and biological risk factors, such as DM, HTN, and hypercholesterolemia. Thirdly, there are psychosocial risk factors, such as socioeconomic status and psychological conditions such as depression (WHO, 2015c).

The literature has extensively discussed secondary prevention. Detels, McEwen, Beaglehole, and Tanaka (2011) categorised disease prevention into three types: primary prevention which aims to lower the occurrence rate of the event in question. For example, the incidence rate of the disease. Secondary prevention which aims to lower the occurrence of the more severe, later stages of the disease, this can be done by identifying the disease at a curable stage. Finally, tertiary prevention aims to reduce the social consequences: after an acute case of cardiac disease, cardiac patients need more attention to improve their quality of life and maintain functional capacity. In addition, they require counselling and support to create a medication plan and encourage the adoption of a healthy lifestyle in order to prevent event recurrence (Piepoli et al., 2010).

The importance of secondary prevention programmes for CHD patients' recovery is well established in the literature (Clark, Hartling, Vandermeer, Lissel, & McAlister, 2007). Secondary prevention along with treatment reduced the 30-day mortality of AMI to great effect, from 13% in 2004 to 8% in 2012 (NICE, 2013d). The latest ESC guidelines (2016) recommend smoking cessation immediately after AMI, adherence to cardio-protective medications and a Mediterranean-style diet. In addition, the patient would benefit from having a Low Density Lipoprotein of less than 100 mg/dl. The target Body Mass Index (BMI) is between 20 to 25, and blood pressure at less than 140/90 mmhg. Moderate-intensity PA is recommended ranging from 2.5 to 5 hours weekly or performing 1 to1.5 hours a week of vigorous-intensity PA or an

equivalent combination. The total PA volume per week can be measured by calculating daily bouts of exercise, each lasting more than 10 minutes, this total PA should be distributed over most days of the week (Piepoli et al., 2016).

There is clear evidence that secondary prevention practices decrease both mortality and morbidity among patients diagnosed with AMI. For example, smoking cessation reduces by 18% the mortality risk after AMI (Gerber, Rosen, Goldbourt, Benyamini, & Drory, 2009). In addition, failure to control risk factors, for instance hypercholesterolemia, was found to be related to angina post-AMI and elevated blood pressure, which is significantly associated with early mortality after AMI (Vega, Martínez, Jiménez, Navarro, & Bernad, 2007). High levels of PA in patients with AMI has been found to have a significant relation to a decrease in morbidity and mortality rates, controlling AMI risk factors after treatment and improving quality of life (Gassner, Dunn, & Piller, 2003).

Many previous studies have proven that secondary prevention strategies have a beneficial impact on the patient, encouraging a healthy lifestyle and decreasing AMI risk factors after treatment (Back, Cider, Gillstrom, & Herlitz, 2013; Bakker, Nijkamp, Sloot, Berndt, & Bolman, 2014; Milligan, 2012). Educational programs have been shown to improve and maintain the blood lipids profile (Luszczynska, Scholz, & Sutton, 2007), encourage smoking cessation, enhance healthy eating behaviours (Holtrop et al., 2006), enhance compliance with prescribed medication and improve PA level, (McKee, Bannon, Kerins, & FitzGerald, 2007), and decrease mortality (Rogers et al., 2007).

Educational programs for patients with AMI should provide detailed information about their disease, its complications, treatment and prevention. One qualitative study, conducted by Astin, Closs, McLenachan, Hunter, and Priestley (2008) explored the information needs among patients with AMI treated with primary angioplasty. It shows that more specific information is needed regarding the risk of AMI recurrence, proportion of heart muscle damage, discharge medications, appropriate levels of PA and healthy diet guidance.

Cardiac rehabilitation is one secondary prevention strategies. Recently a meta-analysis and systematic review to investigate the effectiveness and the cost effectiveness of cardiac rehabilitation from 2009 to 2014 showed that cardiac rehabilitation reduces CVD's mortality and hospital re-admission, and is thus a cost effective intervention (Anderson, Thompson, et al., 2016). In addition, the ESC and the American Heart Association (AHA) recommend cardiac rehabilitation with the highest level of scientific evidence-class (I), after the treatment of patients with CHD (Piepoli et al., 2010).

To summarise, involving patients with AMI in secondary prevention programmes such as health education programmes and cardiac rehabilitation can potentially lead to beneficial health outcomes. Cardiac rehabilitation is an effective secondary prevention intervention that restores both functional capacity and psychological well-being.

2.2.3 Cardiac Rehabilitation Programme

The development of cardiac rehabilitation has its origins in early work by Hellerstein, Wenger and Zohman who in the 1960s, showed that progressive regular exercise after an AMI is beneficial for both physiological and psychological recovery (Certo, 1985). This effectively outlined that regular exercise after a cardiac event, AMI or cardiac surgery re-establishes and enhances a patient's health status (Hellerstein, 1968). This pioneering research formed the foundation of cardiac rehabilitation, which is now an internationally established intervention for those with CHD. The WHO definition of cardiac rehabilitation is:

> "The sum of activities required to influence favourably the underlying cause of the disease, as well as the best possible physical, mental and social conditions, so that they may, by their own efforts preserve or resume when lost, as normal a place as possible in the community. Rehabilitation cannot be regarded as an isolated form of therapy but must be integrated with the whole treatment of which it forms only one facet" (WHO, 1993, p. 1).

Cardiac rehabilitation programme consists of three phases: phase one starts in hospital, phase two is viewed as the early post-discharge phase and usually lasts from 2 to 16 weeks after hospital discharge, and phase three is considered a long-term maintenance programme, this phase is a continuation period from the previous phase with less intensive supervision (Bjarnason-Wehrens et al., 2010). In the UK, after involving patients in phase one of cardiac rehabilitation programme in hospital, the patients continue in the second phase from 2 to 4 weeks after AMI, and 4 to 6 weeks after cardiac surgery (Dalal et al., 2015). Though the early recovery phase is a relatively short period, it is a critical one in which patients with AMI leave to their homes and return to work or normal life. In this period, patients with AMI should adhere to a healthy lifestyle in order to improve health outcomes and reduce the likelihood of future complications. However, there is lack of knowledge about self-efficacy and PA among patients with AMI in the early recovery phase.

According to the National Institute for Health and Care Excellence (NICE), patients with CHD should receive comprehensive cardiac rehabilitation with a tailored exercise programme and health education and recommendations for a healthy lifestyle. This includes a Mediterranean-style diet, weight control, PA levels, maintaining regular exercise, reducing or cessation of smoking and alcohol consumption, in addition to psychological or social and cultural support. Therefore, the overall aim is to support those with CHD to reduce the risk of subsequent cardiac events and enable patients to return to normal active life and develop self-management skills (NICE, 2013c).

A cardiac rehabilitation programme emphasises secondary prevention strategies, including multidisciplinary programmes such as educational intervention, PA sessions and patient counselling, it has been found to have a significant influence on prognosis of patients with AMI after receiving treatment (Piepoli et al., 2016). Additionally, many international associations, such as the ESC and AHA provide clear guidelines on secondary prevention and explaining the benefit of attending cardiac rehabilitation (Anderson et al., 2013).

In a previous multicentre controlled trial intervention study among 3,241 patients with AMI. The control group was given usual treatment without attending cardiac

rehabilitation, whereas the intervention group received usual care and also attended cardiac rehabilitation, the study's findings revealed that cardiac rehabilitation decreased the recurrence rate of AMI, and rates of stroke and mortality among the intervention group (Anderson, Dall, Nguyen, Burgess, & Taylor, 2016; Giannuzzi et al., 2008). Moreover, the same studies indicated that the intervention group of patients with AMI had more adherences to change in their lifestyle, such as PA, control of body weight, diet management and stress control. In addition, much research evidence demonstrates that the benefits of the cardiac rehabilitation programme include reduced hospital admissions, improved PA, increased time and tolerance of exercise, reduced anxiety and depression levels, improved quality of life and reduced overall and cardiovascular mortality (Eshah & Bond, 2009; Heran et al., 2011; Yohannes, Doherty, Bundy, & Yalfani, 2010). Therefore, cardiac rehabilitation effectively reduces CHD risk factors and decreases the burden of CHD.

Although there is a necessity for cardiac rehabilitation, the availability of these facilities across regions is variable. In Europe, less than one third have access to a cardiac rehabilitation programme (Kotseva et al., 2009). Additionally, the European cardiac rehabilitation inventory survey by Bjarnason-Wehrens et al. (2010) showed that most European countries had phase (I) (in-hospital) cardiac rehabilitation programmes but less than 30% of hospitals, across 15 European countries had Phase (II) provisions. Moreover, only 46% had national legislation for phase (II) and 75% had government funding. Regarding cardiac rehabilitation Phase (III), although it is available in most European countries, has less emphasis and support. In addition, 13 European countries reported that cardiac patients covered all costs incurred. This data highlights the obstacles to apply cardiac rehabilitation. Therefore, there is a need for more legislation, sufficient funding, professional treatment, prevention guidelines, and effective health information systems in several European countries (Bjarnason-Wehrens et al., 2010).

Additionally, there is disagreement in the literature regarding cardiac rehabilitation programmes' outcomes. For example, some studies show that there is no significant difference in PA level, anxiety, depression, health-related quality of life, cardiac

events, and mortality between patients with AMI who were involved in a cardiac rehabilitation program and those patients with AMI who were not so involved (West, Jones, & Henderson, 2011). However, this could be because cardiac rehabilitation is a complex and multidisciplinary intervention with many interrelated sessions (Dalal et al., 2015). In addition, the implementation of meta-analysis includes older studies, meaning that the same benefits as now are unclear, as the treatment has become better. In conclusion, although half of patients with AMI globally do not take up cardiac rehabilitation, it is a cost-effective secondary prevention; it reduces CHD risk factors, decreases mortality and enhances self-management skills among patients with AMI.

2.3 Secondary Prevention and Self-Efficacy

The previous section provides an overview of secondary prevention and cardiac rehabilitation programmes. This section highlights the role of secondary prevention and self-efficacy in self-management skills and in reducing CVD risk factors.

Self-efficacy has attracted much attention as a key factor in improvement of self-management skills of patients with AMI (Katch, 2010). In addition, self-efficacy is one of the most important mechanisms for the promotion of secondary prevention among patients with AMI (Lorig & Holman, 2003; Sol et al., 2011; Sullivan, LaCroix, Russo, & Katon, 1998). Recovery after AMI focuses on a change in the behaviour of patients, based on current general recommendations associated with diagnosis rather than being adjusted to each patient´s preferences (Ekman et al., 2011). According to Bandura (1997), it is uncommon for people to attempt to carry out a task if the outcome is expected to be failure, and this is consistent with prior studies showing that the probability of changing a behaviour is weak without belief in the ability to improve the health status by accomplishing a behavioural change (Lorig & Holman, 2003).

The literature shows that improved self-efficacy levels reduce the risk factors of CVDs. For example, in a previous descriptive cohort study of 125 patients with CVD, attending a 12 months self-management program was found that improvements in

self-efficacy are significantly associated with an enhanced adherence to PA behaviour and better food choices (Sol et al., 2011). In addition, a systematic review conducted in the United States (US) to investigate the efficacy of disease self-management programmes among patients with CVD was conducted by Katch (2010). The study found that five disease self-management programmes focusing on self-efficacy showed improved self-efficacy while patients were developing their self-management skills such as medication adherence, patient's perceived management skills, and improved clinical outcomes, such as, lower blood pressure or reduced hospitalisation (Katch, 2010).

There is growing evidence that self-efficacy plays a central role in improving patient outcomes and self-management among patients with CHD, for example, a prior study has shown that self-efficacy reduces cravings upon smoking abstinence (Berndt et al., 2013), and another shows improved adherence to healthy diet (Sharp & Salyer, 2012). In addition, enhanced DM treatment and the effect of adverse events (Robertson, Amspoker, Cully, Ross, & Naik, 2013; Sirikamonsathian, Sriratanaban, Hiransuthikul, & Lertmaharit, 2013). Moreover, self-efficacy can predict adverse health outcomes such as re-admission or mental and physical health problems (O'Neil et al., 2013).

Another study conducted, among elderly patients with CHD aged 65-101 years, to measure self-efficacy and readmission rates, disabilities, and morbidity. The study presented clear evidence that special attention needs to be paid to increasing self-efficacy in patients in order to improve self-care among elderly with CHD (Salamah, Wahl, & Abriam-Yago, 2002). In addition, Maeda et al. (2013) found that social support and depression were associated with treatment adherence and were fully mediated by self-efficacy. Therefore, self-efficacy is a key target for intervention in order to enhance disease self-management skills.

Further, self-efficacy and CVD are strongly related to BMI (Ärnlöv, Sundström, Ingelsson, & Lind, 2011). A cohort study explored the effect of self-reported self-efficacy on cardiovascular lifestyle including BMI. A total of 125 patients with CVD (72 male and 53 female) were assessed, with a mean age of 61 years, most of whom (66%) were patients with CHD. The study found that self-efficacy had a significant

relationship with weight reduction and improved BMI (Sol et al., 2011). These results are consistent with another study from 2013, concerning a convenience sample of 214 patients with CHD (161 male and 53 female), with a mean age of 60 years. This study showed that cardiac self-efficacy levels were significantly influenced by BMI, diagnosis, occupation, experience of receiving patient education, and awareness of CHD risk factors (Kang & Yang, 2013). However, BMI is not the optimum approach to estimate body fat, there are many disadvantages to using BMI as several factors such as age, sex, ethnicity, and muscle mass affect the relationship between BMI and body fat (Stommel & Schoenborn, 2010). In addition, BMI has many clinical limitations due to variation caused by factors such as age, sex, and ethnicity and BMI does not separate between excess fat, muscle, or bone mass, nor does it provide any indication of the distribution of body fat (CDC, 2015). Therefore, BMI has a significant association with healthy lifestyle, PA level and self-efficacy level among patients with CHD.

Although the growing interest in self-efficacy has led to the development of a variety of self-efficacy measures that can be utilized in secondary prevention outcomes, the underlying factors to developing engagement between self-efficacy and secondary prevention outcomes are lacking (Yehle & Plake, 2010). In addition, self-efficacy has been found to have a limited relationship with PA, a prior study was implemented to examine the relationships between barriers and facilitators of personal factors, symptom distress, negative well-being, self-efficacy, and positive well-being with self-reported PA, 6–12 months after cardiac event among 64 cardiac patients. The study found a total of 44% of the variance in PA levels explained, age and gender were responsible for 14.7% of the variance, with symptom distress and negative well-being responsible for an additional 21.6% of the variance. In addition, self-efficacy was responsible for the remaining 7.6% of the variance (Yates, Price-Fowlkes, & Agrawal, 2003).

In conclusion, this section has shown that self-efficacy has a substantial role in secondary prevention among patients with CHD. In addition, the literature provides various examples indicating that an increase in self-efficacy is one of the major

outcomes of cardiac rehabilitation among patients with CHD. Hence, enhancing self-efficacy levels may help to change the lifestyles of patients with CHD and overcome the challenges of improving adherence to treatment, along with the mediator role played by self-efficacy in improving psychological and clinical health outcomes related to secondary prevention and cardiac rehabilitation programmes.

2.4 Coronary Heart Diseases and Healthcare Provision in Jordan

The previous section gives an overview of the role of self-efficacy in secondary prevention in order to reduce CHD risk factors. This section highlights CHD risk factors in the Middle East, particularly Jordan.

The prevalence of CHD has increased in Middle Eastern countries due to a high prevalence of smoking, Hypertension (HTN), dyslipidemia, Diabetes Mellitus (DM), and sedentary lifestyles (Almahmeed et al., 2012). In 2014, an INTERHEART study, administered to 1,364 first time patients with AMI from eight Middle Eastern countries, revealed that AMI occurs at a younger age in the Middle East than in other regions, at the age of 51.2 ± 10.3 years. Across the whole INTERHEART study population, as opposed to the UK, an average age for a first AMI 65 years for men, while women had their first AMI at 73 years (NICE, 2013b). For the overall population, the attributable risk for the nine risk factors (smoking, exercise, alcohol, HTN, DM, waist to hip ratio, psychosocial factors, fruits and vegetables, and Apo B/Apo A1 ratio) was higher in the Middle East (97.5%) than in the rest of the world (90.4%) (Gehani et al., 2014).

Another study, published in 2015, investigated cardio-metabolic disease attributable to dietary intake in the Middle East; it found that systolic blood pressure was the leading risk factor for cardio-metabolic disease deaths in the eight countries, reaching 68% in Libya and 45% in Bahrain. Additionally, fasting plasma glucose and non-optimal BMI were the third and fourth leading risk factors for cardio-metabolic disease mortality in most of the Middle Eastern countries. Moreover, the Jordanian population displayed the lowest intake of fruit, at only 8% (Afshin et al., 2015).

The 2012 WHO report showed that the Middle East has lower rates of PA than other regions, approximately a third of men and 50% of women are physically inactive. In the same WHO report, it was estimated that DM, heart disease and stroke would reduce gross domestic product by up to 5% in most low and middle income-countries in 2015 (WHO, 2015b).

Sayegh, Van Der Walt, and Al-Kuwari (2016) conducted a longitudinal PA assessment study in the Middle East among 549 female Qatari adults, aged between 18 to 64 years, whose mean age was 37.4±11.7 years, and whose mean BMI was 28.8 kg/m². The study revealed that daily steps for the overall population ranged from 3,505 steps per day to 10,010 steps per day, with a median of 6,008 steps/day. 44.1% females were sedentary, 32.4% showed reduced levels of activity, and 23.5% were physically active. For this, Qatari females were not meeting the international recommendations for PA.

In Jordan, the prevalence of Non-Communicable Diseases (NCDs) is increasing progressively last a few years. Indeed, about 13% of Jordan's population suffer from NCDs (Department of Statistics/ Jordan, 2015). CVDs are the leading cause of premature death in Jordan among both men and women, they account for 35% of the mortality rate every year (WHO, 2015e). Furthermore, CHD is the main cause of death, representing 16.8% of total deaths in Jordan (WHO, 2015e). The behavioural and metabolic risk factors of NCDs in Jordan are currently estimated to be daily tobacco smoking 27.1%, blood pressure 28.8%, blood glucose 14.4%, being overweight 64.1%, obesity 30% and raised cholesterol 46.4 % (MoH, 2014). In addition, 39% of patients diagnosed with NCDs have HTN - which represents 11% of Jordan's total population (Department of Statistics/ Jordan, 2015).

Although CVD is the leading cause of premature death (MoH, 2014), a retrospective analysis study was conducted in two major Ministry of Health (MoH) hospitals in Jordan to investigate patients with AMI risk factors of CVD among 730 patients with AMI, from 2002 until 2005. This study found that 40% were DM, 40% had HTN , 62% were smokers, 24% had a previous diagnosis date of CHD and 18% had hypercholesterolemia (Sawalha, Al-Zoobiy, & Shamaileh, 2008). A previous similar

study in Jordan, conducted among 5,000 patients, revealed similar results: 57% had high Triglyceride levels, 67% were smokers, and 47% were diagnosed with DM (Hammoudeh et al., 2006).

Abu-Baker, Haddad, and Mayyas (2010) investigated smoking behaviour among a convenience sample of 300 CHD Jordanian patients, their data showed that 60% of the patients with CHD were smokers before diagnosis with CHD. After the illness, only 30% ceased smoking. In comparison, Kotseva et al. (2009) in a multi-centre study of European countries found that 61% were hypertensive, 46.2% had high cholesterol levels, 28% were DM and 18.2% were smokers. This shows that CVD risk factors rate in Jordan compared to Europe is high. Therefore, efforts to address these CVD risk factors are becoming exceedingly important as the CVD burden for these diseases is likely responsible for major and growing problems in the Jordanian healthcare system.

Patients with AMI would consider a secondary prevention programme to reduce the complications of coronary risk factors. A prior study in Jordan by Eshah (2011) showed patients with first-time ACS believed that educational programmes related to daily living activities, medications and treatment that were attended during and after hospital discharge, were important and effective. Eshah concluded that establishing cardiac rehabilitation programmes that offer patients with ACS all of the information they need, might encourage them to continue to apply self-management skills and comply with secondary prevention after receiving treatment in Jordan (Eshah, 2011). Nevertheless, the secondary prevention strategies in Jordan are insufficient. Moreover, Eshah implemented a quasi-experimental study in Jordan to examine the effect of an education programme on 104 first-time patients with ACS lifestyle changes four weeks after discharge. The study showed that there was no statistically significant difference in PA levels between the two groups and recommended that further support and follow up for Jordanian patients with ACS were needed (Eshah, 2013). A conclusion which can be drawn from the previous studies is that CVD will increase further and that therefore there is need to know how best to manage the

patients with AMI, understanding the key CVD risk factors related to lifestyle changes and preventing secondary outcomes in Jordan.

2.5 Physical Activity

PA refers to “any bodily movement produced by skeletal muscles that requires energy expenditure” (WHO, 2013). Exercise is defined as “a subcategory of PA that is planned, structured, repetitive and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective” (WHO, 2013). Hence, PA includes exercise and other activities such as aerobic activity, occupation, transportation, housework and social activities. On the other hand, sedentary behaviour refers to the activities of sitting and lying (Granat, 2012).

It has been found that regular PA that meets the international recommendation of PA level increases the physiological capability to use oxygen to derive energy for work (Fletcher et al., 2013). Maximal oxygen consumption or maximum volume (V) of oxygen (O_2) kg per ml (VO_2) refers to the aerobic physical fitness of the individual, and is an important determinant of their endurance capacity during prolonged exercise (Hall, 2015). The average healthy male VO_2 max is about 35–40 ml/ (kg per minute). The average healthy female VO_2 max is about 27–31 ml/ (kg per minute) (Fletcher et al., 2013). These scores decrease with age and improve with training, while PA may double VO_2 or correspondingly reduce the heart rate (Fletcher et al., 2013).

PA and sedentary behaviour are complex, multi-dimensional constructs (Plasqui & Westerterp, 2007), which is mean that difficult to measure and cannot be described by single metric such as PA duration only, because this description will inadequately reflect an individual’s PA, as many biologically important dimensions are independent and unrelated (Thompson, Peacock, Western, & Batterham, 2015). Recently, Kelly, Fitzsimons, and Baker (2016) presented measurement frameworks for PA and sedentary behaviour with many facets such as domains, dimensions, and correlates or determinants, with many more sub-groups within each (Figure 2.4). Together these demonstrate the total volume of activity (Kelly et al., 2016).

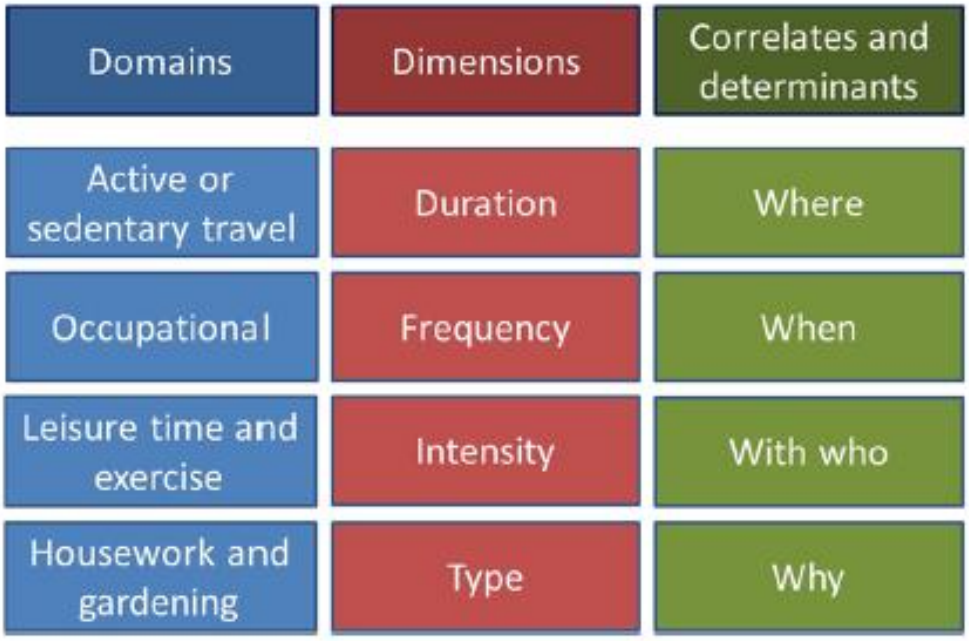
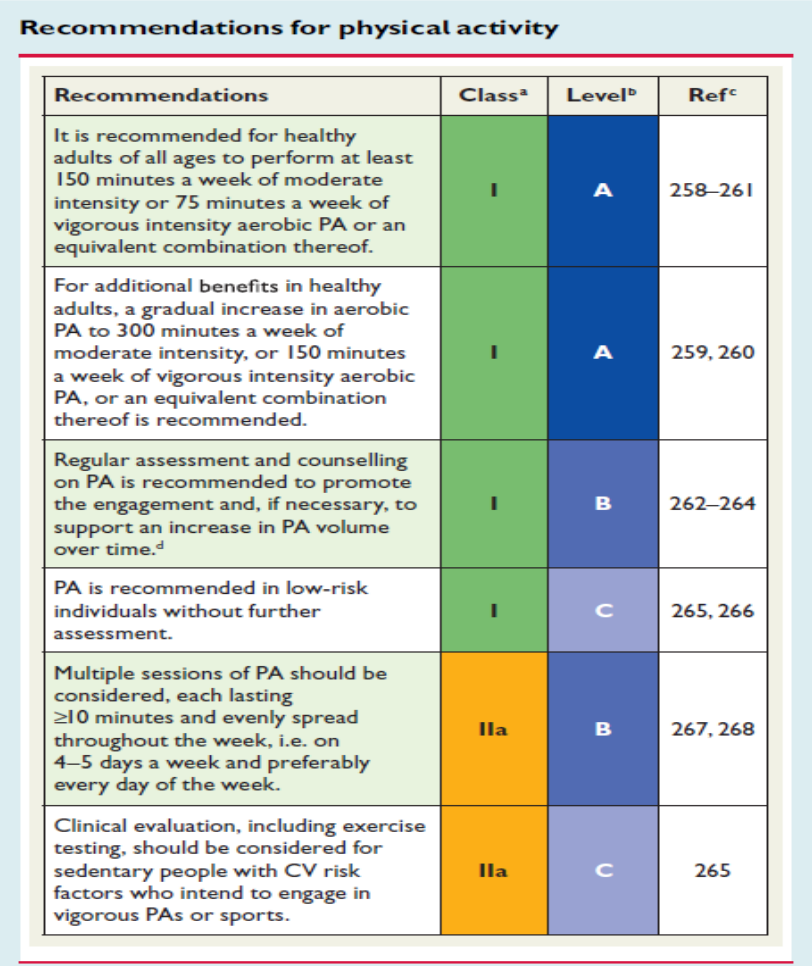


Figure 2.4 Measurement framework for physical activity and sedentary behaviour including domains, dimensions, and correlates and determinants, downloaded from (Kelly et al., 2016, p. 3).

The measurements of PA intensity are commonly in Metabolic Equivalents (METs). Moderate-Vigorous PA (MVPA) refer to the magnitude of the effort needed to achieve PA or exercise (WHO, 2012a). Moderate intensity, approximately 3-6 METs, is the PA that requires a moderate amount of effort and noticeably accelerates the heart rate, such as brisk walking and gardening. Vigorous-intensity, approximately ≥ 6 METs, refers to PA that requires a large amount of effort and causes rapid breathing and substantial increase in heart rate such as running, fast swimming, and fast cycling (WHO, 2012a).

The available evidence on PA from epidemiological surveys and intervention studies provides guidelines concerning how much activity the population at large should undertake in order to maintain and promote health. For example, the WHO guidelines and the ESC both recommend PA for patients with CHD, after further assessment and considering clinical evaluation such as exercise testing. Patients with CHD should undertake 2.5 - 5 hours per week of moderate intensity PA or at least 1.0 - 1.5

hours per week of vigorous intensity PA or an equivalent combination of moderate and vigorous intensity activity, (Figure 2.5) (Piepoli et al., 2010; WHO, 2013). In addition, the percentage of time spent in a particular activity per day can provide an accurate evaluation of PA. For example, the average sedentary time among healthy adults in US and Canada ranges from 55% to 69% of their activities during waking hours, so the upright time ranges from 45% to 31% as reported in the literature (Colley et al., 2011; Matthews et al., 2008).



Recommendations for physical activity

Recommendations	Class[a]	Level[b]	Ref[c]
It is recommended for healthy adults of all ages to perform at least 150 minutes a week of moderate intensity or 75 minutes a week of vigorous intensity aerobic PA or an equivalent combination thereof.	I	A	258–261
For additional benefits in healthy adults, a gradual increase in aerobic PA to 300 minutes a week of moderate intensity, or 150 minutes a week of vigorous intensity aerobic PA, or an equivalent combination thereof is recommended.	I	A	259, 260
Regular assessment and counselling on PA is recommended to promote the engagement and, if necessary, to support an increase in PA volume over time.[d]	I	B	262–264
PA is recommended in low-risk individuals without further assessment.	I	C	265, 266
Multiple sessions of PA should be considered, each lasting ≥10 minutes and evenly spread throughout the week, i.e. on 4–5 days a week and preferably every day of the week.	IIa	B	267, 268
Clinical evaluation, including exercise testing, should be considered for sedentary people with CV risk factors who intend to engage in vigorous PAs or sports.	IIa	C	265

Figure 2.5 European guidelines on CVD prevention in clinical practice, European society of cardiology, 2016 European Guidelines on cardiovascular disease prevention in clinical practice (Piepoli et al., 2016, p. 2343)

Another way of evaluating PA is to count the number of steps. This has traditionally been accomplished by using a pedometer and a guide to health intervention was

developed to classify PA, individuals who take fewer than 5,000 steps per day are considered to have a sedentary life and individuals who take more than 10,000 steps per day are considered active (Tudor-Locke & Bassett Jr, 2004; Tudor-Locke, Craig, Thyfault, & Spence, 2012) as shown in Table 2.3 and Figure 2.6. In addition, Tudor-Locke et al. (2011) showed that 8,000 steps per/day was representative of the PA guideline of special population such as CHD.

Table 2.3

Classification of Pedometer-Determined Physical Activity in Healthy Adults (Downloaded from (Tudor-Locke & Bassett Jr, 2004)

PA level	Steps counts per day
Highly active	More than 12,500
Active	More than or equals 10,000
Somewhat active	7,500–9,999
Low active	5,000–7,499
Sedentary life	Less than 5,000

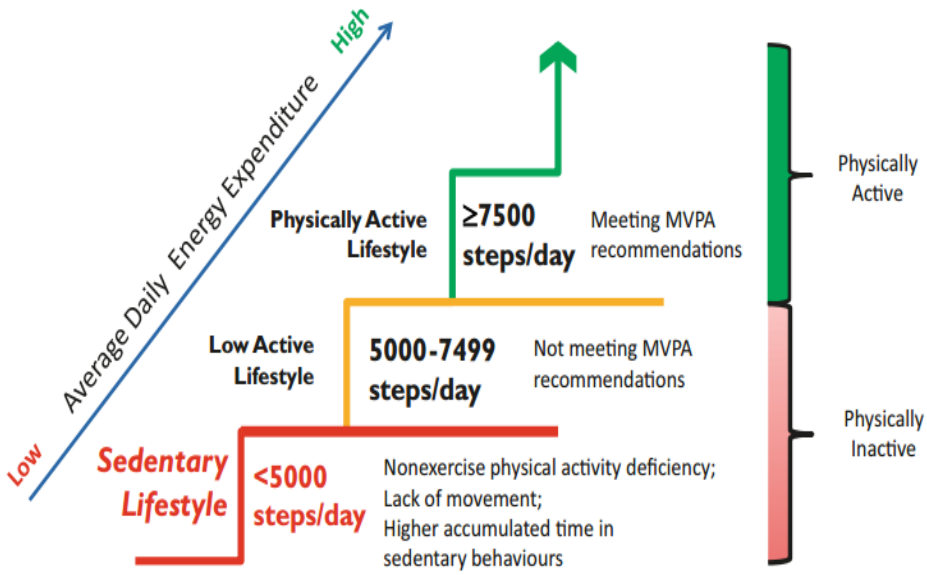


Figure 2.6 Step-defined sedentary lifestyle index for healthy adults (downloaded from (Tudor-Locke et al., 2012)).

Despite recognised benefits and clear recommendations, previous studies suggest that only 15% of the healthy adult population (Colley et al., 2011), and 35% of patients with CHD (Perk et al., 2012) actually meet the amount of PA recommended in PA guidelines. Moreover, BHF survey, administered in 2015, reported that the sedentary time decreases in adults in England as they move into middle age and then increases into older age (BHF, 2015). Sixty-seven percent of men in Scotland and England reported meeting the recommended levels of PA, compared to 37% of men in Wales and 59 % of men in Northern Ireland. On the other hand, women were less active than men in all United Kingdom (UK) countries, with 58% reporting that they met the recommended levels in Scotland, 55% in England, 23% in Wales and 49% in Northern Ireland (BHF, 2015). Thus, the evidence suggests that the amount of PA undertaken across the age spectrum is low and well below the level recommended by the guidelines in order to maintain the health benefits that exercise can bring. Aspects of modern life such as use of cars, television, and computers have meant that most people in society have become much less physically active and increasingly sedentary (Bassett Jr, Freedson, & Kozey, 2010; Hamilton, Hamilton, & Zderic, 2007; Owen, Healy, Matthews, & Dunstan, 2010). Therefore, much evidence recommends that improving PA among patients with CHD to achieve the recommended PA level.

2.5.1 Physical Activity and Cardiovascular Health

The first study to provide clear evidence of the benefits of PA on CVD among adults was that of Morris, Heady, Raffle, Roberts, and Parks (1953), who reported that individuals in physically active jobs had less CHD than those whose jobs involved sitting for prolonged periods. Since then, studies have continued to define and evaluate the health benefits of PA. There is now substantial evidence that PA, particularly of moderate to vigorous intensity, can play a significant preventative role in a number of important and prevalent contemporary diseases, including CVDs' risk factors, obesity, cancer, and DM (Shiroma & Lee, 2010), and PA associated with all-cause mortality in adults after age 40 with various levels of PA has been studied

(Moore et al., 2012). In addition, it increases total life expectancy by 0.4 to 6.9 years (Reimers, Knapp, & Reimers, 2012).

A meta-analysis study from 1980 to 2010, which included 21 studies showed that PA level has a beneficial effect by reducing the risk factors of CVDs among men and women by 20% to 30% and 10% to 20%, respectively (Li & Siegrist, 2012). In addition, PA has a significant role in improving CHD patients' cardiac risk marker outcomes, such as BMI, triglycerides, glucose-tolerance, muscle endurance, and 24-hour heart rate (Back et al., 2013).

PA improves myocardial perfusion, with an increase in the interior diameter of major coronary arteries, an augmentation of microcirculation, and an improvement in endothelial function (Di Francescomarino, Sciartilli, Di Valerio, Di Baldassarre, & Gallina, 2009; Linke, Erbs, & Hambrecht, 2007). Additional reported effects of PA are antithrombotic effects that can reduce the risk of coronary occlusion after disruption of a vulnerable plaque, such as increased plasma volume, reduced blood viscosity, decreased platelet aggregation, and enhanced thrombolytic ability (Lippi & Maffulli, 2009), and a reduction of arrhythmic risk by a favourable modulation of autonomic balance (Billman, 2009).

Patients with critical illness suffer from impaired physical function during hospitalisation. Increased PA, additional to engaging in rehabilitation programmes, has demonstrated resultant improved functional independence at hospital discharge, according to a descriptive study using the behavioural mapping method was conducted by Lay et al. (2015) in order to assess PA levels of patients in the first week after AMI. The nurses observed the patients for 1 minute every 10 minutes from 8 am to 5 pm. At each observation, a nurse recorded data concerning the patient's highest level of PA, location and other people present. The therapists recorded details of physiotherapy and occupational therapy sessions and the study revealed that patients spent half the day being physically inactive. Time spent being physically active was 23% for patients with AMI, which is attributable to walking ability among patients with AMI. However, only 19% of patients with AMI participated in physical

rehabilitation. Therefore, there is a need to investigate patients with AMI in order to understand their PA behaviour.

Obesity more than doubled between 1980 and 2014 worldwide (WHO, 2016b). Being overweight and obesity are defined as having fat that has accumulated in an excessive manner, to the extent that it may influence health (WHO, 2016b). PA's relationship with BMI has previously been examined, a previous longitudinal study, conducted by Ekelund, Brage, Besson, Sharp, and Wareham (2008), found that among 393 healthy adults (176 male and 217 female) with a mean age of 49.7 and 49.2 for men and women respectively, BMI was significantly correlated with sedentary time. Additionally, in the same study, BMI predicted sedentary time at follow-up after adjustment for sex, baseline age, baseline sedentary time, baseline PA level, and follow-up time. A few studies have examined the association between BMI and PA, measured by accelerometer devices. In 2011, in a cross-sectional study among 168 adults with DM (65 males and 103 females) with a mean age of 53.4 years, the PA was measured by an accelerometer during waking hours for seven days, and it was found that total sedentary time, moderate-to-vigorous intensity activity time and increased breaks in sedentary time were associated with BMI outcomes (Healy, Matthews, Dunstan, Winkler, & Owen, 2011).

Sattelmair et al. (2011) found a dose-response relation between PA and health, reported in a meta-analysis of studies conducted between 1995 and 2009. Of the 3,194 studies reviewed, thirty-three met the inclusion criteria, the study shows a dose-response relation between PA and health and CHD risk. Moreover, benefits occur with increased PA. Individuals who engaged in the equivalent of 150 minutes per week of moderate-intensity leisure-time PA had a 14% lower CHD risk, compared with those reporting no leisure-time PA. Those engaging in the equivalent of 300 minutes per week of moderate-intensity leisure-time PA had a 20% lower CHD risk compared to individuals who were physically active below the recommended PA guideline. Consequently, the study recommends PA as a primary prevention strategy to reduce the risk of developing CHD. PA and exercise programmes provide considerable protection in the primary and secondary prevention of AMI, such as

lowering psychological factors, behavioural risk factors, and overall CHD mortality and morbidity (Swift et al., 2013). Therefore, the previous studies show the importance of increasing the adherence of patients with AMI to PA guidelines and reducing of sedentary lifestyles in order to prevent risk factors of CVD from developing.

2.5.2 Physical Inactivity and Sedentary Behaviour

Globally, physical inactivity is considered the fourth leading risk factor for mortality (WHO, 2013); it represents 6% of deaths worldwide. About 23% of adults aged 18 and over were physically inactive, 20% of men and 27% of women globally in 2010. This ratio increased in high-income countries, where 26% of men and 35% of women were physically inactive, as compared to in low-income countries where the corresponding figures were 12% of men and 24% of women (WHO, 2013).

Physical inactivity has become a major public health concern because it is associated with increased risk of morbidity or worsening of many chronic diseases and health conditions. Physical inactivity is considered an independent risk factor for diseases (Hamilton et al., 2007; Healy et al., 2008), estimated to be responsible for 21% to 25% of colon and breast cancers, 27% of DM cases and about 30% of the CHD burden (WHO, 2013). In addition, a sedentary lifestyle is one of the major risk factors for CVDs (Warren et al., 2010).

Previous studies found sedentary behaviour significantly associated with cardio-metabolic risk factors among the healthy adult population. Cardio-metabolic risk factors, such as HTN, obesity, the dyslipidemia combination of high levels of triglyceride and low levels of high-density lipoprotein cholesterol as well as impaired glucose tolerance, are known predictors of CHD and Type 2 DM in adults (Carson et al., 2014). A meta-analysis of 10 cross-sectional studies, in which only one study used a body-worn activity monitor, measured sedentary time in 21,393 adults of 18 years and above. It examined sedentary behaviour and metabolic risk factors and concluded that prolonged time spent in sedentary behaviour was associated with a

73% increase in metabolic syndrome risk. However, further longitudinal studies are needed to explain and confirm this relationship (Edwardson et al., 2012).

Previous research, predominantly focused on sedentary behaviour, (Bassett Jr et al., 2010; Hamilton et al., 2007; Thorp, Owen, Neuhaus, & Dunstan, 2011), has shown that sedentary time, involving prolonged sitting time durations, is considered an independent risk factor for many health outcomes (Bassett Jr et al., 2010; Hamilton et al., 2007). Granat (2012) has classified sedentary behaviour into sitting and lying postures. It has also become clear that not all-sedentary behaviour is the same. Apart from the total time spent sitting, the occurrence and frequency of breaks in sedentary time may also have an influence on a person's health (Healy et al., 2008). Sedentary behaviour includes a wide range of types of behaviours, such as watching television, using a computer, sitting in motorised transportation, and sitting in the workplace (Owen et al., 2010). The majority of sedentary behaviour studies and guidelines focus mainly on screen time, such as television viewing and using a computer, as common and important sedentary behaviours (Pate, Mitchell, Byun, & Dowda, 2011).

Continuing, rapid urbanisation has accompanied social and environmental changes in many countries during recent decades. Consequently, awareness of urbanisation's role in the health risk is vital for health policy makers (Lim et al., 2009). Moreover, insufficient participation in PA and passive use of transportation services increasing physical inactivity may be attributed to urbanisation, which certainly affects population health (WHO, 2013). This shift in research focus from activity to sedentary and then sitting behaviour has been assisted by the new opportunities to measure sitting behaviour directly and accurately provided by the most recent generation of body-worn activity monitors. In conclusion, physical inactivity has increased globally, which can have serious health implications for health. Therefore, patients should adhere to an effective sedentary behaviour reduction strategy to prevent the increasing trend towards physical inactivity.

2.5.3 Physical Activity in Jordan

Globally, the Eastern Mediterranean region has the second highest physically inactive population (31%) after the Americas (32%) among WHO regions and has the highest level for women (WHO, 2010). According to the WHO, the prevalence of insufficient PA levels among adult males is low (15.6%) in Jordan, in comparison to other Middle Eastern countries(WHO, 2010). The highest levels of insufficient PA are seen in Saudi Arabia, Iraq and Kuwait, where over two-thirds (50%) of adults are classified as insufficiently active (WHO, 2010).

Many countries do not support PA or exercise as primary and secondary prevention such as low and middle income countries (Amin, Al Khoudair, Al Harbi, & Al Ali, 2012). Moreover, high risk groups of patients such as patients with diabetes and those with heart problems do not access cardiac rehabilitation (Alsaleh et al., 2016), as part of a healthy lifestyle due to cultural reasons, lack of facilities, or lack of resources (Barghouti et al., 2015). Further, females are more affected by socio-cultural barriers because of their tradition gender role (Amin et al., 2012). In addition, constraints of norms and local tradition prevent the females from doing PA in outdoor activities in the Middle Eastern countries. Furthermore, there are no physical education classes for females in schools in some countries, such as Saudi Arabia (Amin et al., 2012).

There are no formal education programmes, PA programmes or cardiac rehabilitation centres to motivate patients with CHD to maintain PA in Jordan (Alsaleh, Windle, & Blake, 2016). A study was implemented among a convenient sample of 98 patients with AMI from four governmental hospitals in northern Jordan, and it indicated that those developing PA programmes for Jordanian patients with AMI should consider culture, socioeconomic status, personal systems, and demographic factors (Al-Ali & Haddad, 2004). Recently, perhaps hoping to inspire PA in the country, Jordan won the right to host an international women's football competition, the under-17 Women's World Cup in 2016 (FIFA, 2016), as an example for the Jordanian government to motivate PA in the Jordanian community.

Another example to attempts encourage PA is that King Abdullah II (The King of Jordan) has established “The King Abdullah II Prize for Fitness”. This is a physical fitness promotion programme intended to complement the regular physical education curriculum for children aged 9–17 years. The main aims of the programme include muscular endurance, aerobic exercise, flexibility, agility and speed, to encourage students to participate in physical fitness activities and to improve their fitness levels (WHO, 2017).

PA is very important for lifestyle changes among patients with AMI. The previous PA surveys showed that healthy adults are physically inactive in Jordan. The culture, lifestyle of Jordan and health care system has many barriers to engage in PA. In addition, the absence of a cardiac rehabilitation programme is also barrier. Further, insufficient health education programme for patients with AMI after discharge.

There is no previous study measured PA level among patients with AMI in Jordan. In coincide with the burden of CVD in Middle Eastern countries including Jordan is now progressively increasing. The Middle Eastern countries have a popular saying, “al haraka Baraka”, which means, “Movement is a blessing”. This saying indicates that there is need for increasing engagement in PA. Therefore, a clear need to take urgent action to increase PA in Jordan, as part of their efforts to address risk factors linked to CVD and, in particular, physical inactivity.

2.5.4 Body-Worn Activity Monitor

PA is complex in nature, because of the use of many terms and definitions to describe PA. In addition, there is a lack of a framework and tools to describe and explore PA behaviour (Granat, 2012), such as total measurement time or the volume and intensity of PA that improve health outcomes. For this reason, the need for accurate measures of PA is well documented in the health literature (Ainsworth, 2009). Improved precision in the measurement of PA has several implications for health research, including a more accurate evaluation of intervention effectiveness, the ability to make comparisons, and improved monitoring of temporal trends in activity behaviour (Ainsworth, 2009).

PA assessment tools can be categorised as subjective (indirect) and objective (direct). Subjective assessment tools such as diaries and questionnaires have the benefits of being easily self-administered and low cost (Ainsworth, 2009). Questionnaires are subject to recall bias and fail to provide details about PA patterns (Ainsworth, 2009). In addition, the inability of patients to accurately recall relevant PA details necessarily leads to several limitations associated with measurement error, such as overestimation of PA behaviour (Ainsworth, 2009).

Objective tools, such as body-worn activity devices: accelerometers and pedometers, offer an alternative approach to measuring PA behaviour. With improvements in technology over past 20 years, devices have become smaller, movement can be recorded continuously for long periods and software has been developed in order to analyse and present user-friendly, clinically appealing information (Godfrey, Conway, Meagher, & ÓLaighin, 2008). Ainsworth (2009) has concluded objective tools provide optimal accuracy and avoid inaccurate recall during self-assessment of PA. In addition, objective tools improve precision and provide a complete assessment of all forms of PA, irrespective of intensity or where activity occurs (Corder, Ekelund, Steele, Wareham, & Brage, 2008). However, accelerometers are expensive (350 US$) and require a technician to download and interpret the data. Pedometers are relatively low cost (20 US$), but data can be lost and cannot be stored data for later retrieval (Ainsworth, 2009).

There are two main categories of body motion data for PA and sedentary behaviour: firstly, energy expenditure data, secondly, posture classification data (Granat, 2012). Energy expenditure devices determine the volume of activity by quantifying the acceleration profile over a specific period. A threshold level is applied to classify different energy expenditure levels and distinguish between activity and inactivity (Granat, 2012). An energy expenditure device records acceleration signals over a set time period (epoch) and assigns values (counts) to represent the magnitude of acceleration in that epoch. The device is worn on the part of the body which best reflects whole body movement and the more the device moves, the higher the level of the counts; then, energy expenditure can be estimated from studies which have

related counts to energy expenditure inferred from oxygen uptake (Crouter, Churilla, & Bassett, 2006; Freedson, Bowles, Troiano, & Haskell, 2012; Granat, 2012). These devices used many regression equations to determine suitable threshold levels for different activity intensity levels. However, these monitors classify body motion into inactivity and activity based on collected cut-off points from a range of tasks. Then, as they are generalized for that population, the threshold for these monitors can be considered arbitrary (Granat, 2012). In addition, when using these thresholds it is difficult to assess energy expenditure across a range of activities, in addition to which they can overestimate low-level activity and underestimate more vigorous activities (Crouter et al., 2006). Many body-worn activity monitors comprise several sensors, attached to different body segments by a combination of straps and/or harnesses. Although technological advances have both increased memory capacity and reduced the size of devices, the number of different components can make the monitors a burden to wear and limit the use of the devices in the long-term recording of free-living activity. Hence, the researcher chose not to use an energy expenditure device in this study.

Postural classification devices use body position of one or more body segments to distinguish between upright and sedentary posture (Granat, 2012). Posture classification devices, such as the activPAL3™ monitor (PAL Technologies.Ltd. Glasgow. Scotland), use micro-sensors to determine the inclination of one or more body segments and from this data, positional information is derived. The body-posture classification decision occurs through an algorithm operating upon the signals designating the posture at specific points in time. Thus, posture has specific start and end times, which can be measured in seconds or even fractions of a second (Granat, 2012). A particularly important technical development has been the inclusion of inclinometers, an example of such a device is the inclinometer-based activity monitor, the activPAL3™ monitor, which can classify activity into four categories: sitting, lying, standing, and stepping. Therefore, postural classification devices can quantify PA patterns.

The limitations imposed by multiple sensors have been overcome in part by single unit monitors, for example the activPAL3™ monitor. The activPAL3™ monitor attaches directly to the thigh and posture is inferred from the location of the thigh and is classified as sitting/lying, standing, or stepping using proprietary software. This offers advantages in that the monitor attaches directly to the body segment (thigh) which indicates if the individuals are sitting, standing or stepping. The benefits derived from a single attachment may be offset by the output of the monitors as complex activities involving the independent movement of limbs cannot be recorded and upper limb activity remains undetected (Mathie, Coster, Lovell, & Celler, 2004). However, to compensate in part for the reduction in sensors, more complex signal-processing techniques have been developed (Godfrey et al., 2008). The position of the activPAL3™ monitor on the thigh allows the primary postures of sitting, standing and stepping to be recorded and the monitor provides direct measures of both PA and sedentary behaviour.

The activPAL3™ has been recognised as the gold standard in the measurement of sedentary behaviour and has been validated for all outcomes in a wide range of populations (Aguilar-Faríasa, Browna, & Peetersa, 2014). The activPAL3™ monitor is a valid and reliable activity monitor for PA measurement (Ryan, Grant, Tigbe, & Granat, 2006) that can be used with older adults (Grant, Dall, Mitchell, & Granat, 2008). It has been used on people with chronic heart failure (Cowie, Thow, Granat, & Mitchell, 2011), and has an absolute percentage error of ≤ 1.11 % for number of steps and cadence among healthy participants, who walked on a treadmill at five different speeds (0.90, 1.12, 1.33, 1.56, and 1.78 m/s) and outdoors at three slow, normal, and fast speeds (Ryan et al., 2006).

The development of activPAL3™ has provided researchers with an objective method of examining PA behaviours using postural orientation in free-living populations (Chastin & Granat, 2010). To date, studies have found the activPAL3™ monitor to be a valid way to measure posture and motion in adults (Godfrey, Culhane, & Lyons, 2007; Grant, Ryan, Tigbe, & Granat, 2006) and sedentary behaviours in adults (Kozey-Keadle, Libertine, Lyden, Staudenmayer, & Freedson, 2011). Also,

activPAL3™ was used to measure PA level and pattern among cardiac patients (Cowie, Thow, Granat, & Mitchell, 2012). This is consistent with this study's objectives. Additionally, activPAL3™ is an easy to use device and can measure PA level and pattern for patients with cardiac disease. For data analysis, activPAL3™ data can be collected and saved in an Excel spreadsheet and then transferred for analysis.

In summary, the development of accurate and objective measurements of PA has been essential to research in order to evaluate levels of PA and determine the effectiveness of PA intervention programmes (Vanhees et al., 2005). In order to measure objectively the activity behaviour of patients with AMI it is necessary to record both PA, particularly step count, and upright and sedentary postures. In reviewing the instruments available, body-worn activity monitors appear to be the most feasible devices for recording posture and movement, over prolonged periods. To be acceptable to patients with AMI the monitor should be straightforward to use and not interfere with activity. From the literature reviewed, the device that most closely meets these criteria is the activPAL3™ activity monitor.

2.6 Physical Activity and Self-Efficacy

The previous sections provide the background of both PA's role in CVD health and the PA measurement approach. The present section focuses upon the synthesis of research evidence related to self-efficacy and PA behaviour among patients with CHD. The literature review is synthesised from various quantitative studies, which constitute clear evidence for the purpose of identifying the existing body of research, addressing the research problem, and clarifying the gaps in knowledge that require further investigation. In order to achieve this, three main steps should be implemented: browsing, looking for answers and surveying the literature (Greenhalgh, 2014).

Brettle and Grant (2004) explain the use of a search strategy in order to find evidence to inform professional practice. This includes many stages, beginning with defining the key study aims and objectives, setting inclusion and exclusion criteria, identifying

relevant resources, identifying keywords and implementing a search process. In addition, cleaning the results according to a systematic approach to searching, including combined keywords to narrow down the search results, and then reading article abstracts to identify the most relevant articles, is required.

This section presents the strategy employed to search databases and results in the systematic literature review of published research. It also highlights key gaps in the body of knowledge. In addition, it presents the research objectives and the rationale for conducting the study. The review of available study evidence progresses via three steps to guide the presentation of evidence within this chapter. Firstly, there is a comprehensive search strategy including a database search strategy, database keyword strategy, and search results. Secondly, there is an appraisal and quality review of the evidence. Thirdly, there is a presentation of a summary of key findings. Finally, there is a provision of the significance of the relevant studies on the topic.

2.6.1 Comprehensive Search Strategy

A systematic search strategy was developed and employed, using a wide range of databases and search engines. In order to cover all topics in this thesis, the researcher selected the main electronic databases: CINAHL, PsycINFO-OVID MEDLINE, Web of Science and Scopus, to form the main source of literature. In addition, the researcher applied and searched other resources such as Google Scholar and PubMed in order to find certain AMI, self-efficacy, and PA-related topics. Further searching included, reviewing of University of Salford theses and publications available on the University of Salford institutional repository website when available and, furthermore, searching in local journals in Jordan that publish related studies.

2.6.2 Database Searching Strategy

The researcher applied different database searching methods in order to discern the most suitable research results. An appropriate thesaurus associated with specific database terminology and Boolean operators were utilised (AND, OR but avoiding using NOT) to combine concepts, gradually refining the width and depth of the search

to capture available evidence. For example, firstly, to increase the options within the search words, the “OR” operator was used, such as “Acute myocardial infarction” OR “myocardial infarction”. Secondly, to narrow the focus of the search, the researcher used “AND” to link search words together, such as “secondary prevention” AND “self-efficacy”. Thirdly, use of the truncation technique to find syntactical prefix and suffix forms for specific words such as acute myocardial infarction or myocardial infarction by using the asterisk symbol, such as: “infarct*” instead of “infarction”, improves the searching process to include all forms of the term being explored.

2.6.3 Database Search Keywords

The researcher used the keywords in the search process mentioned below in order to identify the relevant research:

“Self-Efficacy”, “Acute Myocardial Infarction”, “Myocardial infarction”, “Acute coronary syndrome”, “Physical activity”, “Exercise”, “Sedentary”, “Self-management”,” Self-care”, “Cardiac rehabilitation”, “Secondary prevention”.

2.6.4 Search Process Criteria

In order to identify the relevant literature, the researcher discussed the keywords used to search the research databases with the thesis supervisors and the University of Salford’s librarian for the School of Nursing. In addition, the selection of inclusion and exclusion criteria for the identification of relevant literature allows replication in further studies (Cronin, Ryan, & Coughlan, 2008). In recent years, remarkable progress has occurred in CVDs, most specifically in advanced technology-based diagnostic devices, pharmacological and non-pharmacological treatment guidelines, and therapeutic procedures, new measurement methods of PA have also come about. Consequently, the researcher decided to limit the search in the databases to those studies in the ten years up to August 2016. Subsequently, the researcher implemented a second search on databases in April 2017, in order to update and check whether there were any missing relevant articles in the literature review. The researcher read the abstracts of each article, identified through the database search.

The inclusion criteria for articles were:

- Articles published in the English language
- Articles available as abstract and in full
- Published between January 2006 and April 2017
- Available as hard copy or soft copy
- Studies were relevant to self-efficacy, PA and patients with CHD

The exclusion criterion for articles were:

- Studies which measured PA by energy expenditure device

2.6.5 Search Results

After applying the inclusion and exclusion criteria on the four databases, the researcher identified 350 articles containing selected keywords in the title and/or the abstract. After reading the abstracts of the search results, for those papers where clarity was not sufficient, the researcher obtained the full text. Following this, the researcher excluded all articles that did not meet the inclusion criteria. There was a dearth of studies that addressed both variables- self-efficacy and PA- together in the same study. Consequently, if the study addressed at least one of self-efficacy and PA variables as an independent outcome then it was included.

The researcher identified thirteen articles that were relevant to the study. Next, the researcher fully reviewed the thirteen articles and then included them. Table 2.4 shows that search results found 156 articles in the CINAHL database; eight of these studies are related to the study topic, hence are included in the study. The PsycINFO-Ovid database identified 102 articles, seven of which were relevant. After exclusion of duplicated articles from other databases, only two of these were included. The Web of Science database identified 58 articles, seven of which were relevant. After exclusion of duplicated articles from other databases, only two of these were included. In addition, the Scopus database contained 34 articles, while six were relevant, only one of which was included after exclusion of duplicated articles from other databases.

The researcher implemented a further search in Google Scholar and PubMed to confirm the searching results, but the search results did not find any new pieces of research.

Table 2.4

Results of the Database Search

Database	Initial Result	Related to the Study	Duplicated Articles	Total articles included
CINAHL	156	8	----	8
PsycINFO-Ovid	102	7	5	2
Web of Science	58	7	5	2
Scopus	34	6	5	1
Total	**350**	**28**	**15**	**13**

2.6.6 Description of the Retrieved Studies

The researcher retrieved thirteen (13) studies up to April 2017. All of the studies were quantitative. The selected studies originated from eight countries: four studies in Canada, three in the UK and 1 study in each of US, Netherlands, Poland, New Zealand, Japan and Jordan. The majority of the studies (9 out of the 13 studies) were conducted after cardiac rehabilitation programmes (Blanchard et al., 2007; Houle et al., 2011; Howarter, Bennett, Barber, Gessner, & Clark, 2014; Izawa, Watanabe, Oka, Osada, & Omiya, 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Reid et al., 2006; Van Sluijs, Van Poppel, Twisk, & Van Mechelen, 2006; Yohannes et al., 2010), three studies were conducted out of cardiac rehabilitation programme

(Blanchard et al., 2006; Fitzsimons et al., 2013; Smith et al., 2015), and one study was conducted among patients receiving behavioural change intervention and not attending a cardiac rehabilitation programme (Alsaleh et al., 2016). 11 out of the13 studies were conducted among patients with CHD (Alsaleh et al., 2016; Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Reid et al., 2006; Van Sluijs et al., 2006; Yohannes et al., 2010), and two studies were carried out among healthy adult participants (Fitzsimons et al., 2013; Smith et al., 2015) (Appendix A).

2.6.7 Appraisal and Quality Review of the Evidence

The researcher adopted a systematic approach to quality assessment, with the appraisal of every single study against the same criteria, facilitating analysis and the scrutiny of study rigour and quality. All research studies were subject to critical appraisal to assess the quality of the selected study within a defined framework developed by the Health Care Practice Research and Development Unit (HCPRDU 2002) Evaluation Tool for Quantitative Research Studies (Long, Godfrey, Randall, Brettle, & Grant, 2002). The research employed the HCPRDU tool because it is simple, clear, and easy to apply. Within the quality appraisal, the researcher focused predominantly on five main subjects from HCPRDU 2002: the study's objectives, method and sample, outcome measurements and results (Appendix A). This section focused and discussed the examination of the 13 relevant studies, using the evidence from these studies to reinforce or challenge findings. The section discussed the quality of available evidence within three sections. The first section discusses the studies that investigated self-efficacy level after cardiac rehabilitation. The second section focuses on the studies that investigated PA level after cardiac rehabilitation. Finally, the third section highlights studies that examined the relationship between self-efficacy and PA behaviour after cardiac rehabilitation.

Study Aims and Outcomes

The aims of the 13 studies overlapped with self-efficacy and PA being the central focus of the majority of the studies. Eight studies investigated the relationship

between changes in self-efficacy and PA in general after cardiac rehabilitation programmes (Alsaleh et al., 2016; Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Van Sluijs et al., 2006). In addition to which four studies discussed the impact of implementing an intervention driven theory including, behavioural change and self-monitoring approach, socio-cognitive approach and mobile health trial on changes in self-efficacy and PA levels among two groups: the control group and the experimental group (Alsaleh et al., 2016; Houle et al., 2011; Izawa et al., 2006; Maddison et al., 2014).

Two studies aimed to identify the relationship between PA intentions, barriers from low self-efficacy, health related benefits and barriers and perceived severity and susceptibility either among patients with CHD who did not participate in cardiac rehabilitation or compared with patients attending cardiac rehabilitation (Blanchard et al., 2006; Blanchard et al., 2007). Further to which Blanchard et al. (2007) compared PA self-efficacy trend among patients with CHD who did and did not participate in cardiac rehabilitation. In addition, Van Sluijs et al. (2006) studied PA benefits, barriers to PA, process of change in health, enjoyment of PA, social support and self-efficacy. Howarter et al. (2014) investigated changes in self-efficacy over 2 years following cardiac rehabilitation and studied whether the psychological variables affected the changes in self-efficacy.

Two studies aimed to investigate the impact of cardiac rehabilitation on long-term PA levels (Reid et al., 2006; Yohannes et al., 2010), and Yohannes et al. (2010) also focused on changes in PA, psychological well-being and quality of life after cardiac rehabilitation. In addition, two studies aimed to identify PA level and sedentary time among health populations (Fitzsimons et al., 2013; Smith et al., 2015). In addition, Smith et al. (2015) determined sitting, standing, stepping time and PA levels for both weekends and weekdays.

Sample

Most the study (10 out of the 13) samples were drawn from patients with CHD, CABG and ACS (Alsaleh et al., 2016; Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Reid et al., 2006; Yohannes et al., 2010). One study recruited its sample from patients being diagnosed with HTN, DM and hypercholesterolemia (Van Sluijs et al., 2006). Only two studies recruited healthy participants (Fitzsimons et al., 2013; Smith et al., 2015).

Sample size and power calculation was mentioned in only one study (Alsaleh et al., 2016), three studies refer the calculation of sample size to published previous work (Maddison et al., 2014; Smith et al., 2015; Yohannes et al., 2010). The remaining studies determined the sample size without providing details on how it was calculated (Blanchard et al., 2006; Blanchard et al., 2007; Fitzsimons et al., 2013; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Reid et al., 2006; Van Sluijs et al., 2006; Yohannes et al., 2010).

Almost half of the studies (6) recruited their participants from just one centre (Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Izawa et al., 2006; Luszczynska & Sutton, 2006; Yohannes et al., 2010). Therefore, this is one particular limitation of these studies, which can limit the generalisability. Six studies recruited participants from more than one centre in their same country (Alsaleh et al., 2016; Howarter et al., 2014; Maddison et al., 2014; Reid et al., 2006; Smith et al., 2015; Van Sluijs et al., 2006). Only one recruited participants from the non-institutionalised population where participants were selected to measure free-living PA (Fitzsimons et al., 2013). Only studies making use of Randomised Control Trials (RCTs) showed the sampling and sample. The remaining studies did not mention the type of sample such as purposive or convenience sample.

Methods

The related studies used a range of methodological designs and approaches to generate evidence in these studies. A later section covers appraisal of these methods

in more detail. Hence, within this review the use of different methods and varied samples has limited the ability to compare directly findings across identified studies, such as the fact that their methods included administering self-reported questionnaires, using a sealed envelope sent by mail, interview, and direct observation methods.

The selected studies used various time frames: five out of the thirteen studies used RCT to compare changes in self-efficacy and PA levels between two groups (Alsaleh et al., 2016; Houle et al., 2011; Izawa et al., 2006; Maddison et al., 2014; Van Sluijs et al., 2006), five studies used repeated measures (Blanchard et al., 2006; Blanchard et al., 2007; Howarter et al., 2014; Reid et al., 2006; Yohannes et al., 2010), one study used a longitudinal design (Luszczynska & Sutton, 2006), one study used cross-sectional study (Smith et al., 2015) and one was a pre-experimental (one group pre-test/ post-test) study (Fitzsimons et al., 2013). Study outcomes include an assessment of self-efficacy and PA over a period from baseline to 12 months. Measurement time points were at baseline, 2 months, 6 months, 8 months and 12 months after cardiac rehabilitation (Alsaleh et al., 2016; Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Reid et al., 2006; Van Sluijs et al., 2006; Yohannes et al., 2010). Therefore, the included studies focused on self-efficacy and PA at baseline, on over periods of 2 months, 6 months, 8 months and 12 months, and no studies measured these variables within 2 months after hospital discharge.

Data Collection

A range of self-reported self-efficacy questionnaires was used in the 13 studies, including self-efficacy for PA (Izawa et al., 2006), perceived self-efficacy, and self-efficacy barriers and benefits questionnaires (Blanchard et al., 2006). Another study used a maintenance and recovery self-efficacy questionnaire, developed by the researcher (Luszczynska & Sutton, 2006). Barrier self-efficacy was measured on a five-item scale, developed by Plotnikoff and Higginbotham (1998) (Blanchard et al. (2007); LaPier, Cleary, & Kidd, 2009). Houle et al. (2011) used Jenkins' self-efficacy

expectation questionnaire, task self-efficacy, barrier efficacy and efficacy strength were used (Maddison et al., 2014), likewise the cardiac exercise self-efficacy questionnaire (Howarter et al., 2014), and the exercise self-efficacy scale was used by (Alsaleh et al., 2016). In addition, two self-efficacy questionnaires were developed, one for making time for exercise, resisting relapse, barriers to and benefits of PA, and the other for knowledge of PA and health, were used by Van Sluijs et al. (2006). Finally, a Maddison et al. (2014) developed a task self-efficacy questionnaire. Data about validity, reliability and the suitability of the self-efficacy questionnaire were mentioned (Alsaleh et al., 2016; Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Van Sluijs et al., 2006). Hence, the authors of the included studies used different self-efficacy questionnaires; there is no consensus on using one type of self-efficacy questionnaire among the included studies.

PA level was assessed by many different methods**.** For example, more than half of the studies (8 out of the 13 studies) used self-reported PA questionnaires**.** Some studies used 7-day PA recall telephone interviews (Blanchard et al., 2007; Reid et al., 2006). Blanchard et al. (2006) measured PA through the Godin Leisure Time Exercise Questionnaire, the self-reported PA questionnaire and PA intentions questionnaire were used by Luszczynska and Sutton (2006). In addition, a self-administered questionnaire was used to measure PA energy expenditure, such as seven-day recall of activity (Yohannes et al., 2010). In addition, some studies used the self-reported international PA questionnaire long form (IPAQ-LF) to assess PA levels (Alsaleh et al., 2016; Maddison et al., 2014).

Other studies used body-worn activity monitors to measure PA, such as the activPAL3™ monitor used to measure PA during weekdays and weekends (Smith et al., 2015), in addition to Fitzsimons et al. (2013), who measured Sedentary behaviour by using the activPAL3™ monitor and also sedentary behaviour was measured subjectively using the Sedentary Behaviour Questionnaire 7 consecutive days**.** Houle et al. (2011) used pedometers (Yamax Digiwalker NL-2000, Lees Summit, USA), with a 7-day memory. Peak VO^2 was measured as an index of exercise capacity with

assessment of PA by pedometer (Izawa et al., 2006). It is worth noting, in addition, that only one study used both self-reported PA questionnaire and pedometer to measure PA level, through the use of Van Sluijs et al. (2006)'s self-reported SQUASH questionnaire and the CSA activity monitor (Computer Science Application, Inc., model 7164). Using a body-worn activity monitor to measure PA is more favourable as it is more accurate and precise than a self-reported PA questionnaire.

Ethical Considerations

Obtaining ethical approval from the respective organisations prior to commencing any study is not only as good practice, but also in some countries it is essential prior to commencing research in the clinical area. The majority of studies (10) obtained consent and approval from a recognised ethical authority: university hospital, local ethics committee, or directors of related departments and/or organisations (Alsaleh et al., 2016; Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Reid et al., 2006; Smith et al., 2015; Van Sluijs et al., 2006; Yohannes et al., 2010). Three studies did not mention how they obtained ethical approval to undertake the research (Fitzsimons et al., 2013; Luszczynska & Sutton, 2006; Maddison et al., 2014), which affects the research quality of these studies.

Bias in Studies

In the RCT studies, the researcher or research team gathered data in five of the studies (Alsaleh et al., 2016; Houle et al., 2011; Izawa et al., 2006; Maddison et al., 2014; Van Sluijs et al., 2006). However, the research team involved people such as unit nurses in implementing the intervention and distribution of questionnaires, yet there was limited information about whether they trained or not. In addition, there was limited data on whether the researcher and the nurses were trained for involvement in study interventions such as behavioural change intervention (Alsaleh et al., 2016). Moreover, three studies used self-reported PA questionnaires, which participants' recall bias may have occurred (Alsaleh et al., 2016; Maddison et al., 2014; Van Sluijs et al., 2006), which in turn affect the resulting recorded of PA level. Researcher bias

was detected in many studies, and only in one study was it mentioned that the participants and the researcher who provided the intervention and assessed the study outcomes was not blind (Alsaleh et al., 2016). The remaining RCT studies did not mention whether the participants and the researcher who were involved in the study interventions and outcomes were blind or not, which is pertinent where the research team's decision may alter how they carry out an intervention and how they record the results.

In the remaining eight studies (Blanchard et al., 2006; Blanchard et al., 2007; Fitzsimons et al., 2013; Howarter et al., 2014; Luszczynska & Sutton, 2006; Reid et al., 2006; Smith et al., 2015; Yohannes et al., 2010), little or no detail was provided, making it difficult to assess possible study bias. In addition, the studies did not mention strategies concerning how to minimise the possibility of introducing study bias. This is important because failure to provide training for the research team could affect how participants respond to the questionnaire.

Data Analysis

All of the 13 studies generated results for the purposes of the study by using software such as Statistical Package for the Social Sciences (SPSS), Statistical Analysis System (SAS) and STATA to manage their data. The common use of using these packages indicates that this software is a convenient and standard tool for quantitative analysis, with which researchers may already be familiar. The most common tests used in these studies for data analysis include chi-square, comparing categorical data, t-test, comparing continuous data between two groups, correlation for the relationship between individual continuous variables, and Analysis of Variance (ANOVA) for more than two groups.

Key Findings

The researcher generated three core findings that highlight the key concepts extrapolated from the review of the current evidence: changes in self-efficacy level, changes in PA level and the relationship between self-efficacy and PA levels.

Changes in Self-Efficacy Level

Increased self-efficacy is important to cardiac rehabilitation outcomes. Indeed, interventions based on behavioural change techniques, theory-driven interventions, and cardiac rehabilitation programmes improved self-efficacy level among patients with CHD (Alsaleh et al., 2016; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Reid et al., 2006; Van Sluijs et al., 2006). The present review found that there was a difference between self-efficacy at baseline and that at subsequent measurement times among different populations such as CHD, AMI, ACS and CABG (Alsaleh et al., 2016; Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Reid et al., 2006; Van Sluijs et al., 2006). Particularly, self-efficacy increased from two to six months after cardiac rehabilitation. However, self-efficacy levels were highest at the initiation of the cardiac rehabilitation programme, whereas self-efficacy significantly declined 6 months following cardiac rehabilitation, and levelled off over the next 18 months (Howarter et al., 2014).

No studies investigated self-efficacy levels in the period of 8 weeks following treatment. Many different types of phase-specific self-efficacy questionnaire such as the recovery and maintain self-efficacy questionnaire, were used for the purpose of measuring self-efficacy, some of these were collection of items related to self-efficacy developed by the author of the study. In addition, there was no consistency regarding the self-efficacy questionnaires used in the relevant studies, which makes comparison between the self-efficacy outcomes difficult. Moreover, self-efficacy was improved in the cardiac rehabilitation context, only one study showed self-efficacy level among patients with CHD not attending cardiac rehabilitation (Blanchard et al., 2006). The remaining studies found that self-efficacy was improved by the impact of intervention or cardiac rehabilitation (Alsaleh et al., 2016; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Reid et al., 2006; Van Sluijs et al., 2006). All studies focused on patients with CHD or ACS. However, no study focused on measuring self-efficacy among patients with AMI, as AMI is a chronic disease of lifelong duration, presenting with acute symptoms, in

which patients need to adhere to programmes using their self-management skills along with cardio-protective medications to reduce CVD risk factors and improve secondary prevention strategies.

Changes in Physical Activity Level

In general, PA level increased after cardiac rehabilitation or intervention among patients with CHD, there was significant difference in PA levels between experimental and control groups. There have been arguments about the influence of psychological factors on PA. For example, Reid et al. (2006) found that PA level decreased cardiac rehabilitation because of the influences of psychological factors, co-morbidity, gender, and education. In contrast, Yohannes et al. (2010) found that PA, depression, anxiety and quality of life increased over 12 months. However, both studies (Reid et al., 2006; Yohannes et al., 2010) used self-reported PA questionnaire to measure PA levels, in which is inherent the risk of recall bias and overestimation. In addition, Reid et al. (2006) found that PA had decreased 2 months subsequent to hospitalisation, this finding emphasises that specific groups require tailored intervention to promote PA in the early recovery phase to maintain PA levels.

Although, PA is a complex behaviour, self-reported recall PA questionnaires were frequently used to measure PA and researchers did not use objective devices to measure PA, even in RCTs studies (Alsaleh et al., 2016; Blanchard et al., 2006; Blanchard et al., 2007; Luszczynska & Sutton, 2006; Maddison et al., 2014; Reid et al., 2006; Yohannes et al., 2010). Therefore, PA behaviour needs more accurate and advanced method for its measurement. Hence, a small number of studies used a body-worn activity monitor (Fitzsimons et al., 2013; Houle et al., 2011; Izawa et al., 2006; Smith et al., 2015). Moreover, for improved accuracy, both self-reported PA questionnaire and accelerometer device were used to assess PA level (Van Sluijs et al., 2006).

It is noteworthy that measuring step count alone to represent the PA level is not sufficient to understand PA behaviour of patients with CHD. Only Fitzsimons et al. (2013) and Smith et al. (2015) measured PA behaviours including sedentary time and

upright time for healthy adults. Fitzsimons et al. (2013) measured PA level such as sitting or lying, standing and stepping among healthy participants, with the activity monitor worn for 24 hours per day for seven consecutive days, without including other PA behaviour such as step count and upright time. In addition, all participants in various different age categories were included. Smith et al. (2015) compared PA level by mean of step count, stepping time, standing time and sedentary time on weekdays and weekends, among healthy workers, the study did not provide information about PA patterns or changes in PA at subsequent times. Therefore, PA is essential self-management skills for patients with CHD. No study investigated PA in the early recovery phase among the included studies. In addition, use of body-worn activity monitors for assessment of PA will be more useful to the understanding of PA behaviour of patients with CHD than using self-reported self-efficacy questionnaires. Moreover, no studies assessed PA behaviour among patients with AMI in the early recovery phase after receiving treatment.

The Relationship between Self-efficacy and Physical Activity Levels

Of the 13 studies performed, 10 studies assessed PA and self-efficacy of patients with CHD after implementing an intervention or a cardiac rehabilitation programme (Alsaleh et al., 2016; Blanchard et al., 2007; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Reid et al., 2006; Van Sluijs et al., 2006; Yohannes et al., 2010) (Appendix A). Only one study (Blanchard et al., 2006) was performed to assess the association between self-efficacy and PA among patients not attending cardiac rehabilitation, two studies (Fitzsimons et al., 2013; Smith et al., 2015) assessed PA among a healthy population,

Only, four studies identified the relationship between self-efficacy and PA (Blanchard et al., 2006; Blanchard et al., 2007; Izawa et al., 2006; Luszczynska & Sutton, 2006). The present review provides evidence that there is a significant relationship between self-efficacy and PA after 2 to 6 months subsequent to AMI (Blanchard et al., 2006; Blanchard et al., 2007; Izawa et al., 2006; Luszczynska & Sutton, 2006). No studies have investigated the relationship between self-efficacy and PA among patients with AMI in the early recovery phase.

One study assessed the relationship between self-efficacy and PA among patients with CHD not attending cardiac rehabilitation (Blanchard et al., 2006). The study revealed that the increase in PA from baseline to 6 months resulted from increases in self-efficacy and PA intentions. Furthermore, a reduction in PA from six to twelve months resulted from a reduction in health-related benefits and PA intentions. Therefore, the associations among these variables within PA were varied after hospitalisation (Blanchard et al., 2006). This study is important due to its addressing other variables that could influence the relationship between self-efficacy and PA.

Another study aimed to assess the relationship between barriers to self-efficacy and self-reported PA and compare two groups of CHD patients, participants who had attended and those that had not attended cardiac rehabilitation, over a 12-month period. It found a significant decline in self-reported PA over time. Moreover, the association between barrier self-efficacy and PA became weaker over time. This result was similar for CHD patients both those who were and those who were not involved in cardiac rehabilitation (Blanchard et al., 2007).

Moreover, phase-specific self-efficacy questionnaires are very useful to predict PA in a specific period, for example, maintenance self-efficacy predicted PA in a subgroup of participants who maintained regular activity at 8 months after AMI, and recovery self-efficacy predicted PA among participants who had relapsed by 8 months after AMI (Luszczynska & Sutton, 2006). On the other hand, the RCT studies in the review showed that there was a significant difference between intervention and control participants. However, they did not examine the relationship between self-efficacy and PA after cardiac rehabilitation (Alsaleh et al., 2016; Houle et al., 2011; Izawa et al., 2006; Maddison et al., 2014; Van Sluijs et al., 2006).

2.6.8 Summary of the Key Findings

The researcher draws a number of issues and findings from the review. These inform and raise questions for the development of further study related to self-efficacy and PA behaviour. The included studies which examined self-efficacy and cardiac rehabilitation or intervention were undertaken in countries where cardiac rehabilitation

is available (except for one study which was conducted in Jordan), where the respective health care organisations support patients with AMI throughout their cardiac rehabilitation programmes. Hence, the majority of the studies assessed self-efficacy levels after cardiac rehabilitation. The reviews studied investigated the changes in self-efficacy and PA by using RCT, cohort and longitudinal studies, comparing between two or three groups, with varied studied populations. However, no study focused solely on an AMI population.

The literature shows improved outcomes in self-efficacy level and PA level after cardiac rehabilitation or implementation of health education intervention. (Alsaleh et al., 2016; Blanchard et al., 2007; Houle et al., 2011; Howarter et al., 2014; Izawa et al., 2006; Luszczynska & Sutton, 2006; Maddison et al., 2014; Van Sluijs et al., 2006). There is strong evidence proving the relationship between self-efficacy level and PA level (Blanchard et al., 2006; Blanchard et al., 2007; Houle et al., 2011; Izawa et al., 2006; Luszczynska & Sutton, 2006; Van Sluijs et al., 2006). The measurement times in the included studies focused on the period from 2 months up to 12 months later, which is the critical period the patients with CHD need to adopt a healthy lifestyle for their life. There were no studies identified that measured self-efficacy and PA in the first 2 months after treatment. In addition, no evidence has been found to reveal the changes in self-efficacy and PA out of the cardiac rehabilitation context, and if there are other mechanisms which could influence self-efficacy and PA among patients with CHD after treatment.

In this review, many studies used different self-reported self-efficacy questionnaires, and there were phase-specific self-efficacy questionnaires such as for task self-efficacy. However, none of these studies used disease–specific self-efficacy questionnaires. There was one study, which used exercise self-efficacy, among patients with CHD in Jordan. However, the study did not mention that an Arabic version of exercise self-efficacy was available. However, using of the exercise self-efficacy questionnaire is to measure exercise alone. In addition, the exercise self-efficacy questionnaire measures continuity in exercise self-efficacy for 40 minutes, over 4 weeks and does not measure PA, more detail in section 3.5.2.

Many studies used frequently self-reported PA questionnaires in order to assess PA behaviour. In addition, many studies used step count to represent the PA level of the participants rather than using other PA parameters such as stepping time, standing time, upright time and sedentary time, which are essential to understand the complexity of PA behaviour. A few studies used body-worn activity monitors, which are accurate, valid and reliable devices. Moreover, in the review, no studies assessed the changes in PA patterns among CHD patients, which are important to understand PA behaviour.

Only one study was conducted among CHD patients who were not participants in cardiac rehabilitation (Blanchard et al., 2006), and the study in question showed that both self-efficacy and PA increased from baseline to six months and that there was no relationship between self-efficacy and PA from six to twelve months after hospitalisation. Finally, there is a single study, which was conducted in Jordan (Alsaleh et al., 2016), the study focused solely on behavioural' change intervention effect on self-efficacy and PA levels among patients with CHD. Moreover, the study used a self-reported PA questionnaire to assess PA level and did not use pedometers or accelerometer devices to assess PA level.

2.7 Significance of the Study

The review has showed the increasing trend of CHD globally, especially low-middle income countries (WHO, 2015b). Much of the available literature showed that secondary prevention has many benefits for patients with AMI in order to reduce mortality and morbidity and improve their self-management skills after AMI (Dunlay, Pack, Thomas, Killian, & Roger, 2014). Indeed, cardiac rehabilitation programmes have a crucial role in developing self-management skills (Dalal et al., 2015; Katch, 2010). In addition, self-efficacy plays a vital role in improving secondary prevention and in promoting PA level (Barkley & Fahrenwald, 2013; Poortaghi, Baghernia, Golzari, Safayian, & Atri, 2013). There is a lack of knowledge about the self-efficacy level of patients with AMI and their PA level and pattern thereof after receiving treatment. In addition, there is limited evidence when it comes to establishing whether

there is any relationship between self-efficacy level and PA behaviour among patients with AMI, who do not participate in cardiac rehabilitation in the early recovery phase.

Further study is required to extend the current knowledge base regarding the changes in self-efficacy level and PA behaviour among patients in their recovery phase after experiencing AMI. In addition, this study will add to the limited body of knowledge and address the gap in the literature regarding exploration of the relationship between self-efficacy level and PA behaviour among patients with AMI who have no access to cardiac rehabilitation, after receiving treatment in the early recovery phase.

Although the majority of the studies reviewed focused on the measurement of PA behaviour by self-reported recall questionnaire, it is necessary to use a validated and reliable body-worn activity monitor in order to measure PA accurately. Additionally, this will help reach a better understanding of PA behaviour among patients with AMI after treatment.

Unfortunately, cardiac rehabilitation is not available in many countries present, even in those where there is a high prevalence of CVD risk factors, such as Jordan. Indeed, one third of the population that dies every year does so as a consequence of CVDs (CHD being responsible for 16.8% of total deaths) (WHO, 2015e), and therefore, patients with AMI must take complete responsibility for developing their self-management skills. In addition, to the best of the researcher's knowledge, there is no Arabic version of the self-reported CSEQ. Moreover, this is the first study to use the body-worn activity monitor in scientific research in the Middle Eastern countries. Consequently, this study presents the healthcare system in Jordan with clear, accurate, and comprehensive measures of self-efficacy level and PA behaviour among patients with AMI in their early recovery phase. It is a great opportunity to direct the efforts to implement the study in Jordan to investigate self-efficacy and PA behaviour among Jordanian patients with AMI.

2.8 Conclusion

In sections 1- 6, an introduction to the thesis has been provided and an overview of CVD and secondary prevention, healthcare provision in Jordan, self-efficacy and secondary prevention, the impact of PA on CVD and the changes and the relationship between PA and self-efficacy after hospital discharge have been presented. These include a critical review of the research literature on self-efficacy and PA. In summary, CVD has been progressively increasing in the last few years, particularly in the Middle East. There is no CSEQ in Arabic available for patients with AMI in the Middle East. Further, self-efficacy and PA play vital role in reducing burden of CVD. Unfortunately, there are no previous studies have been investigated both self-efficacy and PA in the early recovery phase among patients with AMI. Therefore, the aim of this study is to implement the WHO process in order to translate and adapt the CSEQ to Arabic. In addition to assessing the changes in self-efficacy and PA level and pattern among patients with AMI in the early recovery phase and exploring whether there is a relationship between self-efficacy and PA.

Chapter Three: Self-Efficacy

3.1 Introduction

Chapter two presents an overview of the burden of CVD and the role of secondary prevention in preventing risk factors of CVD, in addition to PA and the measurement approach of PA. Moreover, it gives a synthesis of research evidence related to self-efficacy and PA. This chapter focuses on review of self-efficacy and behavioural change, in addition to different types of self-efficacy questionnaires. Following this, it describes the WHO process of translation and cross-cultural adaptation of CSEQ, including validity and reliability evaluation of the Arabic version of the CSEQ.

3.2 Self-Efficacy and Behaviour Change

The self-efficacy construct is based on self-efficacy theory, which was developed based on social learning theory (Bandura, 1997). Self-efficacy was defined by Bandura (1997) as a person's belief in their own abilities to effect events that influence their lives. Bandura (1997) based his concept of behavioural change on two main concepts, self-efficacy and outcome expectations, the latter are the expectations about the outcome resulting from performing that behaviour. Both self-efficacy and outcome expectations play a vital role in the modification of unhealthy behaviours, the adoption of healthy habits, and the maintenance of change (Bandura, 1997).

Self-efficacy is important for achieving appropriate self-management skills for patients with CVD (Katch, 2010). Clear evidence suggests that a predictive link between self-efficacy and health- related behaviour (Bergström, Börjesson, & Schmidt, 2015; O'Neil et al., 2013; Son, Kim, & Park, 2014). Many of the main theories of health behaviour, for example the health belief model (Rosenstock, 1974), the theory of planned behaviour (Ajzen, 1991) and protection motivation theory (Rogers, 1975) include self-efficacy as a significant key factor for motivation, intention and accomplishment. In addition, there is clear evidence to show that improved self-

efficacy beliefs are essential for successful change and maintenance of health behaviour, including: stress management, diet, exercise, overcoming alcohol abuse, smoking cessation, adherence to treatment and self-management skills (Bandura, 1997; Maddux, 1995).

Studies by (Lorig & Holman, 2003; Marks, Allegrante, and Lorig (2005)) have demonstrated that self-efficacy is sensitive to modification, interventions and enhancements; this is associated with improved health behaviours and clinical outcomes. The above findings by Lorig and Holman (2003) also pointed out that self-efficacy can be improved by involving patients in problem solving and adapting their skills to manage their health problems and their particular challenges. For example, Behavioural Change Techniques are an effective method to improve self-efficacy among various groups of people including the CHD population (Ashford, Edmunds, & French, 2010; French, Olander, Chisholm, & Mc Sharry, 2014; Olander et al., 2013). On the other hand, changing behaviour is a complex process that involves many factors, as described in the Behaviour Change Wheel by (Michie, Atkins & West, 2014).

3.3 Behavioural Change Theories

This section presents an overview of behavioural change theories. Different theories and models have been inspected for this research, as the literature presents different theories and models that help the researcher to understand the variables affecting an individual's behaviour changes to promote health outcomes, including CHD (Lee, Arthur, & Avis, 2008). For this study, the researcher has inspected different theories and models. These include the theory of planned behaviour (Ajzen, 1991) and several others. The transtheoretical model of behaviour change by Prochaska and DiClemente (1982) has become progressively common within the area of PA behaviour promotion. Self-determination theory by Deci and Ryan (1985) identifies that patients are responsible for and control self-management skills such as PA level and have an active role in treatment. Self-efficacy theory by Bandura (1997), is considered one of the most extensive motivation theories applied in the context of PA

studies. Following from this, the researcher selected one of these theories as the theoretical framework underpinning this thesis.

It is essential to use an appropriate theory to guide a study for the purpose of maintaining credibility of the findings and creating an important contribution to the body of knowledge (Smith & Parker, 2015). The theoretical framework supports exploration of the relationships between the study's concepts (Smith & Parker, 2015). In addition, using a theoretical framework improves the study's strength and simplifies information transfer through examining current theories (Rycroft-Malone, 2007). A theoretical framework guides the study in each of the key features of the research, such as the choice of variables, methodology, and data analysis of the study.

3.3.1 Theory of Planned Behaviour

The theory of planned behaviour was developed by Ajzen (1991). The theory was designed to predict and explain human behaviour in specific contexts (Ajzen, 1991). The key element of the theory of planned behaviour is that an individuals' intention to change their behaviour influences their behaviour. Perceived behaviour together with perceived intentions determine behavioural intention. The perceived behaviour contributes to a person's behaviour. Therefore, the more an individual perceives a behaviour as being important, the more he or she perceives that they have control over it, and the greater the intention to act (Ajzen, 1991).

Though the theory of planned behaviour suggests a theory of modifying behaviour among cardiac patients, the prior studies that used this theory among patients with cardiac diseases showed that patients with a higher level of intention and perceived behavioural control to change their behaviour were not necessarily more likely to change their behaviour, for example by becoming involved in PA (Johnston, Johnston, Pollard, Kinmonth, & Mant, 2004; Sniehotta, Schwarzer, Scholz, & Schüz, 2005). Therefore, the theory of planned behaviour may present an inadequate explanation for the variable used in this study. Because of this, the researcher did not select the theory of planned behaviour for use in this study.

3.3.2 Transtheoretical Model of Behaviour Change

The transtheoretical model developed by Prochaska and DiClemente (1982) is an integrative model to conceptualise the process of intentional behavior change, in which individuals show their readiness for involvement in new healthy behaviours to manage illness or promote health (Ruggiero et al., 1997). The application of the transtheoretical model was initially to understand how people change their health behaviour, such as cessation of smoking and other unhealthy and addictive behaviours. Later, the transtheoritical model was applied in exercise behaviour studies (Marcus et al., 1992). The transtheoretical model suggests that an individual's behavioural changes progress through a series of stages. These stages include pre-contemplation, contemplation, preparation, action and maintenance and/or relapse, which refer to the process of retreating one stage or more at a time.

The transtheoritical model of behaviour change is understood as a process rather than as an event, so the transtheoretical model intends to explain how behaviour change occurs, rather than why (Prochaska & DiClemente, 1982). The model proposes that individuals move through a series of stages, instead of changing at once, with each single stage being characterised by a temporal component associated with the behaviour change. Previous studies reviewed the effectiveness of the transtheoritical model, including 37 studies focusing on many target behaviours such as smoking cessation, PA, and dietary change. The review showed that there was little evidence to support the effectiveness of stage-based interventions as a basis for behaviour change or for facilitating stage progression (Bridle et al., 2005). Further, Nigg et al. (2011) stated that ordering of behaviour change into a series of different stages makes the model difficult to understand as a continuous process and obscurity about the use of stage timeframes remains a significant concern. Consequently, the transtheoritical model is difficult to apply, with no specific cut-off point being evident between stages. Therefore, this model is not appropriate for the study's objectives and design.

3.3.3 Self-Determination Theory

Self-determination theory was initially developed by (Deci and Ryan (2002); Deci & Ryan, 1985). It refers to supporting the individual's intrinsic tendencies to behave toward promoting their health. It helps the researcher to understand motivation and adherence to health behaviours. The basic principles of this theory are human motivation and personality in a social context that distinguishes motivation as autonomous and controlled, which promotes long-term behaviour change, implying an understanding of the internalisation process. Deci and Ryan (2002) differentiate between intrinsic and extrinsic motivation, with intrinsic motivation refers to initiating an activity for its own sake because it is interesting and satisfying in itself thereof, and extrinsic motivation refers to doing an activity to obtain an external goal. External regulation is the least autonomous form of motivation, consisting of individual achievement outcomes to avoid punishment and/or to obtain rewards (Deci & Ryan, 2002; Deci & Ryan, 1985). Self-determination theory explains the individual's motivation to achieve behavioural changes through intrinsic and extrinsic motivation, and in addition, the three basic needs: competence, relatedness and autonomy.

However, there is little evidence about the use of self-determination theory, according to a systematic review by Teixeira, Carraça, Markland, Silva, and Ryan (2012) to investigate the relationships between key self-determination theory-based constructs and exercise and PA behavioural outcomes. The study showed inconsistencies and mixed evidence associated with the relationships between self-determination theory constructs and exercise. Moreover, there were specific limitations regarding the different associations explored when applying of self-determination theory to understand exercise and PA promotion. In addition, Mallett (2005) showed that a cause-effect relationship cannot be established in an autonomy supportive approach in a stressful environment. Consequently, this theory was not able to provide sufficient explanation for the variables used in this study.

3.3.4 Self-Efficacy Theory

Bandura developed self-efficacy theory as a part of social cognitive theory, which highlights three factors: behavioural, personal, and environmental. These factors interact to determine behaviour and motivation (Ashford & LeCroy, 2009). Bandura (1997) presents self-efficacy as a kind of self-confidence that plays an essential role in behaviour prediction as well as influencing the actions that can affect an individual's life. The basic principle behind Bandura's self-efficacy theory is that individuals are more likely to become involved in activities for which they have a high self-efficacy level and less likely to become involved in those for which they have a low self-efficacy level.

Bandura identified four main sources of self-efficacy in a hierarchy of significance, which contribute to the development of self-efficacy. The four sources of self-efficacy information: First: enactive mastery experience, which is the most effective source of self-efficacy. According to Bandura (1997), success builds a robust belief in one's personal efficacy. However, failure with new tasks obviously reduces the self-efficacy level for that specific task. If a task has been effectively, accomplished many times, unusual failure at the task is unlikely to change self-efficacy for that specific task.

Second: vicarious experience is also known as modelling in which conducting a comparison process effects self-efficacy. People make a comparison between their own capability and the capability of others. The modelling effect occurs as the observer recognises the ease with which the actor has accomplished a particular task. Consequently, the observer develops the perception that they are able to complete the same task. Bandura explained that inefficacy influenced an individual's experience and their tendency to perform in ineffectual ways, which leads to formulating confirmatory behavioural evidence of failure. On the other hand, the vicarious experience can enhance self-efficacy, which weakens the direct experience effect of failure by maintaining achievement in the face of failure frequently.

Third: verbal persuasion, also known as social persuasion, is the third effective source of self-efficacy. Verbal persuasion serves to strengthen people's beliefs that they have the capability to achieve their task. For instance, if they doubt their own

skills and have a tendency to reflect on personal deficiencies, the verbal persuasive effect of a personal trainer will be essential to reduce the self-doubt. Bandura (1997) explained verbal persuasion aimed to enhance self-efficacy level based on the achievement of realistic objectives. However, unrealistic beliefs may reduce the persuader's credibility in the eyes of the patients. In addition, verbal persuasion alone has limited power. However, it is more effective if followed by successful achievement.

Forth: physiological and affective states constitute one of the four sources that are effective for self-efficacy and relate to an individual's ability to interpret symptoms. People judge their capability based on physiological and emotional states. Their reaction to a stressful situation such as pain, fatigue or fear can affect their feelings about their capability to conduct their daily activity, which can, in turn, alter their self-efficacy level (Bandura, 1997). For example, there can be pain or difficulty breathing, which is signs of forthcoming threat that may lead to beliefs of failure to complete the task, such as doing regular PA guidelines. Bandura (1997) proposed that somatic arousal creates the fear of inability, which produces further belief in failure that worsens somatic arousal and produces fear.

The physiological state may affect judgements of capability, a person's perception of physiological and effective responses related to a specific task, which may influence decisions regarding a person's efficacy beliefs (Bandura, 1997). For example, chest pain and fatigue could indicate physical dysfunction. Moreover, fear about the experience of fatigue whilst engaging in PA may decrease self-efficacy. In this study, patients with AMI who usually experience chest pain whilst engaging in PA may begin to feel anxious about their capability to maintain PA level, and then begin to decrease PA level. Thus, physiological and affective states may adversely affect the patients with AMI perception of ability to achieve the recommended level of PA. Therefore, in order to improve self-efficacy, emotional arousal levels would be reduced, in order to achieve the behaviour changes (Jerusalem & Mittag, 1995). Different assessment tools can assess physiological and affective states such as the following: clinical evaluation, for example a treadmill test and echocardiogram, and a questionnaire and daily chest pain diary, which is an inexpensive and easy to administer tool. In addition,

there are two kinds of pain diaries that have been employed in researches: specific pain assessment and functional pain assessment (Karoly & Jensen, 2013).

Self-efficacy theory provides a beneficial theoretical framework for understanding and predicting adherence to behaviour changes (Shortridge-Bagget, 2002). Self-efficacy is important factors for self-management among individuals with AMI (Katch, 2010). Self-efficacy theory proposes that individuals' confidence in their skill to change behaviours affects which behaviours they will participate in (Bandura, 1997; Lorig & Holman, 2003). In addition, in his review article, Blanchard (2012) concluded that self-efficacy theory is a useful theory and should be considered when studying the correlation between self-efficacy and PA among people with CVDs. Moreover, Bandura's self-efficacy theory is widely applied in the literature, and helps to better understand health behaviour and facilitates behavioural change, for example increase of PA level (Lee et al., 2008). Bandura's self-efficacy theory is the most applicable theory among the aforementioned theories.

Hence, Bandura's self-efficacy theory underpins the research methods used in the presented study, including the choice of questionnaire. The researcher selected the CSEQ to elicit data on the self-efficacy level of CHD patients, which is one of the primary variables in the study's theoretical framework. This is in addition to the use of a body-worn activity monitor to measure PA level in order to identify changes in PA in a precise and accurate way. In conclusion, researchers trying to understand patients' motivation for changes in behaviour have used the concept of self-efficacy extensively. Bandura's self-efficacy theory is the appropriate theory to help explain the relationship between self-efficacy and PA. For example, patients with a higher self-efficacy level set higher goals and demonstrate a greater commitment and motivation to achieving higher PA levels. Therefore, Bandura's self-efficacy theory will improve the integration of the study's findings.

3.4 Types of Self-Efficacy

Use of self-efficacy is usually as a general concept only. However, there is a growing interest in moving towards different types of self-efficacy, such as general self-efficacy, disease-specific self-efficacy and phase-specific self-efficacy. General self-efficacy refers to an individual's belief in their ability to perform in general, across a variety of situations (Schwarzer & Jerusalem 1995). In contrast, disease-specific self-efficacy refers to an individual's perception of his or her ability to perform the actions specific to a situation, such as a belief in the ability to influence the outcome related to a specific disease, such as CHD, through achieving several changes (Sullivan et al., 1998). Even though general self-efficacy tasks centre around general situations and disease-specific self-efficacy tasks centre around dealing with situations related to their respective diseases, both concepts are based on self-efficacy, and both types of self-efficacy deal with a person's ability to achieve a desired outcome.

Maddux (1995) developed the concept of phase-specific self-efficacy in the domain of exercise behaviour, McAuley and Mihalko (1998) explained that different kinds of self-efficacy generally represent one of two main components of the self-efficacy concept: a task and a regulatory component. The task component refers to belief in an individual's ability to achieve a specified behaviour, whereas regulatory efficacy refers to belief in an individual's ability to overcome obstacles during the performance of PA.

Rodgers, Hall, Blanchard, McAuley, and Munroe (2002) distinguished between phase-specific self-efficacy beliefs. They found that three types of self-efficacy are relevant to the initiation and maintenance of exercise. First: task self-efficacy, which refers to an individual's confidence in performing essential facets of the behaviour related to exercise initiation. Second: coping self-efficacy, which refers to an individual's confidence in performing the task in the face of barriers to the maintenance of exercise. Third: scheduling self-efficacy, this concerns an individual's confidence in managing the time demands of exercising regularly. Originally proposed as a subcategory of coping self-efficacy, this has been the strongest predictor of exercise persistence (Rodgers et al., 2002). This separation of task,

coping, and scheduling is vital, especially when considering the use of self-efficacy, such as its use in cardiac rehabilitation programmes. However, many researchers combine these three types of self-efficacy to reflect generalised self-efficacy. Moreover, it is proposed that when using different self-efficacy types, different effects at different phases of exercise adoption should be considered (Rodgers et al., 2002).

These phase-specific beliefs have been widely discussed in the literature**;** a previous cohort study, gathered data immediately after completing cardiac rehabilitation and again one month later, in order to examine the relationship between the three types of self-efficacy to improve the adherence pre-, intra- and post- cardiac rehabilitation. The study found that task self-efficacy, for performing elemental aspects of behaviour, was the most changed type of self-efficacy during cardiac rehabilitation and was associated with self-reported exercise at the end of cardiac rehabilitation. However, scheduling self-efficacy, for performing the behaviour regularly, was most strongly related to self-reported exercise post- cardiac rehabilitation (Rodgers, Murray, Selzler, & Norman, 2013). McAuley, Pena, and Jerome (2001) found that the weak predictive role of self-efficacy for long-term maintenance may result from changes in the operationalisation of self-efficacy and an absence of correspondence between the type and complexity of the measured task and measured beliefs. In conclusion, self-efficacy is a complex concept. Patients' health progression and different settings can effectively influence self-efficacy. Therefore, developing the proper type of self-efficacy relevant to each situation in order to measure self-efficacy in each phase is important, in order to understand the changes there-within and avoid misinterpretation or overestimation of self-efficacy levels.

3.5 Measuring Self-Reported Self-Efficacy Questionnaire

The previous sections have described the construct of and different types of self-efficacy, and highlighted the importance of self-efficacy as a factor that influences effective lifestyle change. This section highlights the most commonly used self-efficacy questionnaires. Self-efficacy has been found to be an important personal determinant of human behaviour (Bandura, 1997). As a consequence, many of the

available self-efficacy studies show a growing interest in measuring self-efficacy in patients with chronic diseases (Frei, Svarin, Steurer-Stey, & Puhan, 2009). Self-efficacy has been proven to improve long-term self-management skills (Poortaghi et al., 2013).

There are many of self-efficacy questionnaires such as, general self-efficacy, exercise self-efficacy and medication adherence self-efficacy questionnaires. However, there are two main categories of questionnaire that measure self-efficacy. Firstly, those that address a global, general self-efficacy, such as the General Self-Efficacy Scale by Schwarzer & Jerusalem (1995). Secondly, those designed to measure disease-specific self-efficacy, for example the CSEQ by Sullivan et al. (1998). According to Schwarzer and Renner (2009), disease-specific self-efficacy questionnaires are brief, accurate and able to assess specific situations within the context of large-scale health behaviour screening studies. Unfortunately, there is no questionnaire in Arabic that measure self-efficacy among patients with CHD. Consequently, the need for valid and reliable Arabic version of self-efficacy tools for patients with CHD is substantial for establishing self-management program in Arabic-speaking countries. There are several instruments used to measure self-reported self-efficacy. In reviewing these, there are general self-efficacy scale, an exercise self-efficacy scale, the self-efficacy for daily PA questionnaire and the cardiac self-efficacy scale.

3.5.1 General Self-Efficacy Scale

The General Self-Efficacy Scale was developed by Schwarzer & Jerusalem (1995), and has been translated from the original German version into 31 languages. It is a 10-item scale designed to assess self-efficacy. The scale aims to assess a general sense of perceived self-efficacy with the stated aim of predicting the ability to cope with daily obstacles, as well as adaptation after experiencing stressful life events. It is a self-administered scale and usually takes two to three minutes to complete. The scaled scores for each question range from ‘not at all true’, which scores (1), to ‘exactly true’, which scores (4). Studies have shown that the General Self-Efficacy Scale has high reliability, stability and construct validity. Cronbach’s alpha ranges

from 0.75 to 0.94 across a number of different language versions (Luszczynska, Gutiérrez-Doña, & Schwarzer, 2005; Schwarzer, BaBler, Kwiatek, & Schroder, 1997). In addition, a short form of the General Self-Efficacy Scale (GSE-6) was developed by Romppel et al. (2013) and was demonstrated to be a reliable and valid instrument. Cronbach's alpha was between 0.79 and 0.88. The correlations between the GSE scale and other social cognitive variables are high and confirm the validity of the scale (Luszczynska et al., 2005).

The General Self-Efficacy Scale aims to assess the general adult population, including adolescents. However, the scale measures just one global dimension of self-efficacy with Cronbach's alpha 0.90 (Ebstrup, Eplov, Pisinger, & Jørgensen, 2011). In general, the General Self-Efficacy Scale does not observe specific behavioural changes, and so the CSES cannot measure specific health-related self-efficacy. Consequently, it cannot obtain sufficiently complete and accurate information to meet the present study's objectives, including measuring the self-efficacy of patients diagnosed with AMI.

3.5.2 Exercise Self-Efficacy Scale

The Exercise Self-Efficacy Scale is a self-administered 8-item scale developed by McAuley, Lox, and Duncan (1993). It measures an individual's belief in their ability to maintain periods of continuous exercise, at moderate intensity, for 40 minutes per session, three times a week for the following four weeks. For each item, the individual indicates their confidence in their ability to perform such tasks on a 100-point percentage scale comprising 10-point increments, ranging from not at all confident (0%) to highly confident (100%). To measure the total score for each item of self-efficacy, calculate the confidence ratings and then divide the total by eight, the total number of items in the scale, to produce a maximum probable self-efficacy score of 100. The scale has an excellent Cronbach's alpha of 0.98 to 0.99 (McAuley et al., 2011). Previous studies used the Exercise Self-Efficacy Scale to assess the maintenance of self-efficacy, physiological condition and PA in different populations.

However, previous studies used this scale to measure continuity in exercise self-efficacy for four weeks and not, per se, PA behaviour. In addition, previous studies used it in relation to exercising for 40 minutes without quitting. In addition, the Exercise Self Efficacy Scale measures only exercise, which is part of several identified classifications of PA behaviour, including but not limited to other physical activities, such as recreational activity, occupational activity and social activity. Consequently, the Exercise Self Efficacy Scale is not appropriate with a high-risk population such as patients with AMI and it is not appropriate to use this scale or, at least, it is difficult to modify it to measure PA in the early recovery phase.

3.5.3 Self-Efficacy for Daily Physical Activity Questionnaire

The self-efficacy for daily PA questionnaire was developed by Campbell, Gray, Foley, Maddison, and Prapavessis (2016) to measure self-efficacy-related tasks in activity behavioural domains among a healthy adolescent population. Example of these include at home, at school, at work, during leisure time, and for transportation purposes. It consists of 39 items: nine items for school activity, 6 items for transportation activity, 12 items for leisure time activity, 6 items for household activity, and 6 items for occupational activity. It asks how confident individuals are about doing 10, 30 and 60 minutes of light, moderate and vigorous intensity activity on five or more days per week. Participants respond to each item using a 10-point scale ranging from 0% (not at all confident) to 100% (completely confident). Calculating a cumulative average from all item responses gives participants scores ranging from 0% to 100%, with a higher score being indicative of greater self-efficacy.

The questionnaire measures self-efficacy for PA in a free-living condition in healthy adults, making it unsuitable among patients with CHD and it has proven difficult to modify if for this context. In addition, this scale includes some sections such as school or work which are not appropriate to elderly patients. In addition, the questionnaire asks the participants to engage in such activity for up to 60 minutes. Therefore, the researcher cannot use this questionnaire in this study.

3.5.4 Cardiac Self-Efficacy Questionnaire

Sullivan et al. (1998) developed the CSEQ, its purpose is to examine the role of self-efficacy in the physical and role functions of patients with coronary heart disease after controlling for the effects of anxiety and depression (Sullivan et al., 1998). In addition, CSEQ plays a predictive role for cardiac patients, in relation to cardiac function and hospital admission following a coronary event (O'Neil et al., 2013).

The CSEQ is a self-administered questionnaire consisting of 16 items. It has three subscales: 1. control of symptoms, eight items, 2. Maintenance of function, consisting of five items, 3. three other items related to weight, smoking and diet. Patients are asked to rate their confidence in knowing about or acting on each of the 16 statements on a 5-point Likert scale (zero = not at all confident, one = somewhat confident, two = moderately confident, three = very confident and four = completely confident). The CSEQ is a valid and reliable questionnaire; Sullivan et al. (1998) reported its reliability as 0.90 for the control of symptoms subscale, and 0.87 for the maintenance of function subscale. In addition, (Fors, Ulin, Cliffordson, Ekman, and Brink (2014); Sarkar, Ali, & Whooley, 2009) concluded that the CSEQ is valid and reliable when used with patients diagnosed with AMI.

In conclusion, the CSEQ is a disease-specific self-efficacy questionnaire, which serves to meet the study's objectives. CSEQ is a validated, reliable tool and widely used questionnaire. In addition, it is suitable for the selected age range in the study, for example, from 18 to 75 years. Hence, the CSEQ is a suitable questionnaire for data collection in the context of this study and meets the study's objectives. The researcher used CSEQ in this study.

3.6 Translation and Cross-Cultural Adaptation of Cardiac Self-Efficacy Questionnaire

This section highlights both the original CSEQ as developed by Sullivan et al. (1998) and other available versions of the CSEQ. It then describes the process undertaken to translate and adapt the CSEQ. The section also presents participants'

characteristics and the results of the validity and reliability tests of the new version of the CSEQ. Due to time limitation, the researcher recruited the sample for validity and reliability evaluation from patients with CHD. Therefore, they were not recruited for the second study phase (measurement of self-efficacy and activPAL3™ among patients with AMI). Consequently, this section presents detailed information regarding the study phase one- method and data analysis.

Recently, the CSEQ had been translated into Swedish (Fors et al., 2014). Fors and his colleagues translated and cross-cultural adapted the CSEQ for 288 Swedish patients with ACS. Construct validity using confirmatory factor analysis, and convergent and discriminant validity were tested. The results revealed that the Cronbach's alpha for all items was 0.89, demonstrating the CSEQ to be a valid and reliable measure when evaluating self-efficacy in patients with ACS. In addition, the CSEQ has been translated into Thai (Saengsiri, Thanasilp, & Preechawong, 2013), Saengsiri et al. (2013) translated and cross-cultural adapted the CSEQ for 280 Thai patients with CHD. Evaluation of test of the validity and reliability of the CSEQ found that the CSEQ is valid and consistent; the Cronbach's alpha for all items was 0.92.

Many studies have focused on the prevalence of CHD risk factors in the Middle Eastern countries (Eshah, 2013; Gehani et al., 2014; Khattab et al., 2013), yet few studies investigate the impact of self-management on CVD risk factors. In fact, to the best of the researcher's knowledge, no previous studies have explored the role of self-efficacy in self-management in Arabic-speaking countries. One of the possible reasons for this gap in the literature is the lack of a valid and reliable tool to measure cardiac self-efficacy for patients with CHD in Arabic-speaking countries. Consequently, it was necessary to undertake a rigorous process of translation and cross-cultural adaptation of an appropriate tool in order to measure self-efficacy in the course of this study. In addition, an Arabic version of CSEQ is now required to measure self-efficacy for further studies that focus on self-management skills among patients with CHD.

The objectives of the translation and cross-cultural adaptation of CSEQ are:

1. Translation and cross-cultural adaptation of the CSEQ to Arabic language by using the WHO guidelines
2. Evaluation of the psychometric properties validity and reliability- of the Arabic version of the CSEQ

3.6.1 Method

The researcher adopted the WHO process of translation and cross-cultural adaptation of questionnaires to produce the Arabic version of CSEQ. This followed a thorough inspection of a variety of translation methods (Beaton, Bombardier, Guillemin, & Ferraz, 2000; Eremenco, Cella, & Arnold, 2005; Guillemin, Bombardier, & Beaton, 1993). Before applying the process outlined by the WHO for the translation and cross-cultural adaptation of questionnaires, the researcher obtained ethical approval from the University of Salford, UK (ethical application HSCR14/120) and the Jordan University Hospital (JUH), Jordan. Following that, the researcher recruited eighty participants diagnosed with and treated for CHD from JUH, in order to undertake a validity and reliability test of the CSEQ. The study recruited participants with CHD at JUH and were haemodynamically stable. Of these, a sub group of thirty participants was involved in face validity testing. The researcher gave the participants information about the aim of the translation process and provided written consent. The researcher distributed the questionnaire to and collected from patients once they were in a stable condition.

Participants were included if they were diagnosed with CHD, as confirmed by ECG, Troponin level test or coronary angiography. All participants spoke Arabic as their first language, were being treated in JUH, were 18 years old or over, and had good reading and writing skills and were therefore able to understand and complete the questionnaire. Those excluded were patients who had a severe comorbidity disease such as cancer, had cognitive disabilities and/or had a history of drug or alcohol abuse.

3.6.2 Process of the WHO Translation and Cross-Cultural Adaptation of Questionnaires

The WHO guidelines provide a clear, comprehensive and systematic process for establishing adaptation of a questionnaire as shown below:

1. Forward translation: One translator, a health professional, familiar with the terminology for the area covered by the questionnaire will translate the original CSEQ to the Arabic. The translators should aim at the conceptual equivalent of a word or phrase, not a literal translation
2. Expert panel reviewing: Bilingual translators in English and Arabic convene for translation. The expert panel identifies and resolves inadequate expressions or any discrepancies between the forward translation and the existing version
3. Back-translation: An independent translator, who has no prior knowledge of the CSEQ, will translate the CSEQ back to English
4. Pre-testing and cognitive interviewing: Administration of the produced Arabic version of the CSEQ to 10 participants, with implementation of interviews, in which the researcher will ask the participants about the clarity of the Arabic version
5. Producing final version: After reaching a simple, clear and comprehensible translation and resolving any unclear expressions or any discrepancies, a final version is ready.
6. Documentation: Documentation of the previously described translation steps.

The WHO process of translation and cross-cultural adaptation of instruments is a well-established method and has been refined in the course of several WHO studies, such as the WHO Quality of Life-BREF, ICD-10 Symptom Checklist for Mental Disorders (version 1.1) and Severity of Dependence Scale instruments (WHO, 2014). The WHO process of adaptation of the CSEQ consists of six steps (WHO, 2014). Conceptual equivalence of translation was established through selecting a specific method of translation upon which to develop the target version of the questionnaire in the study (Beaton et al., 2000).

The aim of the translation and cross-cultural adaptation was to produce an alternative language version of an original text. Specifically, this process ensured conceptual and item equivalence in each target country, each new language version should be relevant, acceptable and understandable to the target population (WHO, 2014). In addition, paying attention to semantic and conceptual equivalence of the component parts in the original English version, indeed to verify the validity and reliability of the concepts, the phrasing and terminology with the target sample was a priority (Beaton et al., 2000; Eremenco et al., 2005).

3.6.3 Application of WHO Translation and Cross-Cultural Adaptation of Questionnaires Process

Before beginning the WHO process of translation and cross-cultural adaptation of the questionnaire, the researcher sought permission to use and adapt the questionnaire from the author of the CSEQ (Appendix B). WHO process of translation and cross-cultural adaptation of the questionnaire consists of six stages, as shown in Figure 3.1. The original English version of the CSEQ is the gold standard from which all other translated version of the CSEQ derives. Following this, the study evaluated of the validity and reliability of the CSEQ. The analyses of the data such as descriptive statistics for participants' characteristics were made using IBM SPSS, version 22.

Stage One: Forward Translation

In accordance with the WHO Process of translation and cross-cultural adaptation, two Jordanian translators implemented a detailed review of the CSEQ. The first translator was a native Arabic speaker, a nurse familiar with self-efficacy and the care of patients with CVD. The second translator was a professional translator with no medical background. Both translators had some knowledge of English-speaking culture, and spoke fluent English, but their mother tongue was Arabic. In order to produce a more understandable version, it was essential to provide translators with instructions on the concepts in the original version of the instrument. The two translators compared the two Arabic translations, and then created an initial Consensual Arabic Version (CAV 1). Using this approach supported the conceptual

equivalence of the forward translation. In addition, it avoided ambiguity of terminology. The researcher instructed the translators to use language to be natural, simple, clear and acceptable for Arabic people with CHD.

During the translation stage, the translators used Modern Standard Arabic (Fusha), which is a clear, concise, and acceptable language for the broadest audience (Khalaila, 2013). The translators sought a conceptual and cultural equivalent of each English phrase, rather than conducting a verbatim translation, and took into consideration the definitions of the original items, questions, or sentences, in order to translate them into the most relevant form. In addition, the translators avoided using jargon, colloquialisms, and idioms.

Maintaining the cultural equivalent of each sentence is an essential issue during the process of translation and cross-cultural adaptation. Accordingly, the translators placed a great emphasis on preserving the CSEQ adaptation in the cultural context. For example, there was one item asking about “maintain sexual relationship with your spouse”. The translators changed this item into another expression that was most appropriate given the cultural and norms of society in Middle Eastern countries, where the Arabic society accepts the sexual relationships within marital context and the government and religion accept or support no other sexual relationships such as partnership relationships. Finally, they considered issues of gender applicability. For example, item 9 of the CSEQ in the maintain function subscale contains the word “maintain”, the Arabic translation of the English word “maintain” was “*yohafeth*,” which is used for male and “*tohafeth*,” which is used for female. Therefore, the panel replaced them with the word “*mohafethah*” which is noun phrase and can be used for both male and female.

Stage Two: Expert Panel – Review of the Forward Translation

The expert panel consisted of an additional three individuals: a health professional and two translators. All panel members were bilingual (Figure 3.1). The aim of this step was to identify any unclear expressions, ambiguous concepts or discrepancies, and to compare the forward translation with the original CSEQ. The expert panel oversaw the translated version of the CSEQ. The expert panel rejected inappropriate

items and alternative words suggested. For example, items 1.2.3 and 4 of the CSEQ in the control symptoms subscale contains the word “control”, the Arabic translation of the English word “control” was “*sytara*,” which is used to express the power to manage in general, but “*tahkom*,” is used more frequently in medical and scientific fields that express the same meaning. Therefore, the panel replaced the word “*sytara*,” with the word “*tahkom*,” which is more appropriate. Subsequently, the expert panel edited (CAV1). Then, the expert panel achieved a consensus on the Arabic version of the CSEQ. This became (CAV 2).

Stage Three: Back Translation into English

Back translation involved translating the Arabic version of the CSEQ back into its original language (English), as a means of comparing the two versions (Wild et al., 2005). Two independent bilingual translators back translated the Arabic translation into English. The two bilingual translators, who were not involved in the forward translation stage, grew up in an Arabic-speaking country (Jordan) and completed graduate level studies in the UK. None of the translators had any prior knowledge or experience of the original version of the questionnaire. As in the forward translation process, the back translation process focused on conceptual rather than absolute linguistic equivalence. Each translator made a back translation of (CAV 2) to create English back translation version 1 (EV1) and English back translation version 2 (EV2). The back translators then compared the two English versions to create the Consensual English back translation Version (CBV).

It is important to note that there may be some variations in the wording, as not all English words easily translate into other languages. For example, in the phrase “somewhat confident’’, the word “somewhat” does not translate easily into Arabic. The underlying concept of “somewhat” is “fairly”, therefore an Arabic translation should reflect this concept rather than search for a literal translation. The back translators removed the response option “Non applicable”, as, after explaining at the beginning of the questionnaire that participants should select the most appropriate or closest answer; all items have an applicable answer. In addition, the issue of gender in

Arabic had considered during translation. Hence, the back translators chose words and verbs appropriate to both genders. This involved a considerable number of changes to many items in order to capture the original concepts. Consequently, the back translator used simple and standard Arabic words to make the CSEQ clear and understandable, as presented in Table 3.1:

Table 3.1

Comparison of the Original English Items and Back Translated Ones

Original English Items	From Arabic back to English
How confident are you that you know or can	How are you confident that you know
Control your chest pain by changing your activity levels	Control of chest pain by changing your activity levels
Control your breathlessness by changing your activity levels	Control of your difficult breathing by changing your PA
Control your chest pain by taking your medications	Control your chest pain by using own medications
Control your breathlessness by taking your medications	Control of difficulty breathing by having own medicine
When you should call or visit your doctor about your heart disease	When you are calling or visiting your doctor about heart disease
How to make your doctor understand your concerns about your heart	How to make your doctor understand your fears about your heart disease
How to take your cardiac medications	How to take your heart medications
How much PA is good for your health	How much of PA improves your health
How much confident to	How much you are confident to
Maintain your usual social activities	Maintain your usual social activities
Maintain your usual activities at home with your family	Maintain your usual activities with your family at home
Maintain your usual activities at work	Maintain your usual activities at work

Maintain your sexual relationship with your spouse	Maintain your sexual relationship with your spouse
Get regular aerobic exercise (work up a sweat and increase your heart rate)	Get regular exercises (working until sweating and increasing heart rate)
How much is good for you to do:	How much is good for yourself to do:
Lose weight (if you are overweight)	Reduce your weight (if you are obese)
Stop smoking (if you do smoke)	Stop smoking (if you are a smoker)
Change your diet (if your doctor recommended this)	Changing your diet (if your doctor recommended that)
Not at all confident	Not confident
Somewhat confident	Confident fairly
Moderately confident	Moderately confident
Very confident	High confident
Completely confident	Confident completely

Stage Four: Pre-testing the CSEQ and the implementation of cognitive interviewing

The expert panel oversaw the consensual English back translation version and the original CSEQ, to create the final English CSEQ version. Following that, the expert panel compared the final English CSEQ version and (CAV 2), resulting in the generation of the consensual Arabic version (CAV 3), (Figure 3.2). In accordance with the WHO guidelines (WHO, 2014), the (CAV 3) of the CSEQ was administered to 10 Jordanian patients diagnosed with CHD in a hospital setting. The language used in the translated CSEQ was suitable for a 12-year-old child to comprehend, thus making it easily comprehensible for the study participants (Beaton et al., 2000).

Cognitive interviewing, conducted by the researcher, was utilised to understand how respondents process and respond to CSEQ items. Cognitive interviewing is defined as “general method that developers of such material can use to critically evaluate this

transfer of information in which targeted audience understand, mentally process and respond to the presented material" (Willis, 2004, p. 5). The researcher interviewed each participant who completed the CSEQ, in order to gain their feedback and ensure that all questionnaire items were understandable and included all the expected concepts. The researcher asked the respondents regarding the meaning of each item, in addition to if they perceived any problems with the written language, format or scoring scale.

The cognitive processes included participants completing the translated CSEQ and obtaining their feedback on their understanding of individual questions, for example, what they thought the question was asking. What came to mind when they heard a particular phrase or term. The researcher asked the participants to repeat the question in their own words, give associated response options, and verbalise the process they had followed when producing their answers. The participants answered these questions for each item. If alternative words or expressions existed for an item, the respondent suggested selecting the alternative that best represented their usual language. The researcher reviewed any comments made by the respondents and made any necessary revisions. At the end of the cognitive interviewing process, the evaluation of a final translated version was ready.

Stage Five: Final version of the CSEQ

Once a linguistically and conceptually equivalent version of the CSEQ became available in Arabic (Appendix C), it was subsequent possible to examine validity and reliability. This step is important because when translated into other languages, the validity and the reliability of the items from the original CSEQ do not always remain intact. Therefore, it was necessary to determine validity testing and test-retest reliability for the translated CSEQ version. This process involved making minor changes to CSEQ items, in order to retain the spirit of the original concepts, and the adaptation of simple formal Arabic words to make the questionnaire clear and comprehensible (Beaton et al., 2000).

Stage Six: Documentation

The researcher reported the development of the final version of the Arabic CSEQ with the review process of the CSEQ translation. All the stages of translation and cross-cultural adaptation were successfully completed and documented. After completing the six steps, the researcher implemented the validity and reliability evaluation for the CSEQ, (Figure 3.1).

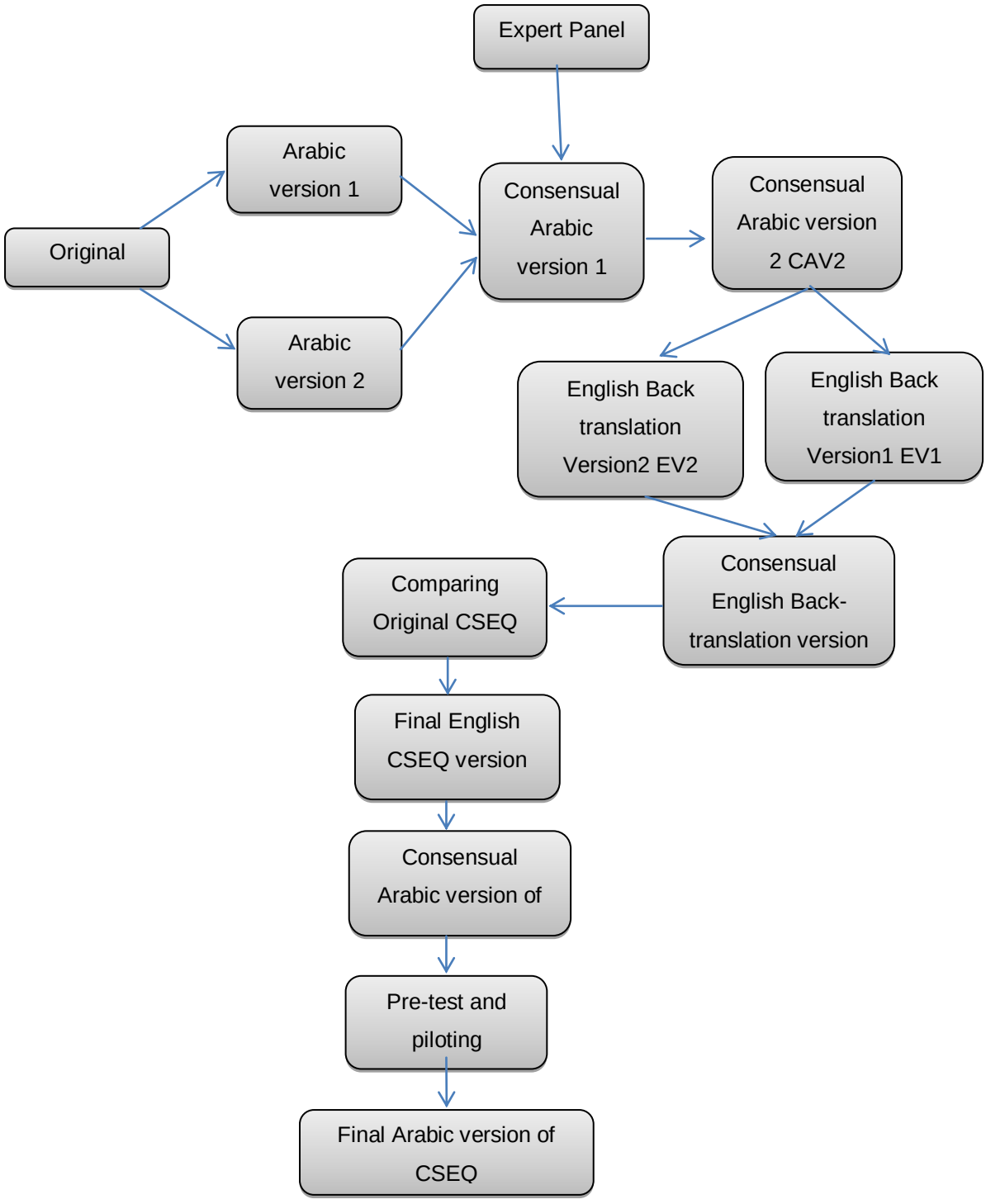


Figure 3.1 Flowchart describing the WHO process used for translation and cross-cultural adaptation of the CSEQ

3.6.4 Key Points to Ensure Rigour

The more rigorous and inclusive the process of translation, the more likely the translation and cross-cultural adaptation will achieve equivalence between cultural groups (Hilton & Skrutkowski, 2002). Ensuring rigour starts with the application of a well-known method of translation (WHO, 2014), and selecting translators who are fluent in both English and Arabic languages and cultures to preserve meanings in the translated materials. The translators were familiar with Modern Standard Arabic Fusha. The experience of these translators in both Modern Standard Arabic Fusha and English helped them to provide more acceptable and understandable versions alongside the equivalent meaning of the original version.

The WHO guidelines state that in the forward translation step, the translator should be knowledgeable of English-speaking culture, but his or her first language should be the primary language of the Arabic culture. However, in the back translation step, the first language of the independent bilingual translator should be English and he should be knowledgeable about the questionnaire language. However, due to the shortage of bilingual translators having English as their first language, translators for whom Arabic is the first language and who are fluent in both English and Arabic were considered. Therefore, the researcher contacted Arabic bilingual translators from the target country (Jordan) who had been resident in the UK for a number of years and were fluent in and familiar with both English and Arabic languages and cultures. Therefore, the forward translators' specialities were nursing and the English language. The expert panel's specialities were nursing, English language and business administration, and the back translators had business administration and nursing as their specialities.

3.6.5 Evaluation of Psychometric Properties

This section presents an evaluation of the psychometric properties of the Arabic version of the CSEQ. Due to time limitations, the researcher carried out only face and content validity testing, in addition to test-retest reliability for the Arabic version of the CSEQ.

The researcher recruited a total of 80 patients with CHD for test-retest reliability. The participants' characteristics are presented in Table 3.2. All participants completed the CSEQ. Before receiving the completed questionnaires, the researcher checked completion of all questionnaires from the respondents. Consequently, there were no missing data. Completion of the CSEQ took approximately 10-15 minutes. No items were considered confusing, nor were any multiple answers found. This indicates that the CSEQ had an excellent acceptability rating.

Validity

Achieving successful translation is essential in order to ensure consistency in the validity between the original CSEQ and its translation. However, successful translation does not ensure that the questionnaire has the same of face and content validity as the original CSEQ (Beaton et al., 2000). According to Anthoine, Moret, Regnault, Sébille, and Hardouin (2014), a review of published articles describing the sample size for validation studies from 2009 to 2011 showed that there is no clear method or justification for the determination of sample size for validation testing. According to Beaton et al. (2000) guidelines for the process of adaptation of self-report measures, a total of 30 to 40 subjects is sufficient to test the validity for a pre-final version of a new questionnaire. Consequently, the researcher tested face validity of the Arabic version of the questionnaire on 30 patients with CHD. Due to time limitations and the difficulty of collecting the target sample of patients with AMI, the researcher decided to evaluate the validity and reliability tests on patients with CHD.

Table 3.2

Demographics and characteristics of patients diagnosed with CHD (study phase one)

Characteristics	Frequency	Mean
Age		57.4 ± (6.9) years
Sex		
Male	55	68.8%
Female	25	31.2%
Education level		
Higher diploma or less	33	41.3%
Bachelor degree	38	47.5%
Postgraduate degree	9	11.3%
Marital status		
Single/Widowed	14	17.5%
Married	58	72.5%
Divorced	8	10%
Employment		
Employed	17	21.3%
Unemployed	11	13.8%
Retired	30	37.5%
Self-employed	22	27.5%

In order to implementing face validity, the researcher met the participants in the meeting room in JUH. The researcher asked each participant completed the questionnaire for their understanding of the meaning of each questionnaire item as well as whether or not they had problems with the questionnaire format, instructions or response scales. The participants expressed their satisfaction with the transparency of the CSEQ and the ease of its completion. The researcher asked participants whether they had any comments or suggestions that could make the questionnaire more comprehensible. More than two thirds of participants (21 participants) expressed their satisfaction and they did not suggest or provide improving comments. Five participants commented that it would be desirable to modify the alternating scoring system and add numbers for each choice. Two participants suggested changing the colour to separate each section and make the questions in bold font and two participants suggested to a few changes in questions number 8 and 13.

Regarding content validity, a panel of five experts from the school of nursing at the University of Jordan evaluated the relevance between the original and Arabic versions of the CSEQ by rating the degree of relevance of each item on a four-point scale: 1 – irrelevant, 2 – somewhat relevant, 3 – quite relevant, and 4 – highly relevant. The 'relevance rating score' was calculated based on the number of items rated by the experts, and the content validity index (CVI) was computed according to the proportion of experts that rated the item's relevance at either three or 4 on the scale. The Scale-level Content Validity Index (S-CVI), was accepted at CVI > 0.80 (Polit & Beck, 2012). The average degree of relevance for the questionnaire items used in this study was 80%, which indicates that the Arabic version of the CSEQ was an accurate reflection of the English version. The CVI was found to be 1.0, which also indicates an excellent level of content validity for the Arabic version (Polit & Beck, 2012).

Reliability

Using the IBM SPSS application version 22, the researcher evaluated the test-retest reliability. A value of more than 0.7 is considered acceptable but more than 0.8 is

preferred (Pallant, 2010). Test-retest stability was measured by the Intraclass Correlation Coefficient (ICC), which is the proportion of total variation that is between-subjects variation, ICC is considered acceptable if it is equal to or greater than 0.7 (Terwee et al., 2007). According to Shoukri, Asyali, and Donner (2004) many factors determine the sample size for evaluation of test-rest reliability such as, number of raters, number of subjects, confidence interval, cost, and time for data collection. Based on the number of raters the planned ICC is between 0.7- 0.9 and to minimize the variance of ICC, 50 to 58 participants is sufficient for implementing test-rest reliability. Hence, the researcher decided to recruit 80 participants to complete the Arabic version of the CSEQ. All participants had been diagnosed with CHD, were 18 years old or over, and were able to read and write in Arabic. The researcher distributed the CSEQ to each participant at two different time points: directly after their enrolment in the study, to complete the CSEQ independently after admission to the medical unit, and 24-48 hours after receiving the first questionnaire. The participants completed and returned the questionnaire after 10-30 minutes. The period between the first and second administration of the CSEQ to the participants was two days, and the researcher ensured that no interventions were applied that might have been able to increase self-efficacy between the two administrations.

The Cronbach's alpha score for the Arabic version of the CSEQ was 0.846. This is consistent with a similar study of the Thai version of the CSEQ (0.92) (Saengsiri et al., 2013), including the original study, 0.90 for the control of symptoms subscale, and 0.87 for the maintenance of function subscale (Sullivan et al., 1998). The internal consistency of all CSEQ items was greater than 0.7. Moreover, the internal consistency of the three individual parts of the CSEQ ranged from 0.711 to 0.841. For the first subscale, which focuses on controlling symptoms (8 items), Cronbach's alpha was 0.841. For the second subscale, which considers the maintenance of function (5 items), it was found to be 0.715 and for the third subscale, which comprises three items related to a healthy lifestyle, it was calculated as 0.711, (Table 3.4). The researcher evaluated the test-retest reliability of the CSEQ by using two-way mixed ICC. The ICC score for the Arabic version of the CSEQ was 0.929. The ICC for the

three subscales of the CSEQ ranged from 0.835 to 0.895, the ICC values of ≥ 0.5 are considered good (Pallant, 2010), (Table 3.3).

Table 3.3

The Arabic Version of CSEQ Subscales Test Retest Reliability and Internal Consistency

CSEQ and Subscale	Range	Cronbach's alpha	ICC (95% CI)
CSEQ (All subscales)	0-64	0.846	0.929 (0.889- 0.954)
Subscale 1: Control symptoms part	0-32	0.841	0.895 (0.837-0.933)
Subscale 2: Maintain function part	0-20	0.715	0.845 (0.758- 0.901)
Subscale 3: Healthy lifestyle part	0-12	0.711	0.835 (0.742- 0.894)

3.7 Conclusion

Self-efficacy has different types of questionnaire, such as general or disease-specific questionnaires, in addition to phase-specific self-efficacy questionnaires. CSEQ is one of the most widely used disease-specific questionnaires. Therefore, the researcher selected the CSEQ for use to measure self-efficacy in the present study. However, there is no available Arabic version of CSEQ. Therefore, the researcher applied the WHO process of translation to produce an Arabic version of the CSEQ. The researcher successfully translated and cross-cultural adapted the Arabic version of the CSEQ. Further, the evaluation of the Arabic version of CSEQ showed to be a valid and reliable tool.

Chapter Four: Methodology and Method

4.1 Introduction

The previous chapter presents an overview related to self-efficacy, behaviour change theory and measuring self-reported self-efficacy. In addition, a description of the translation process of the CSEQ (study phase one) and validity and reliability testing were presented. This chapter begins with methodology and research method of the study phase two. In addition, the chapter provides a description of a pilot study and an explanation of the data collection procedure in chronological order. Finally, the chapter presents a section on data management and a summary of the chapter.

4.2 Methodology

Research Paradigm

Both research paradigms and philosophy influence the research methodology. It is important to explore them to select and use an appropriate study design and data collection procedure. A paradigm has been defined as “the basic beliefs, systems, or the world view that guide the investigation, not only in choice of methods, but in ontologically and epistemologically fundamental ways” (Denzin & Lincoln, 1994, p. 105). According to Teddlie and Tashakkori (2009), researchers in the social and behavioral sciences use one of three main categories: quantitatively oriented, qualitatively oriented, and the mixed methodology. After reviewing these approaches, the researcher considered the use of quantitative method was essential to meet the study’s objectives.

Quantitative approaches using positivist research methods include tests and experiments, which can be controlled and used in measurements to support a hypothesis. If such an approach is included in the research, control involves imposing conditions on the research situation so that bias is minimised and precision and validity are maximised (Polit & Beck, 2012). In addition, this approach reduces research topics as far as possible to simple questions with quantifiable answers. For

example, if the researcher is interested in exploring the relationship between diet and cardiac disease, quantitative approaches consider many steps to control other variables that contribute to cardiac disease, such as stress or smoking. The results are analysed to produce quantifiable, statistically significant data. The results of quantitative research are intended to be generalisable (Polit & Beck, 2012).

The study used the quantitative method, as the researcher believes that the analysis of the changes in and the relationship between self-efficacy and PA level among patients with AMI in the early recovery phase is feasible through using questionnaires and body-worn activity monitors. The questionnaires and research tools used in the study are valid and reliable for the purposes of collecting the data, and are sufficient to meet the study's aims. Further, there was no need to implement interviews with the participants.

4.3 Method

The principles of Bandura's self-efficacy theory underpinned the present study. This study used a descriptive repeated measures design. The sample consisted of all patients admitted to a Jordanian Coronary Care Unit (CCU) with a confirmed AMI after receiving treatment with either PPCI or thrombolytic therapy. The researcher used the Arabic version of the CSEQ to measure self-efficacy. The researcher gave the CSEQ to patients at three time points: baseline, 2 weeks (Time 1), and 6 weeks (Time 2) after hospital discharge. In addition, PA was measured using a body-worn activity monitor (activPAL3™ monitor). Patients were asked to attach the activPAL3™ monitor to their leg and wear the device for one full week at two different time points Time 1 (2 weeks) and Time 2 (6 weeks) after hospital discharge. This study thereby supports health policymakers in establishing future cardiac management programmes by addressing the importance of self-efficacy and PA among patients with AMI, in order to help patients with AMI to increase their adherence to PA after treatment in the early recovery phase.

The activPAL3™ data were downloaded by the activPAL3™ software application package version 7.2.32, and the data were then moved to Microsoft Office Excel

2010 spreadsheet software. Subsequently, the collected numerical data were analysed using IBM SPSS version 22, comparing each group of data at Time 1 and Time 2 by using paired t-test, and using repeated measures ANOVA to compare more than two groups of data. The researcher used the Pearson or Spearman correlation coefficient to determine the relationship between self-efficacy and PA level and carried out further analysis using the MATLAB 2015 application for calculating PA patterns.

4.3.1 Study Setting

The implementation of the study was at JUH, Amman, Jordan. JUH is one of the most specialised, advanced technological medical centres in the public sector, and is a tertiary hospital with over 500 beds. JUH patients include people who are referred to the hospital by the MoH, employees of the University of Jordan and their dependents, and the employees of private firms with whom JUH has contractual agreements, as well as some independent private patients. JUH receives patients' referral from almost all the cities in Jordan. It holds 5.8% of the total number of hospital beds in Jordan and accounts for 4.6% of all hospital admissions (MoH, 2014). JUH has an occupancy rate of 77% and employs 2% of the physicians in Jordan (MoH, 2014). Therefore, the researcher chose JUH to collect the study data, as it is one of the largest hospitals in Jordan and receives patients with AMI referrals from cities across the country.

The CCU consists of 12 beds. JUH performs more than 4,000 cardiac catheterisation procedures annually, including coronary angiography, PCI, PPCI procedures and CABG operations. In addition, the JUH includes two cardiac catheterisation laboratories and six cardiac outpatient clinics. Once patients with AMI are medically stable, they are transferred to - a regular unit- the Medical Cardiac Unit (MCU). The MCU consists of 52 beds. In addition, the MCU receives many patients with other cardiac conditions, such as heart failure, patients with cardiac arrhythmias and HTN. The researcher recruited all patients from the CCU and the MCU. Therefore, the

researcher decided to collect the data from JUH, because the JUH could enable the research to recruit the sample required for the study.

4.3.2 Background to the Cultural Context of Jordan

This section aims to provide an overview of the research context, which is Jordan. In order to gain an in-depth understanding of the study findings, it is pertinent to explain the findings in their socio-cultural context and in relation to the lifestyle in Jordan. Thus, this section sheds some light on Jordan's modern history, the demographic data and cultural aspects, including the economic and in addition, an explanation of the health care system.

4.3.2.1 Jordan and its Position in the Global Context

1921 marked the end of Ottoman and the Transjordan Emirates of Jordan was established (Al-Ramahi, 2008), Jordan gained its independence from Britain in 1946 (Cleveland & Bunton, 2016). Tribalism still has a major role in the political, social and cultural life of Jordan, in order to protect the norms and traditions of the Jordanian community (Al-Ramahi, 2008), such as social activities and marriage. The culture of Jordan and its organisation are very similar to those of the Arab world in general.

Jordan is located in the Middle East with the West Bank to the west, Syria to the north, Iraq to the east and Saudi Arabia to the east and the south (Figure 4.1). Jordan is a small Arab country in the Middle East, covering 89,318 square kilometres, almost equal to an area of Scotland. Administratively it is divided into twelve governorates: Ajloun, Aqaba, Balqa, Karak, Mafraq, Amman, Tafila, Zarqa, Irbid, Jerash, Ma'an and Madaba (Department of Statistics/ Jordan, 2015).

Arabic is the predominant spoken language, and Arabs used it extensively in conversations and in daily life. Approximately, 430 million people throughout the Middle East and North Africa speak Arabic (Roudi-Fahimi & Kent, 2007). In Jordan, English is taught to all students and is widely spoken (Department of Statistics/ Jordan, 2015).

Figure 4.1 Map of Jordan (downloaded from www.emapsworld.com)

4.3.2.2 Population

2014 statistics show that the total population of Jordan was 6.7 million - 82.6 % of the population was classified as urban, with the majority (70%) concentrated in three main regions: Amman - the capital (35% of the country's population), Zarka, and Irbid, whilst the rural population makes up 17.4%. The population density was 7,532 persons/km^2 (Department of Statistics/ Jordan, 2015). The family size is decreasing since 1979 to about six members per family. Kinship relationships are patriarchal, and extended family ties govern social relationships and tribal organisation (Al-Ramahi, 2008).

The population is growing rapidly, at a rate of approximately 2.2% every year, and it is a relatively young population, with about 60% aged between 15 and 64 years and only 3.2 % of the population being over 65. The percentage of the total population who are male is 51.5 % (Department of Statistics/ Jordan, 2015). The birth rate is 28 per 1000 and the death rate is 6 per 1000 (Department of Statistics/ Jordan, 2015).

The life expectancy of the Jordanian population is estimated to be 72.4 years for men and 76.7 for women (MoH, 2014), which is less than some other countries, for example the UK - 79 years for men, and 82 for women (WHO, 2009).

Jordan is predominantly an Islamic country. The majority of Jordanians are Muslim (92%), with only 6% being Christians (Department of Statistics/ Jordan, 2015). The culture of Jordan is based on both Arabic and Islamic elements with significant Western influence (Al-Ramahi, 2008). Islamic rules shape most Arabic cultural and social values, which then shape most traditional lifestyle values and customs, including values associated with communication. Many Jordanian laws such as those of a hereditary nature or related to marriage are based on the Quran and the Hadith (a collection of Mohammed's sayings). The most important Muslim practices are the Five Pillars of Islam. One of the five essential Pillars practiced by Muslims is the recitation of prayers five times a day (Salat). Mosques announce calls to prayer publicly.

The month of Ramadan, the ninth month of the Islamic calendar, is a time of fasting from sunrise until sunset (The Holy Quran, Sura 2: Versus 183-185). Most public restaurants do not open for business until just before sunset. Therefore, during the month of Ramadan, the lifestyle changes, and most people are awake at night (during which they are permitted to drink and eat) and asleep in the afternoon (during which they are fasting from drinking and eating).

Jordanian people hold traditional opinions regarding the social roles of males and females and believe that men are responsible for providing the family income and making financial decisions while women's primary role is housework and childcare. This patriarchal structure is a cultural lifestyle born of Jordanians' values, beliefs, and norms, which therefore justifies male dominance in all social spheres (Al-Ramahi, 2008). According to this perspective, men's dominance is encouraged in all social organisations, especially the families (Khalaf et al., 2010).

4.3.2.3 Socio-Economic Development

The Jordanian individual income is classified falling in the lower-middle income group, the country has an income per capita of 5,815 US$ (WHO, 2015d), which is lower than many other countries, such as the UK, which sits at 37,340 US$ (WHO, 2012b). The retirement age is 60 years, but the early retirement age in Jordan can be 50 years for both men and women (Social Security Corporation/Jordan, 2014). The average wage for males is 673 Jordan Dinar and for females, it is 607 Jordan Dinar. The percentage of female workers is 23.9%. Unemployment among the Jordanian labour force over the age of 15 years runs at 11.9% (males 10.1% and females 20.7%) (Social Security Corporation/Jordan, 2014).

The climate of Jordan is of the Eastern Mediterranean type, which is characterised by being hot and dry in summer, cold and humid in winter, with annual average temperatures ranging from 12 to 25°C and summertime highs reaching 40°C in the desert regions (United Nations Development Programme, 2013). Jordan's only seaport is Aqaba. Jordan suffers from a shortage of water, and indeed this is the gravest environmental challenge that Jordan faces today. Water is the decisive factor in the population/resources equation. On a per capita basis, Jordan has one of the lowest levels of water resources in the world (United Nations Development Programme, 2013).

The transportation system in Jordan comprises roads, airports, and one port. There are conventional buses and extensive fixed-route "servis" (share-taxis, up to five passengers) in the main cities. The servis are licensed, with a standard fare scale (ranging from 0.3 to 7 US$ for each inter-city trop and 0.2 to 0.5 US$ for intra-city travel) (Land Transport Regulatory Commission, 2016), but there are no fixed pick-up or set-down points. Buses are the main means of inter-city transport in Jordan (Land Transport Regulatory Commission, 2016). There are no longer any scheduled passenger trains running in Jordan.

4.3.2.4 Healthcare Sector in Jordan

Jordan has one of the most modern healthcare infrastructures in the Middle East (MoH, 2014). The healthcare sector In Jordan consists of 104 hospitals, which are divided into four main sectors: MoH (public hospitals), Royal Medical Services (military hospitals), university teaching hospitals and the private sector (MoH, 2014). MoH is the major single institution financing and providing healthcare services in Jordan (Department of Statistics/ Jordan, 2015). The MoH owns and operates 29 hospitals in 11 governorates, with 3,456 hospital beds, accounting for 37% of total hospital beds in Jordan. In terms of utilisation, 43% of inpatient care and 45% of outpatient care occurs within its hospitals (Department of Statistics/ Jordan, 2015). Second: Royal Medical Services mainly provide secondary and tertiary care services. The Services have has 10 hospitals (7 general and 3 specialist), with 1,801 beds, representing 19% of the hospital beds in Jordan with an occupancy rate of 79% (Department of Statistics/ Jordan, 2015). Third: private sector accounts for 36% of hospital beds and 56% of hospitals with an occupancy rate of 46.2% (MoH, 2014). In addition, the private sector employs 61.8% of all physicians, 93% of all pharmacists, 71% of all dentists, and 52% of all nurses. This sector continues to attract significant numbers of foreign patients from nearby Arab nations (MoH, 2014). Forth: university teaching hospitals include two hospitals: King Abdullah University Hospital. The total bed capacity of the hospital is 650 beds (MoH, 2014). The hospital serves as a referral hospital for all public sector hospitals in the Northern Region. More than 85% of the hospital admissions are for patients referred by the MoH and the Royal Medical Services. The second university teaching hospital is JUH. JUH was established in 1971 under the name of Amman Grand Hospital, and was renamed JUH in 1975 after it was affiliated with Jordan University and its medical school (MoH, 2014). Though the healthcare system in Jordan consists of these four main sectors, none of these sectors has a well-structured cardiac rehabilitation programme (Eshah, 2011).

The total expenditure on health services per capita in 2014 was around 798 US$, 7.5% of the gross domestic product, which is considered high. In the UK, for example, in 2014 the total expenditure on health services per capita accounted for about 3,377

$ US, which was 9.1% of the gross domestic product (WHO, 2015e). The physician and nurse ratios per 10,000 heads of population were 30 and 39 respectively (Department of Statistics/ Jordan (2015). For comparison, the equivalent UK statistics for physician and nurse ratios were 27 and 81 per 10,000 respectively (WHO, 2009). Although Jordan has a lower proportion of nurses, then, it has a slightly higher proportion of physicians than the UK.

In conclusion, this section provides an explanation of the context of this study. It is vital to be aware of cultural and socio-economic considerations within Jordan, as these influence the results and, subsequently, the discussion. Although many factors enable individuals to increase PA level such as, religion and weather, other factors, such as conservative norms and transportation systems decrease PA levels among the Jordanian people. In addition, the health care system needs to face many challenges and needs more improvements.

4.3.3 The Sampling Process and Sample

Sampling is the process of selecting a portion of the population to represent the entire population (Polit & Beck, 2012). A sample is a subset of population elements, and sampling design is classified as either probability sampling, which involves random selection in choosing the elements and each element in the population has an equal, independent chance of being selected, or non-probability sampling, which involves non-random selection, and some elements do not have a chance of being included (Polit & Beck, 2012).

There are several approaches to sampling: probability sampling, such as simple random sampling, stratified random sampling cluster sampling, and systematic sampling, in addition to non-probability sampling such as convenience sampling, quota sampling, consecutive sampling, and purposive sampling. Although the JUH receives patients with AMI from all cities in Jordan and all patients with AMI have the opportunity to participate in the study, convenience sampling was chosen because this is used primarily when the participants are conveniently available and accessible (Polit & Beck, 2012). Data were collected between March and December 2015.

However, consecutive sampling might be considered if the researcher collected the data from other major hospitals in Jordan. In conclusion, this study focused on particular characteristics among patients with AMI that were of interest according to the inclusion and exclusion criteria, which best enabled the researcher to meet the research objectives. Hence, the researcher decided to select convenience sampling as a sampling method in order to help meet the study objectives.

Sample Size

Convenience sampling, a form of non-probability sampling, was utilised in this study. The researcher recruited one hundred patients with AMI from JUH for the purpose of assessing self-efficacy and measuring PA behaviours. A preliminary power analysis was conducted to determine the numbers needed for the proposed analysis in this study (Polit & Beck, 2012).

Based on a similar study of cardiac self-efficacy conducted by Sarkar et al. (2009), the mean cardiac self-efficacy score at Time1 would be 30 out of 60 and the proposed difference of 5, to give us a mean cardiac self-efficacy score at Time 2 of 35 out of 60, which would be clinically significant. The standard deviation for this measure is 14. Using this power analysis calculation showed that 82 participants would be needed for 80% power to show the association between self-efficacy and free-living habitual PA variables.

No previous studies used body-worn activity monitors among cardiac patients in Jordan. Therefore, the rationale for the sample size in this study was informed by power calculations adopted in previous studies that used body-worn activity monitors among cardiac patients (Cowie et al., 2011). From looking at published data, the researcher proposed that mean steps per day at Time 1 would be 2,000 and change in mean steps per day would be 500 in Time 2. The standard deviation (SD) for this is 1,000, and a power analysis concluded that 32 participants are required for 80% power.

To account for attrition, the researcher added an additional 20% to the calculated sample size. Consequently, 82 patients are enough to form a suitable target sample. Therefore, the researcher decided that 100 participants would be an appropriate

sample size, as it allowed for dropout. In addition, the power analysis indicated that a sample of 100 patients with AMI would be sufficient to show changes in self-efficacy and PA behaviours at two time points, Time 1 and Time 2, and to assess the relationship between these two variables, with a significant interval of 5% and a 95% confidence interval level.

Inclusion Criteria

All patients admitted to the CCU of the JUH with a confirmed first diagnosis of AMI, using standard ESC criteria (Thygesen et al., 2012), were eligible for the study. It was also necessary that participants were over 18 years old, able to read, comprehend and write in Arabic, be medically stable (free of chest pain, haemodynamically stable, clear site of catheterisation and transferred to the MCU), and willing to give informed consent.

Exclusion Criteria

The researcher excluded any participants with illness or an injury that might prevent them from participating in the regular daily PA, such as joint-replacement surgery less than three months previously, lower back pain or surgery or other musculoskeletal problems, which might impede free-living PA. The researcher also excluded participants if they met any of the following criteria:

- Patients with AMI with heart failure (ejection fraction of less than 35%) (McMurray et al., 2012)
- Patients with other cardiac disease, such as valvular disease or pericarditis
- Other co-morbidities (life-threatening, infectious, uncontrolled or exacerbated by PA)
- Patients have mental health problems or learning disabilities.

4.3.4 Tools for Data Collection

This section provides a detailed discussion of the research tools used in this study, including a demographic data sheet, a medical-record data sheet, a CSEQ, a body-worn activity monitor, and a daily diary for chest pain.

Sociodemographic Data Sheet

A sociodemographic data sheet is a single form designed by the researcher for this study (Appendix D). The recruited patients completed the document in order to obtain demographic information about their age, gender, marital status, educational level and employment status. These data helped the researcher to identify the participants' characteristics. The researcher assessed the homogeneity of the sample in each group in the demographic variables. In addition, the research compared the difference of the sociodemographic data between the participants of the study and the patients with AMI who refused to participate in the study. The researcher collected this data once at baseline time only.

Medical-Record Data

The researcher recorded medical data, such as the patients' diagnosis date and type of treatment, for example PCI, PPCI, and medical therapy from the patients' files. The researcher upon arrival at the OPD obtained the patients' BMI. The researcher calculated BMI manually. BMI = weight (kg) / [height (m)]^2. The researcher calculates the BMI through dividing the individual's weight in kilograms by the square of their height in metres. BMI is simple to obtain and has been shown to be a reliable tool for assessing overweight compared to other measurements (CDC, 2015). The researcher used the weight and height scales available in the outpatients' cardiac clinic.

The Cardiac Self-Efficacy Questionnaire

Self-efficacy levels were measured by using a validated and reliable self-reporting CSEQ with Cronbach's alpha scores of 0.90 for control symptoms and 0.87 for maintenance function themes (Sullivan et al., 1998). CSEQ is used widely in the

literature for assessing self-efficacy patients with cardiac disease (Allahverdipour, Asgharijafarabadi, Heshmati, & Hashemiparast, 2013; Fors et al., 2015; O'Neil et al., 2013; Sarkar et al., 2009; Sol et al., 2011). In addition, CSEQ is a disease-specific self-efficacy questionnaire that can provide accurate information regarding patients with AMI ability when they have to accomplish disease-specific situations.

After obtaining permission from the Author (Appendix B), the researcher translated the self-efficacy questionnaire from the original English version into Arabic, in order to make it conceptually equivalent for the targeted sample. Before using the translated CSEQ, evaluation of reliability and validity tests showed that, the Arabic version of CSEQ is valid and reliable with Cronbach's alpha scores of 0.85, (see section 3.6.5).

Daily Diary for Chest Pain

According to Bandura, physiological and affective states are one of the four sources of self-efficacy, as individuals usually rely on their somatic and emotional condition when judging their capabilities. The researcher interpreted patients experiencing symptoms such as chest pain as a sign of susceptibility to lower performance ability. Hence, the researcher developed and used a daily diary for chest pain, which made note of factors such as the duration of chest pain, frequency and intensity at Time 1 and Time 2, as a tool to measure physiological and affective states (Appendix E). The researcher asked all participants to complete this daily dairy, and in the event that they did not feel pain, to return the daily diary with a blank entry. The participants completed the daily diary for chest pain if they felt chest pain. They described the pain, such as the pain for 2 minutes, once per day and 2/10 intensity. In order to link these data with changes in PA of participants, the daily diary for chest pain was returned along with the activPAL3™ monitor and CSEQ.

Using the activPAL3™

The activPAL3™ monitor (PAL Technologies.Ltd. Glasgow. Scotland) is a single thigh-mounted accelerometer-based device, as shown in Figure 4.2. The activPAL3™ monitor measures bodily acceleration using a triaxial accelerometer, it also incorporates an integrated microprocessor, which performs data reduction and

manages data storage. The activPAL3™ monitor is worn at the midpoint of the anterior aspect of the thigh; it is lightweight (15 g) and small (53×35×7 mm). The activPAL3™ monitor is attached to the skin using a PAL*stickie*™. These are self-adhesive patented dual layer hydrogels that are recommended for the attachment of the activPAL3™ monitor. Participants also use an additional waterproof bag to cover the adhesive pad in the case of exposure to water. The activPAL3™ data outcome presents the data in different colours, such as red for walking, green for standing and yellow for sitting/lying positions across the measurement days and hours (Figure 4.3 and Figure 4.4).

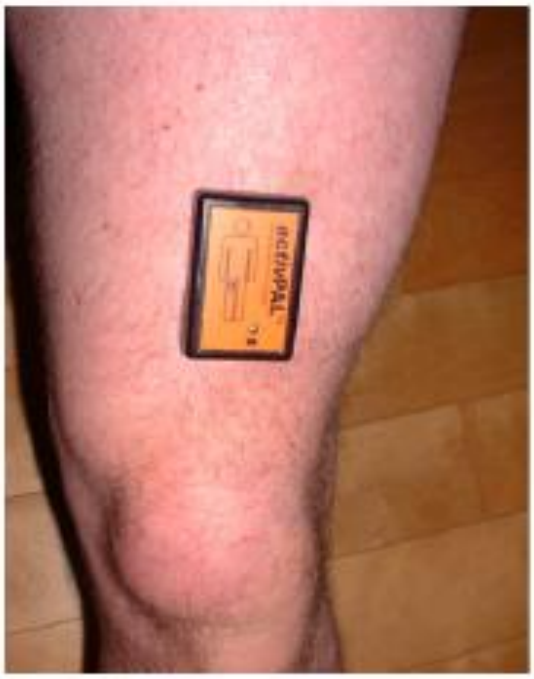


Figure 4.2 activPAL3™ body-worn activity monitor downloaded from (Clarke-Moloney et al., 2007, p. 489)

When the monitor was first put on by the researcher, all participants were given written and verbal instructions about the fact that the monitor had to be removed temporarily during periods of showering, bathing, or swimming. In normal circumstances, the activPAL3™ monitor is small and very light and does not interfere with normal activity or work. However, occasionally a participant was uncomfortable

or unhappy wearing the monitor. If this occurred, the researcher advised the participant to take off the monitor for a short period. The participant also had the option to take the device off and end data collection.

The activPAL3™ monitors were used to measure PA in this study. Each participant was provided with an activPAL3™ monitor and a detailed demonstration of how to wear and remove the device (Appendix F). Participants were instructed to attach the activPAL3™ monitor for a full seven days at two time points, two weeks and six weeks after hospital discharge, for 24 hours per day (including when sleeping), and only to remove the device before swimming or doing any other water-based activities. The activPAL3™ monitor instructions and guidelines were given to the participants when attaching the activPAL3™ monitor in the outpatient clinic at two weeks and six weeks.

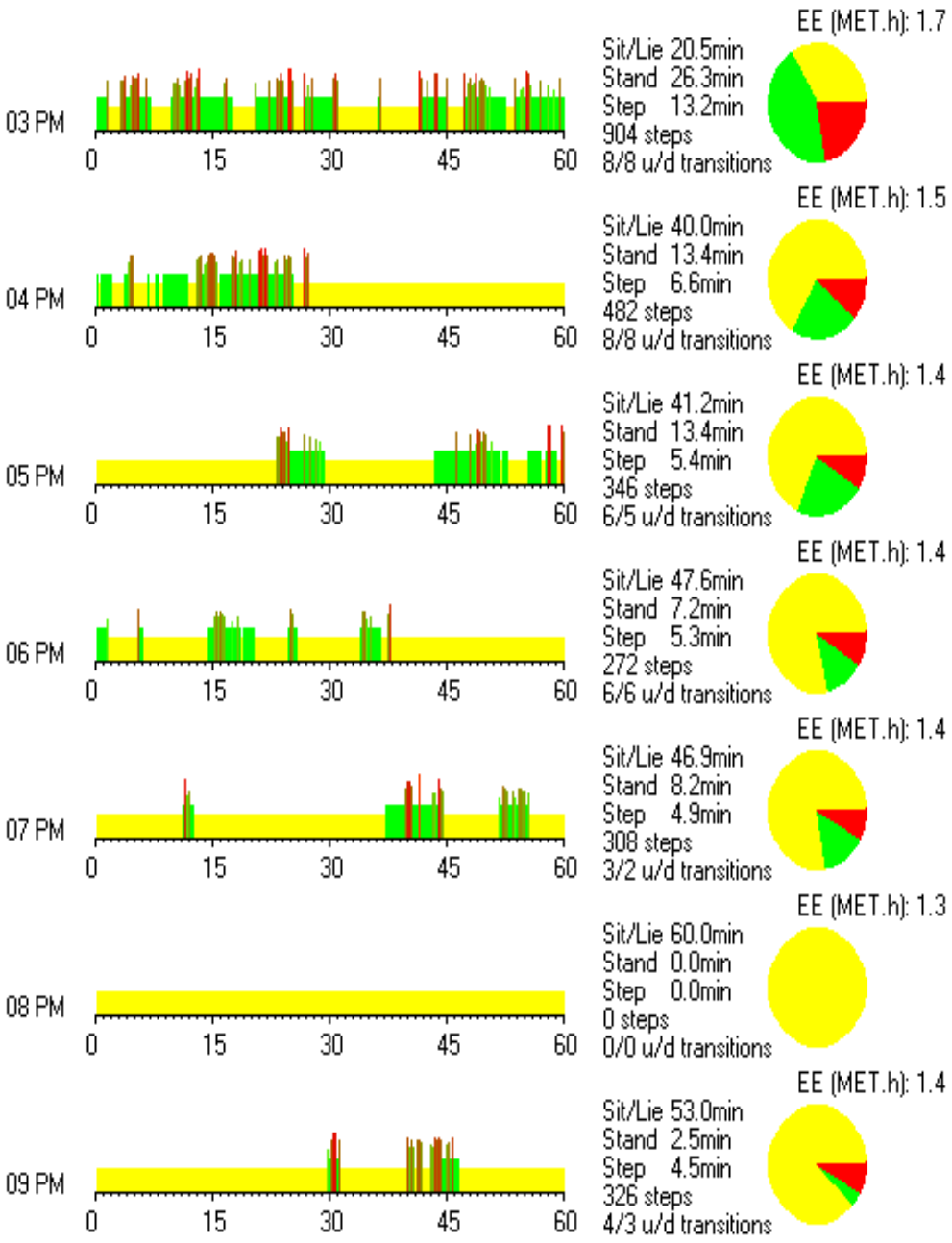


Figure 4.3 Example of downloaded activPAL3™ monitor data (hourly)

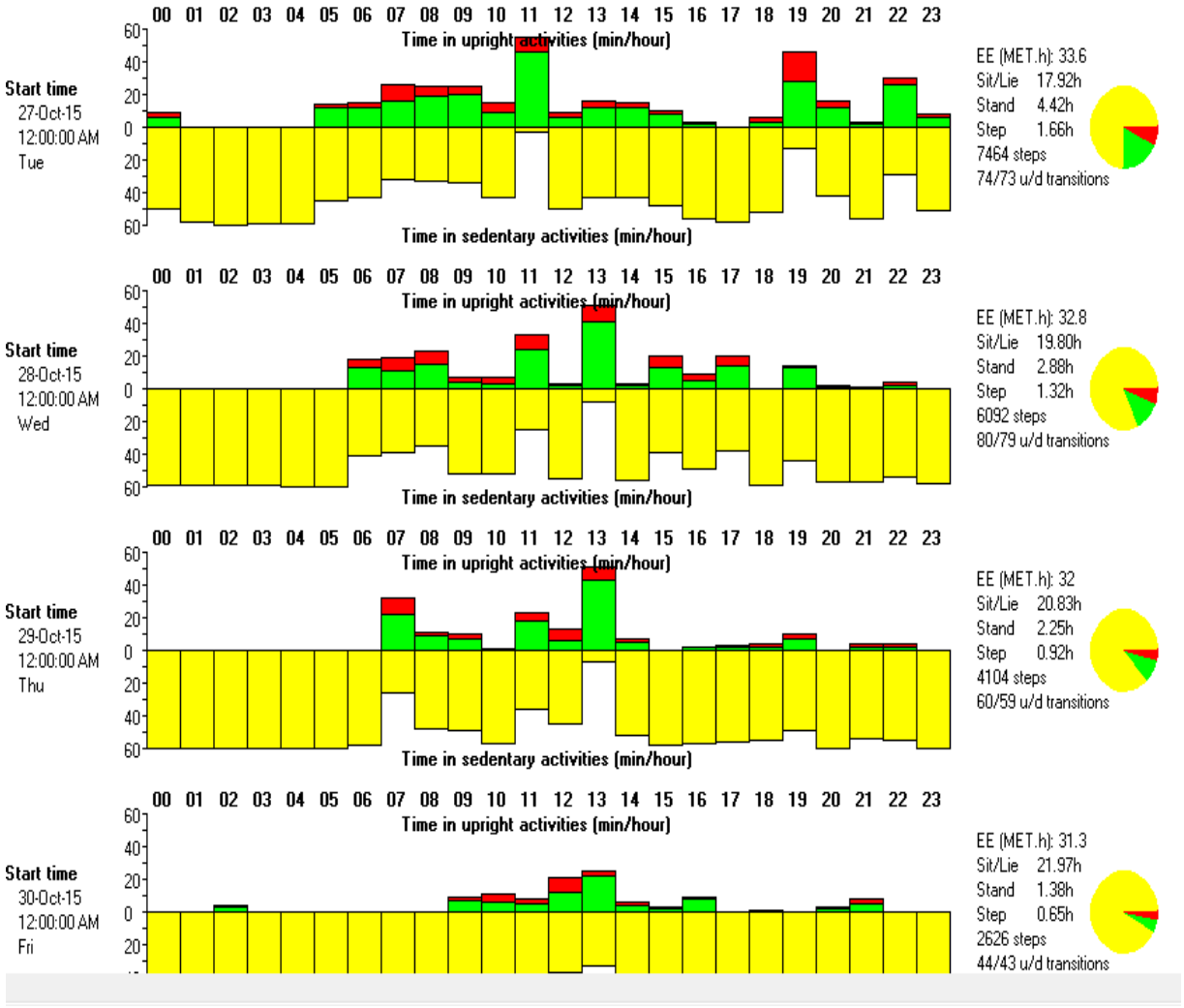


Figure 4.4 Example of downloaded activPAL3™ monitor data (daily)

Charging and Programming the activPAL3™

The activPAL3™ is able to record data for up to 14 consecutive days, powered by an internal rechargeable battery. A docking station recharges the device through connecting a docking cable from the docking station to a USB port on a computer. Then the activPAL3™ device is placed in the docking station, which has slots for programming, data transfer, and charging. Complete charging takes around 3 hours. An orange light on the device shows when the battery is charging and switches off to indicate that the device is fully charged.

Prior to use on a participant, a fully charged activPAL3™ is programmed to start recording new data. Programming the device requires the use of the activPAL3™ software application. The researcher downloaded the activPAL3™ software application from the activPAL3™ company website and installed it on a personal computer. After installing the software, the programming of the device occurs through connecting the device to the computer via a USB port using the station docking cable. The researcher starts the activPAL3™ software application, selects “Communicate with activPAL3™” from the “File” menu, and presses the “reprogram and clear memory” button. After the clearing the memory, the reprogrammed device starts recording immediately. A series of rapid flashes indicates that the device is programmed and ready for use. The researcher could use the activPAL3™ software application to program the device in order to start recording later, according to the planned start date and time. Throughout the duration of the device’s recording of a participant, a green light flashes every three seconds to indicate that the device is active and recording.

The Placement of the activPAL3™

Once the activPAL3™ monitor is charged and programmed, the device is attached to the patients. The activPAL3™ is placed directly on to a patient’s skin on their mid-thigh. The researcher then secures the monitor in place with a small hypoallergenic adhesive gel patch (hydro gel) “PAL*stickie*™”. The researcher further secured the device through applying a transparent sticky film (Tegaderm) over the top. The activPAL3™ monitor is then worn continuously for the required duration of monitoring. During monitoring, the patient can continue wearing the device while carrying on with normal free-living activities during the day and during periods of sleep overnight. However, the waterproof bag was not used in this study to protect the activPAL3™ monitor. Accordingly, the participants need to remove the monitor during any exposure to water-based activity.

activPAL3™ Data Download

The device was then inserted into the docking station and connected via the USB cable to the computer on which the activPAL3™ Professional software was installed. From the “File” menu, the researcher selected “Communicate with activPAL3™”, and, once a connection had been established, pressed the “download stored data” button to save the recorded data on to the computer. The data download usually took a few seconds to complete. The saved raw activPAL3™ file for each patient was identified by an anonymous code for further analysis.

The activPAL3™ monitor provides step counts and posture classification. The activPAL3™ monitor output data classifies body posture as sitting/lying, standing and stepping, through determining the inclination of the thigh, whether the wearer’s thigh is horizontal, as in sitting or lying, or vertical, as in standing or walking, as shown in Figure 4.5. In addition, the activPAL3™ monitor provides an assessment of PA in terms of energy expenditure, based on default values of metabolic equivalent. At the end of data collection, the activPAL3™ monitor data can be downloaded, via a connector to a computer, in the form of daily and hourly activity, which is classified as time spent sitting/lying and standing and stepping. Then the data is stored, processed and retrieved by special activPAL3™ application software.

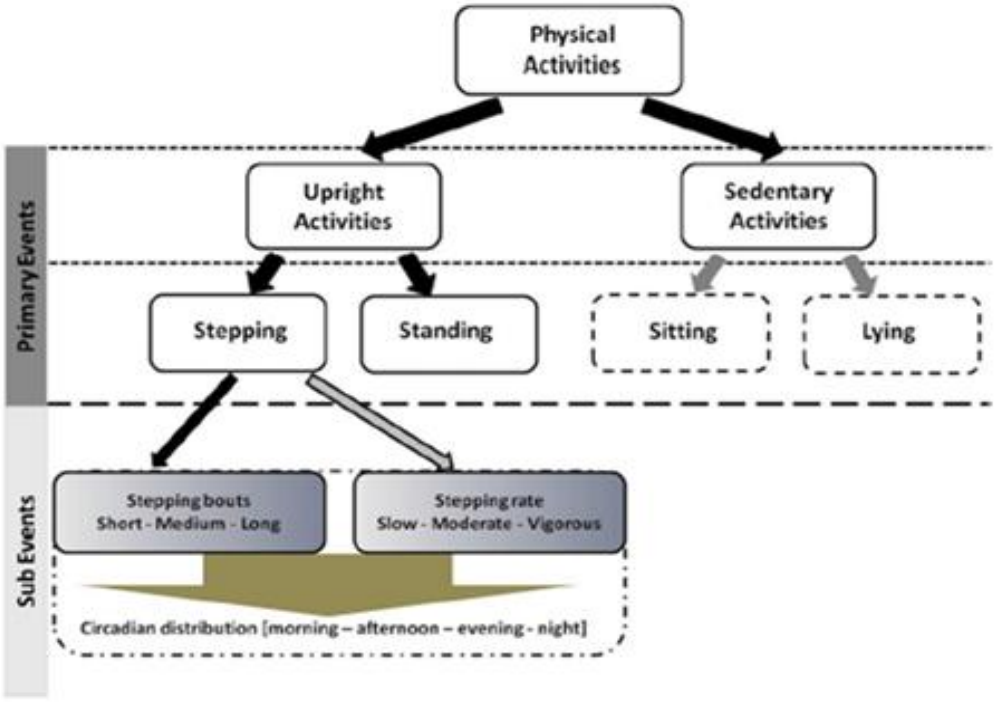


Figure 4.5 Physical activity behaviour categories (Granat, 2012, p. 1787).

4.3.5 Pilot Study

The researcher conducted a pilot study for four reasons: first, to evaluating the feasibility of the proposed PA study, second, assessing the appropriateness of the research design and questionnaires, third, testing the clarity of the Patient Information Sheet (PIS) (Appendix G) and consent form (Appendix H). Forth, gaining information about the rate of recruitment and identify any barriers to recruitment. The University of Salford and JUH in Jordan offered ethical approval permission to start the study.

The researcher randomly identified a total of 10 patients with AMI from the CCU at JUH. According to the same inclusion and exclusion criteria of the study, the researcher identified seven of these 10 patients as being eligible for the pilot study process. Their ages ranged from 42 to 68 years. Two of these patients were not willing to participate in the study. The researcher therefore contacted the remaining five patients (3 men and 2 women). After their transferred from the CCU to the MCU, the researcher met the participants in the meeting room in the MCU, and the

researcher explained the aims and importance of the study, the participants' role and patients' information confidentiality, the five participants agreed to take part in the study and signed the informed consent. All participants completed the questionnaire and the activPAL3™ monitor measurements as prescheduled.

4.3.6 Data Collection

The researcher implemented the study in the JUH with patients in the early recovery phase. Study data were collected via a self-reporting CSEQ, a socio-demographic data sheet, medical records and an activPAL3™ monitor. To fulfil the study requirements, data collection lasted approximately nine months, excluding the month of Ramadan, a month of fasting, when many changes in people's lifestyle, eating habits and physical activities occur. The data collection procedure began in March 2015 and ended in December 2015.

The researcher held individual meetings with the head of the cardiology department and the JUH director of nursing units to explain the study objectives, design and methods, including the health professional team role of introducing the study to eligible and willing patients. The researcher then gave informal explanations and an outline of the purpose of the study to the CCU and MCU nurses.

Following research ethics and governance approval, the researcher initially contacted the potential participants and the CCU nurses distributed an invitation letter (Appendix I). The CCU nurses approached all eligible patients with AMI admitted to the CCU about collecting data for the study. The researcher provided verbal and written explanations of the study, as well as the PIS and a consent form, once the patient gave outright approval. The PIS outlined the study's purpose, methods, ethical approval, the participation's risks and benefits, information confidentiality, contact details of the researcher and explained that participation in the study was voluntary. The general objective of the PIS was to confirm that each willing participant understood the circumstances of the study before deciding whether or not to participate in it (Bateman, 2002). The researcher provided eligible and willing patients with 12 hours to reflect before deciding whether to participate or not. Then, the

researcher asked willing participants to sign a consent form, thus granting their informed and written consent.

Data Collection Procedure

Arrangements for the pre-data collection procedure were as follows. All patients diagnosed with AMI who were willing to participate were included in the study. Nurses working in the CCU approached and identified patients with AMI after admission to the CCU between March and December 2015.

The researcher reassured participants that their participation was entirely voluntary, that all information would be confidential, that all participants' privacy, respect and dignity would be carefully considered, and that participants could withdraw from the study at any time, without having to give a reason. The researcher also informed them that all participants' information is confidential and kept for three years after the study for further analysis.

Day 1: Admission to CCU: CCU nurses provided all eligible patients diagnosed with AMI with a PIS 24 hours after admission, if they were stable. After receiving the PIS, the CCU nurse asked patients with an AMI for a decision about participating in the study. When the patients with AMI were haemodynamically stable, such as being free of chest pain, the CCU nurses transferred the patients with AMI to the MCU, where post-PCI patients in a stable health condition can stay. Only if eligible patients with AMI were willing to participate did a CCU nurse contact the researcher.

Days 2 and 3 (after transfer from CCU to MCU), 24 to 48 hours after admission after the patients had received the PIS and were willing to proceed, they met with the researcher in a prescheduled meeting room in the MCU. The researcher scheduled meetings depending on the availability of a meeting room, the patients' readiness and the researcher's availability. During the meetings, the researcher introduced himself and briefly explained the study, its objectives and phases, and the participants' role. At this point, the researcher requested informed consent. Willing participants signed a consent form to enrol in the data collection process at both 2 weeks (Time 1) and 6 weeks (Time 2) after hospital discharge. After patients had signed the informed

consent form, the researcher gave the CSEQ and the socio-demographic data sheet to the patient whilst they were in-patients of the MCU. The expected time to complete the study questionnaire was 15 to 30 minutes. Furthermore, the researcher used medical-record data to identify the type of treatment and the diagnosis date of participants. Then, the researcher informed participants that the next data collection times would be 2 weeks and 6 weeks after discharge, in the cardiac outpatient clinic, 30 minutes before their scheduled follow-up appointments

Day 14: (2 weeks after discharge – 1st cardiac outpatient clinic appointment): On the first follow-up appointment day, the researcher met the participants in the cardiac outpatient clinic. An activPAL3™ monitor was attached, BMI was calculated, and the CSEQ and daily diary for chest pain were provided and explained, in addition to an envelope to return the completed questionnaire and an activity monitor and a driver who was assigned to collect the envelopes from the participants' residence. At this time, the researcher obtained permission from the participants to use their telephone number to facilitate ongoing communication.

After a full 7 days had elapsed, the researcher contacted the participants in order to arrange collection of the activPAL3™ monitors and CSEQs from their homes. In agreement with the University of Salford's lone working policy code of conduct for off-site visits (HSC/AC issue 12.05.10 version 2), the researcher considered the following points to ensure his safety during the data collection period: firstly, the researcher moved between his home and the JUH by public transport to reduce the possibility of physical harm of the researcher. Secondly, because the Jordanian postal system is not accessible to many citizens, a Jordanian driver with a valid, full driving licence and familiarity with places and addresses in Jordan, was assigned to collect the activPAL3™ monitors and CSEQ. The driver received the activPAL3™ monitors and CSEQ in sealed envelopes that had been given to each of the patients when they received a questionnaire and an activity monitor in the OPD.

Day 42 (6 weeks after discharge – 2nd cardiac outpatient clinic appointment): The researcher repeated the same arrangement with the participants after 6 weeks (T2) in order to obtain a second measurement for the CSEQ and the activPAL3™ monitor.

4.3.7 Ethics and Data Management

4.3.7.1 Ethical Consideration

Ethical issues have been considered carefully, as per the principles outlined in the Declaration of Helsinki (Declaration of Helsinki, 1964). Key ethical principles were taken into consideration, such as protecting anonymity, confidentiality, privacy, obtaining informed consent, avoiding deceptive practices, the protection of participants, briefing, the patient's right to withdraw from the study at any time and the declaration of any conflict of interests.

The University of Salford and the JUH granted an ethical approval to the researcher (Appendix J and K). All data are anonymous. The researcher kept hard copy data (papers such as the questionnaire, consent form and demographic data sheet, and medical record data sheet) in a locked filing cabinet. In order to improve handling of the information, the researcher assigned a code to each participant. Moreover, the researcher saved soft copy data (such as Microsoft Word or Excel spreadsheet files) on a password-protected computer, which only the researcher could access.

According to the University of Salford's requirements, the researcher and supervisory team performed a risk assessment prior to conducting the research. The researcher recognised three possible hazards: psychological distress for the involved patients, breaches of data confidentiality, and the possibility that using a driver could risk patients' confidentiality about revealing potentially sensitive topics or issues.

To reduce the participants' risk of psychological distress in the study, the researcher informed the participants that their participation was voluntary and approved by JUH, and that they could withdraw from the study at any point. In addition, the researcher considered the following precautions:

- CCU nurses initially contacted potential participants
- The researcher provided the PIS to all patients who were eligible and expressed an interest in study participation.
- The researcher invited the patients to complete the questionnaire after their transfer from the CCU to MCU. At this point, they were medically stable, such as being clear site of cardiac catheterisation, chest pain-free for more than eight hours, and haemodynamically stable.

In order to reduce risks related to data confidentiality, the researcher followed the precautions listed below:

- The researcher kept hard copy data anonymously in a locked and separate filing cabinet
- Each participant was assigned a code in the study which was kept securely in locked filing cabinet that could only be accessed by the researcher
- The researcher kept software data on an encrypted computer, and only the researcher had the password.

In order to reduce the possibility of breaching the patients' confidentiality through using a driver to collect the questionnaires and activPAL3™ monitors, the researcher considered the following steps:

- The researcher gave the driver used to collect the PA monitors the patients' names and addresses only.
- The researcher gave an empty envelope to each participant to return the completed questionnaire.
- The agreed time to collect the questionnaire and activPAL3™ was a maximum of two hours, beginning from when the researcher called the driver, up until reaching the participant's home, and a maximum of two hours from when the driver had left the participant's home and returned to the researcher.

4.3.7.2 Data Management

The following sections explain the procedures for the management of data collected for both questionnaires and ActivPAL3™ data during this study, including the accuracy of input, activPAL3™ data quality assessment protocol, missing data, activPAL3™ monitor data outcome measure and data analysis.

The researcher checked and stored the completed questionnaires and the participants' consent forms in a separate, locked file cabinet. Then, the researcher entered questionnaire data into an SPSS IBM 22 file, which was stored on a password-protected computer for the researcher's use only.

The researcher downloaded activPAL3™ data from each monitor using the activPAL3™ software package. These were stored in coded folders. In addition, the stored files did not include the participants' names on the computer, thus ensuring the anonymity of all participants. Then, the researcher saved activPAL3™ data in Microsoft Excel 2010 spreadsheet software.

The researcher inspected the graphical activity profile over seven days for every participant and identified all grossly abnormal periods of activity that were out of character for the participants. In addition, the researcher inspected of the raw acceleration signals from abnormal periods in detail. If the acceleration signal remained constant throughout, this meant that the participants attached the monitor incorrectly and the researcher therefore excluded these data from the analysis. Examples of these abnormal periods included protracted periods of standing during the night and prolonged sedentary spells during the daytime in a participant who on other days changed position regularly.

The researcher saved numerical data for each of the seven days in Microsoft Excel 2010 spreadsheet software. The recorded data showed participants' activity for 24 hours from 0100 to 2400 for seven consecutive days. Every hour recorded consisted of upright time and/or sedentary time. The researcher extracted the summary data for each hour and implemented summation of stepping and standing times to provide upright time. The participants were considered to be sedentary when the activPAL3™ signal registered sitting/lying. An event refers to each period of continuous upright or sedentary posture. All collected data from questionnaires and activPAL3™ were

entered and kept together in an SPSS IBM 22 file, then checked for accuracy prior to analysis.

4.3.8 Managing Missing Data

Questionnaire data: The researcher instructed the participants to complete all items in the questionnaires. When contacting the participants to collect their questionnaires, the researcher reminded the participants of the necessity to complete the entire questionnaire. Upon receiving the returned, completed questionnaires, the researcher reviewed the participants' responses to ensure the minimisation of missing data. There was no data found to be missing in the collected data.

activPAL3™ data: The researcher provided a demonstration of how to correctly apply and remove PAL*stickie*™. The participants were instructed to remove the activPAL3™ monitor when bathing/showering and advised to renew the PALstickie™ when re-applying the activPAL3™ monitor. The participant was asked to wear the activPAL3™ monitor at all times with the exception of when bathing. The activPAL3™ monitors were attached by the researcher to the participants. Depending upon the preference of the participants, the researcher gave the patients the option to put the monitor either on the right or on left thigh, in addition to providing written instructions and the contact details of the researcher to the participants.

An appointment was made with the participants to collect the activPAL3™ monitor. Before contacting the participants to collect their activPAL3™ monitors, the researcher reminded the participants of the necessity to keep activPAL3™ monitors on their thigh at all the measurement times. Then, activPAL3™ data was assessed and a quality protocol was applied to ensure the data accuracy, where days were removed from activPAL3™ data, if the participants removed or were noncompliant with the activPAL3™ data quality protocol.

Accuracy of Input (Questionnaires and activPAL3™ Data)

After downloading the data from the activPAL3™ monitors, the data was transferred to Microsoft Excel 2010 spreadsheet software. Next, the researcher entered the collected data from both the questionnaires and activPAL3™ monitors into SPSS software version 22 and kept this data together. To ensure the accuracy of data entry, the researcher checked quality assurance of input with different methods at baseline and Time 1 and Time 2 points. Firstly, the researcher reviewed the data frequently for completeness and accuracy. Secondly, the researcher selected ten full data entries at random and compared them with the written questionnaire answers; there were no differences between the participants' responses and data entered. Thirdly, after the data-cleaning procedure, descriptive and frequency statistical data were analysed. In addition, the researcher examined the lowest and highest scores for each variable in order to determine any outliers.

activPAL3™ Data Quality Assessment Protocol

Before moving the activPAL3™ data from the Excel 2010 spreadsheet to SPSS, key recommendations from (Edwardson et al., 2016), when using the activPAL3™ monitor were adopted to apply a quality assessment protocol. Therefore, the researcher considered the following points for cleaning the collected data:

- Sleep or prolonged activPAL3™ removal (non-wear) is commonly represented by unchanging sitting/lying periods (if the monitor was placed in a horizontal position while removed) or unchanging upright time (if the monitor was placed in a vertical position while removed) in the activPAL3™ file.

If sleep period and prolonged non-wear periods were sitting/lying bouts ≥ 5 hours in a 24-hour period and coded as sleep, and then combining other sleep periods into the sleep bouts using the following guidelines:

a) If a sedentary period ≥ 3 hours within 15 minutes of sleep, with including any movement the researcher considered it as sleep time.

b) If sedentary period ≥ 30 minutes within 15 minutes of sleep bout and <20 steps in interim plus any movement, these were considered as sleep time.

c) During sedentary period where the only recorded movement between the sleep bout and the sedentary bout was standing, the researcher considered this as sleep time.

- Whole day data were excluded where data suggested that the activPAL3™ monitor mainly was removed, the monitor had been positioned upside down, detached from the participant or oriented incorrectly, or there was unusual activity during the measurement time.
- The measurement would be for a minimum of 3 days, with at least 13 hours' measurement per day.
- The researcher identified any disturbances and assessed repetitions or regularity on all days by manual inspection of the event files before taking any decision.
- After cleaning the data, the researcher removed the data of any patient with less than three complete days from the study. The researcher then recorded non-compliance days.

4.3.9 activPAL3™ Monitor Data Outcome Measure

Physical Activity Volume

For each participant, the activPAL3™ outcome measure for the five PA volume parameters: steps count, stepping time, standing time, upright time and sedentary time, which was the total spent time for every hour of recording, calculated at both Time 1 and Time 2, were compared. PA volume was calculated, and each of the PA volume parameters such as steps count, stepping time, standing time, upright time and sedentary time were calculated by computing total amount of time spent in each parameter per day, then the average per hour and average per day was calculated. The research did not split the PA parameters into weekends and weekdays as the data collection procedure occurred during participants' sick leave. Subsequently, the

researcher has presented the PA volume according to an overall summary for Time 1 and Time 2, weekdays and 24 hours.

The activPAL3™ data for all participants were classified as sedentary when the activity monitor signal registered sitting/lying. Every hour recorded consisted of upright time and/or sedentary time. The sedentary data was a constant 60 minutes minus upright time.

For each participant, the researcher calculated the primary outcome measure through measuring the total time spent for the five PA parameters for every hour of recording at Time 1 and Time 2, and then comparing the primary outcome measure according to measurement time. A significance level of 5% was set for all testing procedures. For a complete description of the PA performed by the two-time measurement points, the researcher has presented the data in numerical and graphical forms.

Physical Activity Pattern

The researcher carried out further assessment of the PA pattern for upright events and sedentary events, through calculating the accumulated percentage from the duration of percentage for activity time with different cut-off points, and examining the differences between Time 1 and Time 2. In terms of assessing the changes in PA pattern, the activPAL3™ data files were processed with MATLAB 2015. The researcher extracted the PA data of all participants undertaken each day between 0100 and 2400 hours in this study (Figure 4.6).

The researcher saved numerical data for each of the 7 days in Excel spreadsheets. The researcher extracted the summary data for each hour and summed the stepping and standing times to provide the upright time. In addition, the researcher inspected individual records for each day. An event refers to each continuous upright or sedentary period. During the measurement at the two time points, the length of each upright and sedentary event was determined for all participants.

For both times 1 and 2, the total number of upright events throughout the week was calculated and allocated to the appropriate time category (0.5 minutes, 1 minute, 2

minutes, 3 minutes, 5 minutes, 10 minutes, 15 minutes, 25 minutes, 30 minutes) and percentage category (10%, 20%, 25%, 30%, 40%, 50%, 60%, 70%, 75%, 80% and 90%). The same process was performed on sedentary events at both times 1 and 2, expressed as a duration (5 minutes, 15 minutes, 30 minutes, 60 minutes, 180 minutes, 300 minutes, 600 minutes, 900 minutes and 1,200 minutes) and a percentage (10%, 20%, 25%, 30%, 40%, 50%, 60%, 70%, 75%, 80% and 90%).

Within each time point, the researcher calculated the duration and the percentage of upright and sedentary events for all participants. Then, the researcher statistically compared and investigated mean duration and percentage of events between Time 1 and Time 2.

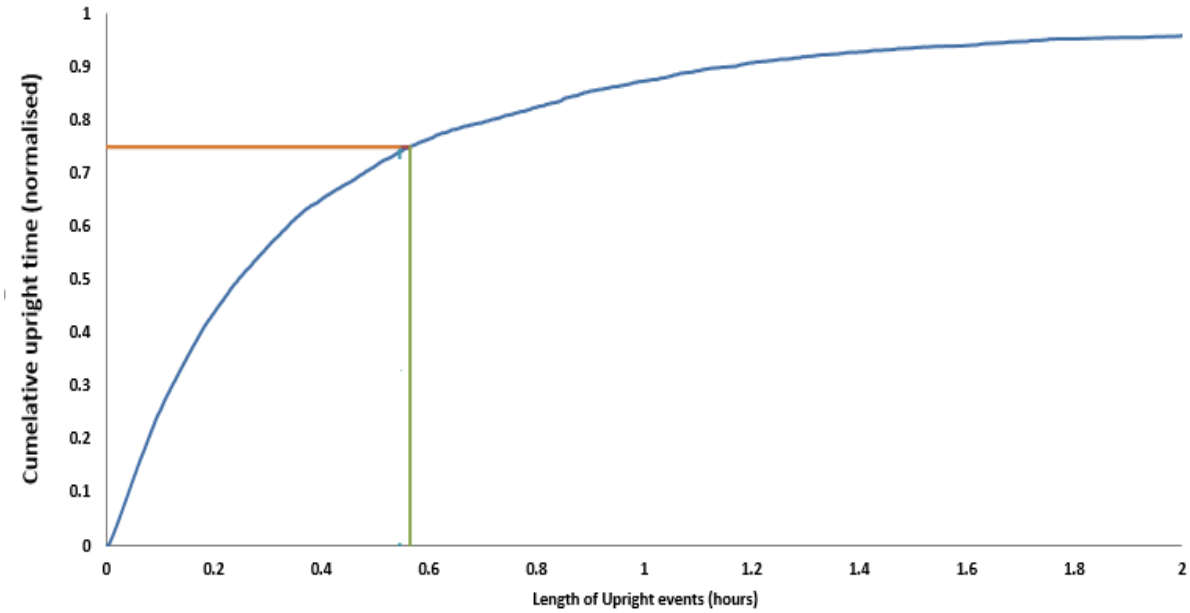


Figure 4.6 Example of physical activity pattern plot of normalized curve accumulated by upright events from shortest to longest. The horizontal line at 75% shows a cut-off point to provide outcomes and to characterize the curve.

4.3.10 Statistical Data Analysis

Questionnaires Data Analysis

The researcher began data analysis by checking the assumptions of the planned analysis and evaluation for missing data. The daily diary for chest pain was analysed and entered into SPSS in order to link pain assessment data with whether there is link between changes in the PA level of participants and feelings of pain. The researcher used descriptive and inferential statistical analyses. Before starting data analysis, the researcher checked the outliers, and then normality distribution of the variables through the Kolmogorov-Smirnov test, a quantile-quantile plot (Q-Q plot) and skewness. The researcher used Levene's Test of Equality of Variance to assess the homogeneity of variances.

The researcher used descriptive statistics to present the participants' demographic characteristics, such as mean, median, standard deviation and frequency, and skewedness. The researcher used ANOVA to compare three or more groups. In addition, the researcher used the Pearson correlation coefficient (or Spearman's correlation as an alternative test for non-parametric variables) to investigate the relationship between two continuous variables such as the relationship between the self-efficacy level and BMI. A significance level of 5% was set for all testing procedures. For the analysis of the questionnaire data, the researcher used the IBM SPSS Statistics version 22. Subsequently, the questionnaire data and the activPAL3™ data were kept together in an SPSS file.

activPAL3™ Data Analysis

The activPAL3™ data was downloaded using the activPAL3™ analysis software package, and then transferred to an Excel 2010 spreadsheet. Following this, the activPAL3™ data was transferred to IBM SPSS Statistics version 22. The same data analysis steps were repeated for activPAL3™ data. For example, the researcher assessed the outliers, normality and homogeneity of variances. Then, the researcher undertook descriptive and inferential statistical analyses.

A paired t-test (or Wilcoxon test, if the assumption as alternative test for non-parametric variables) was used to compare two related groups such as PA parameters at Time 1 and Time 2. Pearson correlation coefficient (or Spearman's correlation, if the assumption as alternative test for non-parametric variables) was used to investigate the relationship between two continuous variables such as the PA volume and BMI. For further analysis, the researcher used the MATLAB 2015 application to assess the changes in PA patterns between Time 1 and Time 2.

4.4 Summary

This chapter has outlined the study's methodology and method in order to prepare for the description of the findings given in Chapter five. In summary, the reported study used a quantitative method and a descriptive repeated measures design. The chapter has presented discussion of the pilot study and the data collection procedure. Finally, the chapter has provided thoroughly detailed information regarding the ethical considerations and data management in the study.

Chapter Five: Results

5.1 Introduction

The study has two phases, Chapter three presented results from phase one, the translation and cross-cultural adaptation of the CSEQ and validity and reliability evaluation of the CSEQ. This chapter describes the findings from phase two. The chapter begins by presenting pilot study data results for study phase two. In addition, the chapter provides a description for statistical analysis of the sample characteristics in the study. Following this, the chapter presents findings of the assessment of self-efficacy and its subscales, in addition to PA levels and patterns at Time 1 and Time 2 among patients with AMI. Moreover, the chapter provides an assessment of the relationship between self-efficacy and PA levels among patients with AMI. It concludes with a summary of the findings.

This chapter presents the results in five sections, as follows:

I. Pilot data for study phase two
II. Sample characteristics, demographic data regarding patients with AMI and clinical details of the sample
III. Assessing changes in self-efficacy levels among patients with AMI after hospitalisation and the relationship between self-efficacy and clinical details among patients with AMI at baseline, Time 1, and Time 2
IV. Assessing PA levels, pattern changes, and the relationship between PA level and clinical details among patients with AMI at Time 1 and Time 2
V. Examination of the relationship between self-efficacy and PA level at baseline, Time 1, and Time 2 among patients with AMI after hospitalisation

5.2 Pilot Data

All participants completed the CSEQ questionnaire and assented the placement of the activPAL3™ monitor. No participant reported any difficulty with the interpretation of the questions or responses and, based on analysing the completed pilot study, the

responses given by participants were appropriate and as expected. The researcher asked the participants to contact him if they had any enquiries.

The results of the pilot study indicated that the study design, research method, and methodology were feasible and appropriate in this setting. The pilot study provided some useful, practical information regarding recruitment to the study, as it seemed from an early stage that it would be feasible to recruit the expected sample size, of around 12 to 16 participants per month, meaning the researcher could potentially recruit 3 to 4 participants per week. The researcher made three changes to the study protocol: first, replacing the adhesive tape previously used to attach activPAL3™ with Tegaderm, to avoid irritation to participants' skin. Second, removing of the hair from the thigh before attaching the activPAL3™ monitor, to decrease the painful sensation upon its removal. Third, emphasising the fact that participants were welcome to contact the researcher if they had questions or enquires during the data collection period and making participants aware that they could be provided with their results three days after the activPAL3™ monitor collection date.

5.3 Sample Characteristics

Figure 5.1 shows details of the participants' recruitment to the study. At the baseline, the researcher assessed 324 patients for eligibility. Less than half of the total number of assessed patients (136 out of 324 patients) was eligible and recruited to the study. The remaining 188 patients did not meet the inclusion criteria. However, 36 participants refused to participate for personal reasons. Therefore, 100 patients participated at Time 1. The response rate was 100 % at Time 1. Subsequently, six patients withdrew at Time 2. Thus, the response rate was 94% at Time 2, as shown in the CONSORT flow chart in Figure 5.1. Table 5.1 shows the sociodemographic of the study participants, such as age, gender, marital status, level of education and employment status. Frequency and percentage show the demographic spread of the total sample. Further, Table 5.1 shows a descriptive analysis of the clinical variables of the participants, such as BMI.

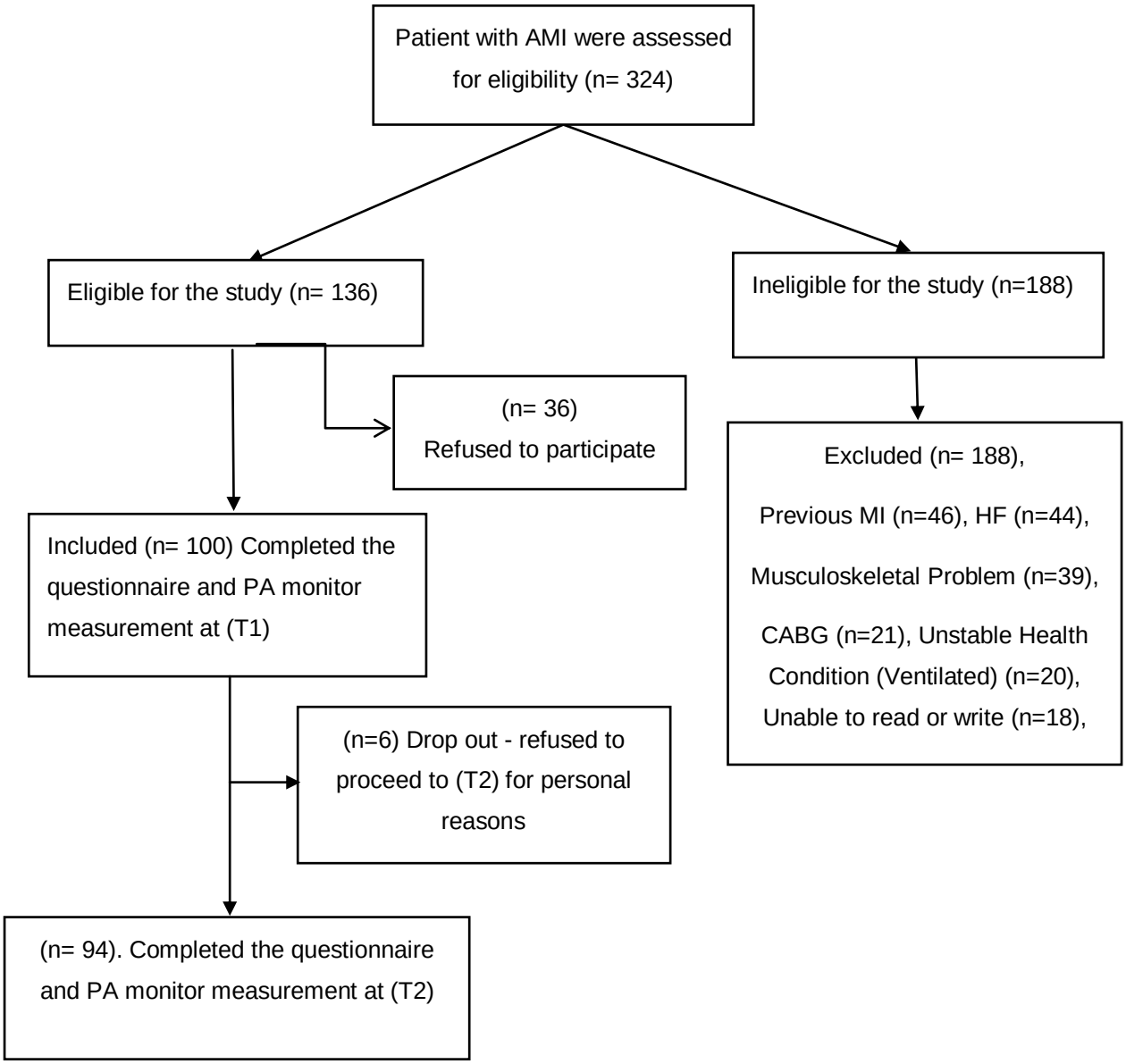


Figure 5.1 Study CONSORT flow chart

5.4 Study Variables

The study included 15 variables distributed across four main categories. The first category was sociodemographic variables such as age and gender. The second category was self-efficacy, which included global self-efficacy and its three subscales. The third category was PA volume, which included five parameters: step count, stepping time, standing time, upright time and sitting/lying time. Finally, the fourth category was clinical variables, which included three variables: CHD diagnosis date, BMI and type of treatment (Table 5.2). Before starting data analysis, the outliers of the sample were checked, and normality distribution of the variables was assessed by the Kolmogorov-Smirnov test, a quantile-quantile plot (Q-Q plot) and skewness (Pallant, 2010). The researcher found that all of the variables were normally distributed.

Table 5.1

Demographic Characteristics for Eligible Participated Patients with AMI

Sociodemographic Variables	Frequency
Age (years)	*M*=54.5, *SD*= 9.9 (36-75)[a]
Gender	
Male	62 (62%)
Female	38 (38%)
Marital Status	
Single / widowed	26 (26%)
Married	62 (62%)
Divorced	12 (12%)
Educational level	
Secondary school or less	33 (33%)
Higher Diploma or less	21 (21%)
Bachelor degree	39 (39%)
Higher education	7 (7%)
Employment status	
Employed	31 (31%)
Unemployed	11 (11%)
Retired	22 (22%)
Self-employed	36 (36%)
Clinical Data	
STEMI treated by PPCI	46 (46%)
THROMB & PCI	22 (22%)
PCI	32 (32%)
Diagnosis Date of CHD (months)	*M*=65.28, *SD*=37.3 (12-216)[a]
BMI	*M*=25.61, *SD*= 0.61 (22-28.5)[a]

Values are numbers (percentages) unless stated otherwise

[a]Values are M, SD (Range)

Table 5.2

All Study Variables, Codes and Measurements Level

No	Variable	Description	Codes	Measurement level	Baseline	T 1	T 2
1	Sex	participants' sex	1= male, 2 =female	Nominal	✓		
2	Age	participants Age in months	Age in years	Continuous	✓		
3	Education	participants education level	1= secondary school or less 2= Higher Diploma or less 3= Bachelor degree 4= Higher education	Nominal	✓		
4	Marital status	Marital status	1= Single/ widow 2= Married 3= Divorced	Nominal	✓		
5	Employment	Employment status	1= employed 2=unemployed 3=self-employed 4= retired	Nominal	✓		
6	Global CSE	Cardiac self-efficacy total score	Score Range from 0-64	Continuous	✓	✓	✓
7	CSE Control symptoms	Control symptoms theme from 1-8 item	Score Range from 0-32	Continuous	✓	✓	✓
8	CSE maintain function	maintain function theme from 9-13 item	Score Range from 0-20	Continuous	✓	✓	✓
9	CSE Healthy life style	Life style theme from 14—16 item	Score Range from 0-12	Continuous	✓	✓	✓
10	Step count	Number of steps/ week	Mean number of steps per day	Continuous		✓	✓
11	Standing	Total time in	0-1	Continu		✓	✓

	time	standing position		ous			
12	Stepping time	Total time during stepping status	Score Range from 0-1	Continuous		✓	✓
13	Upright time	Total of standing and stepping time	Score Range from 0-1	Continuous		✓	✓
14	Sedentary time	Total of sitting and lying time	Score Range from 0-1	Continuous		✓	✓
13	BMI	Body Mass Index = Weight in Kg ÷ Height in metres^2	Score in numbers according to the equation	Continuous	✓		
14	CHD Diagnosis Date	Start date of diagnose as CHD patient	Score in number of months of CHD diagnosed	Continuous	✓		
15	AMI Treatment type	Treatment modalities used for CHD patients	1= PPCI 2= THROMB & PCI 3=PCI	Nominal	✓		

5.5 Cardiac Self-Efficacy Measurements

5.5.1 Self-efficacy levels

The researcher used a translated, self-reported CSEQ to measure self-efficacy levels at baseline, Time 1 and Time 2 among patients with AMI in the early recovery phase. The CSEQ includes three subscales: control symptoms, maintain function and a healthy lifestyle (section 3.5.4). There is an increase in mean self-efficacy across the three measurement times. Table 5.3 presents the mean score of global self-efficacy and its subscales at baseline. In turn, Table 5.4 presents the mean score of global self-efficacy and its subscales at Time 1 and Table 5.5 presents the mean score of global self-efficacy and its subscales at Time 2. The trends in self-efficacy and its subscales across the three measurement times show an increase in the global self-efficacy and its subscales from baseline to Time 1 and between Time 1 and Time 2

(Figure 5.2). The three subscales showed a similar increase in self-efficacy mean scores from baseline to Time 1. However, the increase in the healthy lifestyle subscale mean score was less between Time 1 and Time 2.

Table 5.3

The Descriptive Statistics of the Cardiac Self-Efficacy at Baseline

CSEQ and the three subscales	N	M	SD	Minimum	Maximum	Range
Global CSEQ	100	22.14	8.26	8	47	39
Subscale 1: Control symptoms	100	11.10	4.03	1	22	21
Subscale 2: Maintain function	100	6.89	3.09	2	16	14
Subscale 3: Healthy lifestyle	100	4.21	2.38	0	10	10

Table 5.4

The Descriptive Statistics of the Cardiac Self-Efficacy at Time 1

CSEQ and the three subscales	N	M	SD	Minimum	Maximum	Range
Global CSEQ	100	34.75	9.14	17	52	35
Subscale 1: Control symptoms	100	16.56	4.97	8	28	20
Subscale 2: Maintain function	100	11.16	3.08	5	20	15
Subscale 3: Healthy lifestyle	100	7.03	2.12	3	12	9

Table 5.5

The Descriptive Statistics of the Cardiac Self-Efficacy at Time 2

CSEQ and the three subscales	N	M	SD	Minimum	Maximum	Range
Global CSEQ	94	48.09	8.55	21	60	39
Subscale 1 Control symptoms	94	23.61	4.63	10	30	20
Subscale 2 Maintain function	94	15.56	2.9	6	20	14
Subscale 3 Healthy lifestyle	94	8.85	2.08	3	12	9

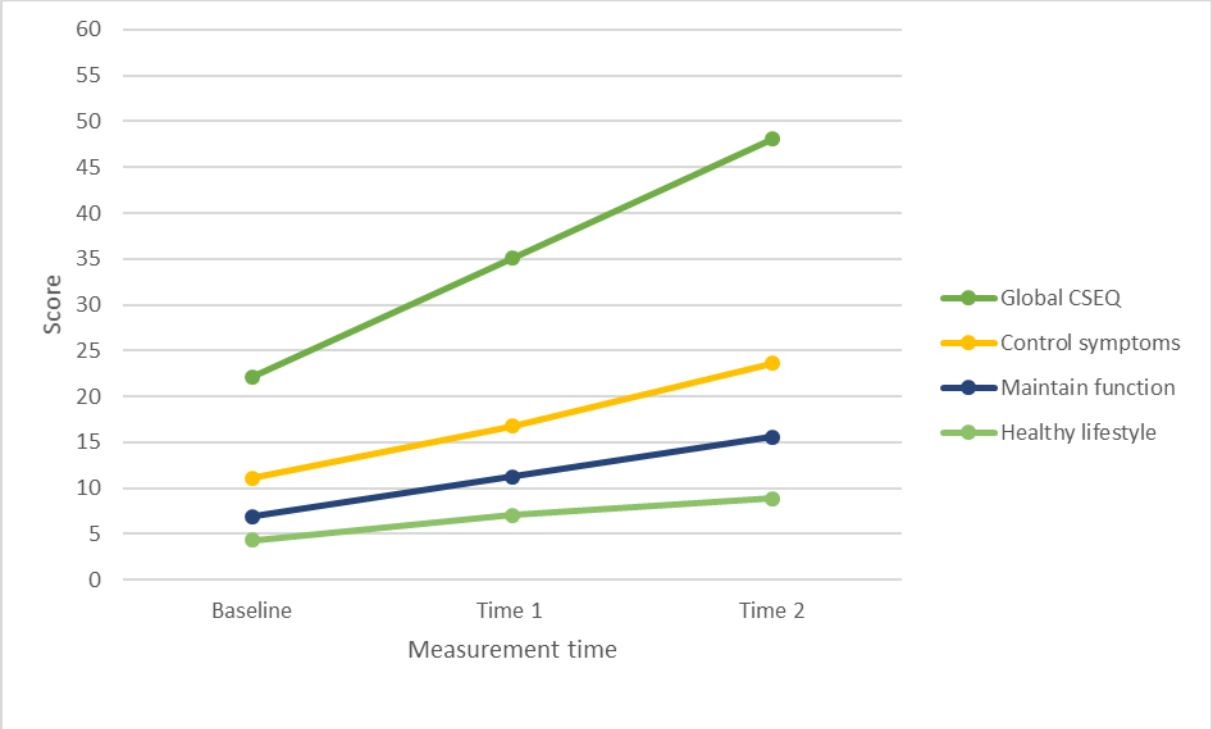


Figure 5.2 Trends of self-efficacy and the three subscales levels at baseline, Time 1 and Time 2

5.5.2 Daily Diary for Chest Pain

The researcher used a self-administered daily diary to measure chest pain, along with the CSEQ at Time 1 and Time 2. However, no participants reported chest pain in the daily diary. The participants complained of feelings of pain from the puncture site of

catheterisation and they expressed their concerns about fear of recurrent AMI, inability to return to normal lifestyle and development of further complications.

5.5.3 Changes in Self-Efficacy Levels at Baseline, Time 1 and Time 2

The mean score of self-efficacy increased during the three measurement times. The researcher examined the changes in self-efficacy between the baseline, Time 1 and Time 2 using one-way repeated measures ANOVA. Before starting the analysis, the researcher used Mauchly's tests to evaluate the assumption of sphericity for global self-efficacy and its subscale. Mauchly's tests indicated that the assumption of the sphericity had not been violated for the global self-efficacy (X^2 (2) = 0.794, p = 0.672), Control symptoms subscale (X^2 (2) = 0.859, p = 0.651), maintain function subscale (X^2 (2) = 0.313, p = 0.855) and healthy lifestyle subscale (X^2 (2) = 1.413, p = 0.493).

The repeated measures ANOVA found significant changes between the mean global self-efficacy score at baseline, Time 1 and Time 2 (*F (2, 92) = 268.5, p < 0.001).* The findings of ANOVA reported that significant changes in the mean control symptom subscale score at baseline, Time 1 and Time 2 (*F (2, 92) = 222.6, p < 0.001*). Further, the analysis showed significant changes between the mean maintain function subscale score at baseline, Time 1 and Time 2 (*F (2, 92) = 224.5, p < 0.001*). Over and above this, significant changes between the mean healthy lifestyle subscale score were found at baseline, Time 1 and Time 2 (*F (2, 92) = 124.6, p < 0.001),* as illustrated in Table 5.6.

Table 5.6

Changes in Self-Efficacy Score at Baseline, Time 1 and Time 2

	df	Sum of squares	Mean square	F	*p*
CSEQ self-efficacy	2	31254	15627	268.5	$p < 0.001$*
Subscale 1 Control symptoms	2	7363	3681	222.6	$p < 0.001$*
Subscale 2 Maintain function	2	3533	1766	224.5	$p < 0.001$*
Subscale 3 Healthy lifestyle	2	979	489	124.6	$p < 0.001$*

* Correlation significant at <0.05 level (2-tailed)

5.5.4 Self-Efficacy and Clinical Data Variables

The study examined the relationship between the mean self-efficacy score and the clinical data variables, such as BMI and CHD diagnosis date by using a Pearson product-moment correlation coefficient (*r*) at baseline, Time 1 and Time 2. In addition, the study examined the differences in mean self-efficacy score for groups related to type of AMI treatment, such as PPCI, THROMB with PCI and PCI using ANOVA test at baseline, Time 1 and Time 2.

At baseline, the researcher used Pearson correlation tests to examine the relationship between BMI, diagnosis date of CHD and self-efficacy. The findings showed there were no correlations between BMI, diagnosis date of CHD and self-efficacy and its subscales ($p>0.05$), as shown in Table 5.7. In addition, ANOVA tests showed that there were significant differences in patients' global self-efficacy mean scores related to types of AMI treatment ($F\ (2,97) = 3.4,\ p=0.036$) and control symptoms subscale ($F\ (2, 97) = 3.5,\ p=0.032$). However, there were no significant differences in the maintain function and healthy lifestyle subscales among types of AMI treatment groups ($p>0.05$) at baseline (Table 5.8). A Tukey post-hoc test revealed that patients treated with PCI have global self-efficacy scores ($M=24$, $SD=9.8$) significantly higher than patients treated with THROMB and PCI ($M=18.27$,

SD 6.9), (p=0.034). In addition, patient treated with PCI showed significantly higher control symptoms subscale score (*M= 12.09, SD =4.8*) than patient treated with THROMB and PCI (*M=9.2, SD=3.3), (p= 0.027*). There were no other statistically significant differences between types of AMI treatment and global self-efficacy and its subscales at baseline (*p*>0.05).

Table 5.7

The Relationship Clinical Variables with Self-Efficacy at Baseline

	BMI		Diagnosis date of CHD		
	r	*p*	*r*	*p*	Analysis Test
Global CSEQ	0.059	0.562	- 0.113	0.263	Pearson correlation
Control symptoms	0.063	0.531	-0.043	0.671	Pearson correlation
Maintain function	-0.023	0.820	-0.130	0.199	Pearson correlation
Healthy lifestyle	0.127	0.209	-0.143	0.155	Pearson correlation

* Correlation significant at <0.05 level (2-tailed)

Table 5.8

The Difference in Self-Efficacy Score at Baseline According to Type of AMI Treatment

		df	Sum of squares	Mean square	*F*	*p*
Global CSEQ	Between group	2	448	224	3.452	0.036*
	Within group	97	6307	65		
	Total	99	66756			
Control symptoms	Between group	2	110	55	3.568	0.032*
	Within group	97	1504	15		
	Total	99	1615			
Maintain function	Between group	2	36	18	1.956	0.147
	Within group	97	310	9.3		
	Total	99	946			
Healthy lifestyle	Between group	2	22	11.3	2.031	0.137
	Within group	97	541	5.5		
	Total	99	564			

* Correlation significant at <0.05 level (2-tailed)

At Time 1, the findings showed that BMI had no relationship with self-efficacy level or any of its subscales (p>0.05), Table 5.9. The there was a small negative correlation between diagnosis date of CHD and global self-efficacy level (r =-0.226, p = 0.024) and a small negative correlation between diagnosis date of CHD and the control symptoms subscale (r =-0.224, p = 0.025) at Time 1 (Table 5.9). In addition, ANOVA tests showed that there were no significant differences in the mean scores for global self-efficacy or the subscale mean scores among the type of AMI treatment groups (p >0.05), as shown in Table 5.10.

Table 5.9

The Relationship between Clinical Variables with Self-Efficacy at Time 1

	BMI		Diagnosis date of CHD		
	r	*p*	*r*	*p*	Analysis Test
Global CSEQ	0.123	0.224	-0.226*	0.024	Pearson correlation
Control symptoms	0.119	0.238	-0.224*	0.025	Pearson correlation
Maintain function	0.059	0.559	-0.180	0.073	Pearson correlation
Healthy lifestyle	0.163	0.105	-0.187	0.062	Pearson correlation

* Correlation significant at <0.05 level (2-tailed)

Table 5.10

The Difference in Self-Efficacy Score at Time 1 According to Type of AMI Treatment

	df	Sum of	Mean	*F*	*p*

			squares	square		
Global CSEQ	Between group	2	224	112	1.351	0.264
	Within group	97	8050	82		
	Total	99	8274			
Control symptoms	Between group	2	111	55	2.301	0.106
	Within group	97	932	24		
	Total	99	934			
Maintain function	Between group	2	11	5.5	0.582	0.561
	Within group	97	932	9.6		
	Total	99	943			
Healthy lifestyle	Between group	2	4.3	2.1	0.481	0.620
	Within group	97	442	4.5		
	Total	99	446			

* Correlation significant at <0.05 level (2-tailed)

At Time 2, the findings showed that there was only one significant small positive correlation between BMI (M=25.6, SD=1.61) and the healthy lifestyle subscale (M=8.85, SD=2) (r = 0.222, p = 0.032). There was no correlation between diagnosis date of CHD and self-efficacy (p>0.05), as shown in Table 5.11. In addition, ANOVA tests showed there were no significant differences between self-efficacy and its subscales and types of AMI treatment as shown in Table 5.12.

Table 5.11

The Relationship between Clinical Variables with Self-Efficacy at Time 2

	BMI		Diagnosis date of CHD		
	r	*p*	*r*	*p*	Analysis Test
Global CSEQ	0.189	0.068	-0.084	0.419	Pearson correlation
Control symptoms	0.130	0.212	-0.105	0.312	Pearson correlation
Maintain function	0.168	0.105	-0.001	0.996	Pearson correlation
Healthy lifestyle	0.222*	0.032	-0.121	0.247	Pearson correlation

* Correlation significant at <0.05 level (2-tailed)

Table 5.12

The Difference in Self-Efficacy Score at Time 2 According to AMI Type of Treatment

		df	Sum of squares	Mean square	*F*	*p*
Global CSEQ	Between group	2	1.5	0.7	0.110	0.990
	Within group	91	6805	74		
	Total	93	6807			
Control symptoms	Between group	2	3	1.5	0.070	0.932
	Within group	91	1997	21.9		
	Total	93	2000			
Maintain function	Between group	2	3	1.5	0.179	0.836
	Within group	91	780	8.5		
	Total	93	783			
Healthy lifestyle	Between group	2	6.4	3.2	0.739	0.481
	Within group	91	399	4.3		
	Total	93	405			

* Correlation significant at <0.05 level (2-tailed)

5.6 Measurements of Physical Activity

This section presents data analysis for both PA volume and PA patterns at Time 1 and Time 2. At Time 1, the study recorded a complete set of data (7 days) from 45 participants and recorded the remaining set of data (3-6 days) from 46 participants. At Time 2, the study recorded a complete set of data from 60 participants and recorded the remaining set of data (3-6 days) from 23 participants (Table 5.13). The minimum number of days accepted for inclusion was three days according to the activPAL3™

data quality assessment protocol (section 4.3.8). At Time 1, the excluded data was 144 days, 11 participants had odd and irregular data and 77 days were removed for noncompliance with the activPAL3™ data protocol, representing 20% of the data. At Time 2, the excluded data was 118 days, 11 participants had odd and irregular data and 41 days were removed for noncompliance with the activPAL3™ data protocol, representing 18% of the data.

The researcher used an activPAL3™ monitor to measure PA behaviour at Time 1 and Time 2 in the early recovery phase. After application of the activPAL3™ data quality protocol, and removal of non-worn activPAL3™ time, the study included 556 days for Time 1 and 540 days for Time 2. The study measured PA for seven days consecutively for 100 participants at Time 1 and for 94 participants at Time 2. The study presents the measurement of PA behaviour in two parts: PA volume and PA pattern.

Table 5.13

Summary of activPAL3™ Data Included for Analysis

activPAL3™ included data	Number of participants at Time 1	Number of participants at Time 2
7 Days	45	60
6 Days	27	13
5 Days	12	4
4 Days	3	4
3 Days	4	2

5.6.1 Physical Activity Volume

This section describes the PA data at the Time 1 and Time 2 measurements. The section presents the data through first: overall summary for Time 1 and Time 2 and comparison of PA measurement parameters between Time 1 and Time 2. As to the means of step count, stepping time, standing time, upright time (stepping time and

standing time) and sedentary time (sitting/lying time). Second: according to the day of the week, third: according to hour.

5.6.1.1 Primary Outcome Measure- Step Count

5.6.1.1.1 Overall Step Count for Time 1 and Time 2

The mean daily step count for all participants was calculated. The population mean steps at Time 1 were 6,981 steps and at Time 2 were 7,149. There was considerable variation in mean daily steps per day for both Time 1 and Time 2 as indicated by the large standard deviation (2,800) and range of step count 11,704 at Time 1 and standard deviation (2,575) and range of step count 10,919 at Time 2 (Table 5.14). The minimum daily step recorded on a single day in Time 1 was 1,795 steps and the maximum daily step count was 13,499. The minimum daily step recorded in Time 2 was 2,273 steps and the maximum daily step count was 13,192. Figure 5.3 shows the mean and standard deviation of the population in a boxplot format. There was no significant change in mean daily step count between Time 1 and Time 2 (paired t-test, t (74) = -0.673, p = 0.503).

Table 5.14

Summary Overall- Mean Daily Step Count in Time 1 and Time 2

	Number of steps per day					
Measurement time	M (step/ day)	SD (step)	Range (step)	Minimum (step)	Maximum (step)	paired t-Test / *p* value
Time 1	6,981	2,800	11,704	1,795	13,499	0.503
Time 2	7,149	2,575	10,919	2,273	13,192	

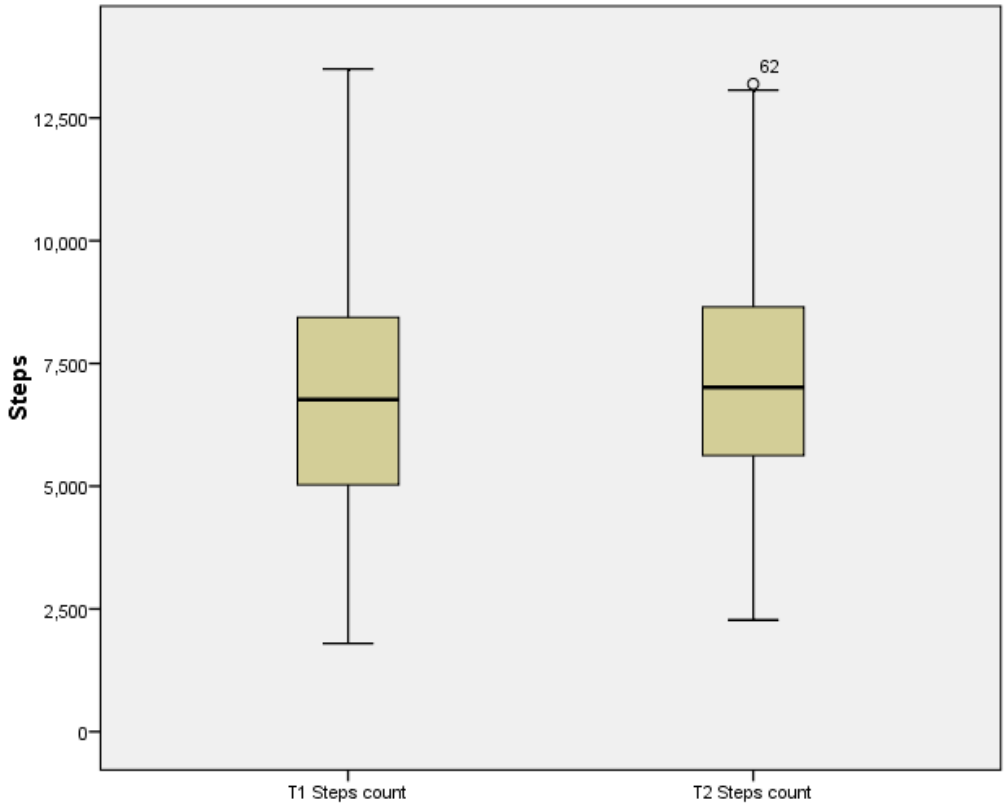


Figure 5.3 Boxplot of mean daily steps of all participants at Time 1 and Time 2

5.6.1.1.2 Step Count across the Week

The researcher calculated the mean number of steps per day for each participant for each day for Time 1 and Time 2. At Time 1, the mean values indicated that there were relatively large variation differences of 1,884 steps between the least active day, which was Friday (5,661 steps) and the most active day, which was Tuesday (7,505 steps), (Appendix L). Figure 5.4 shows a relatively large standard deviation, indicating a considerable variation in step count of the participants. At Time 2, the mean number of steps per day values indicated that there was considerable variation of (1,893 steps) between the least active day, which was Friday (5,965 steps) and the most active day, which was Monday (7,804), (Appendix L). Figure 5.5 shows relatively large standard deviation, indicating a considerable variation in step count of the participants.

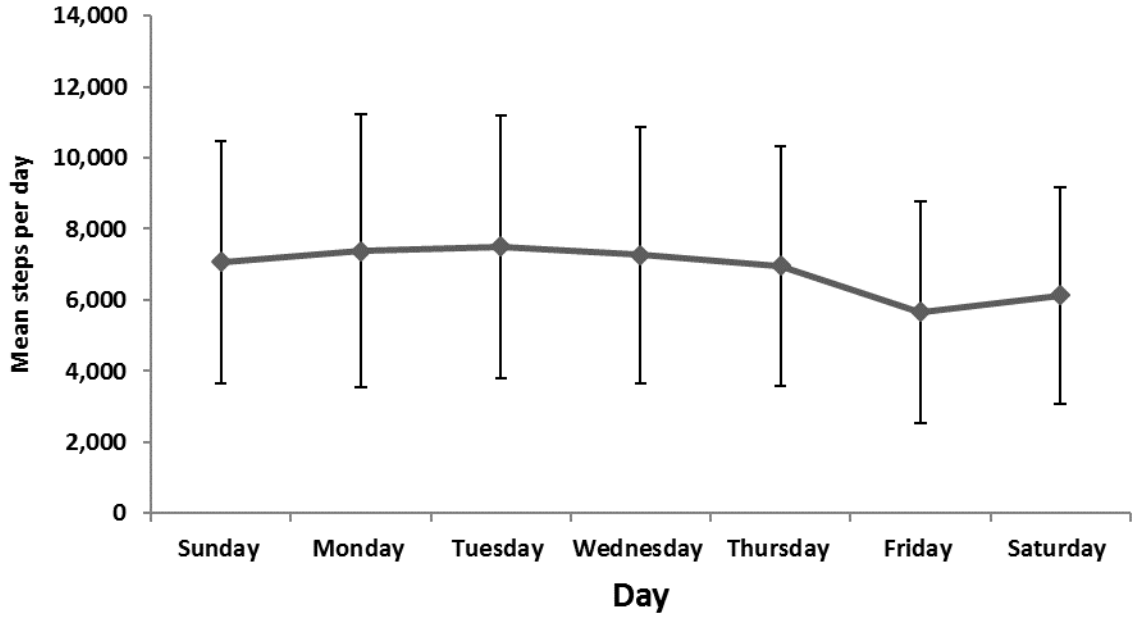


Figure 5.4 Mean step count according to day at Time 1(error bars represent ± SD)

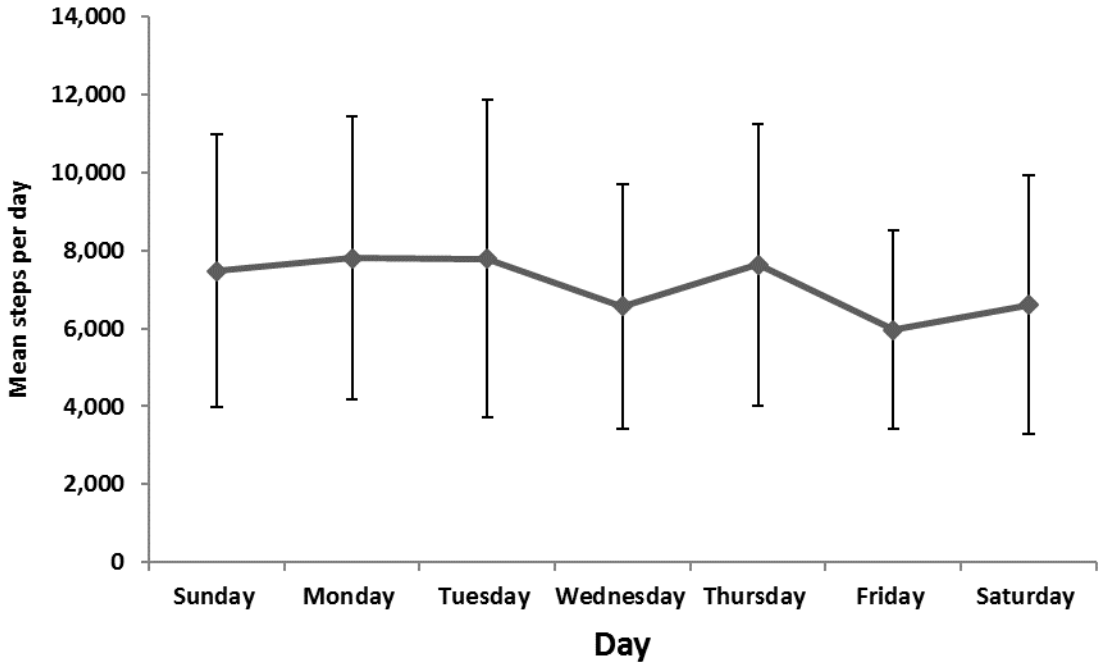


Figure 5.5 Mean step count according to day at Time 2 (error bars represent ± SD)

5.6.1.1.3 Step Count Over a 24-Hour Period

The mean step count for each hour across all participants was calculated and this as shown in Figure 5.10 for Time 1 and in Figure 5.11 for Time 2. For each participant, the researcher computed total step count for each hour, taking an average over the included days, which gave a mean step count for each hour of the day. An averaging of individuals gave the mean step count, and standard deviations (Figures 5.6 and 5.7), the Figures showed there were few steps per hour during the night. In Time 1, number of steps increased sharply from 06:00 to 14:00. Then, decreased gradually in the afternoon and evening (Figure 5.6). Relatively large standard deviations indicate that there were considerable variations between individuals in mean step count throughout the entire day (Appendix M). These variations were less evident through the night between the hours 01:00-06:00.

In Time 2, the mean step count was small between from 12:00 until 05:00 (Figure 5.7). Mean hourly step count increased gradually at 06:00 until 13:00 (615 steps). After that, mean step count started decreasing to 338 steps at 16:00, and subsequently dropped from 17:00 to 161 steps at 24:00. (Appendix N). Figures 5.6 and 5.7 showed the comparison of the hourly pattern of Time 1 and Time 2. Mean step count per hour was greater at Time 2 through the morning and afternoon. However, at Time 2, the step count was slightly higher than at Time 1. However, there are relatively low levels of mean step count throughout the day at both times.

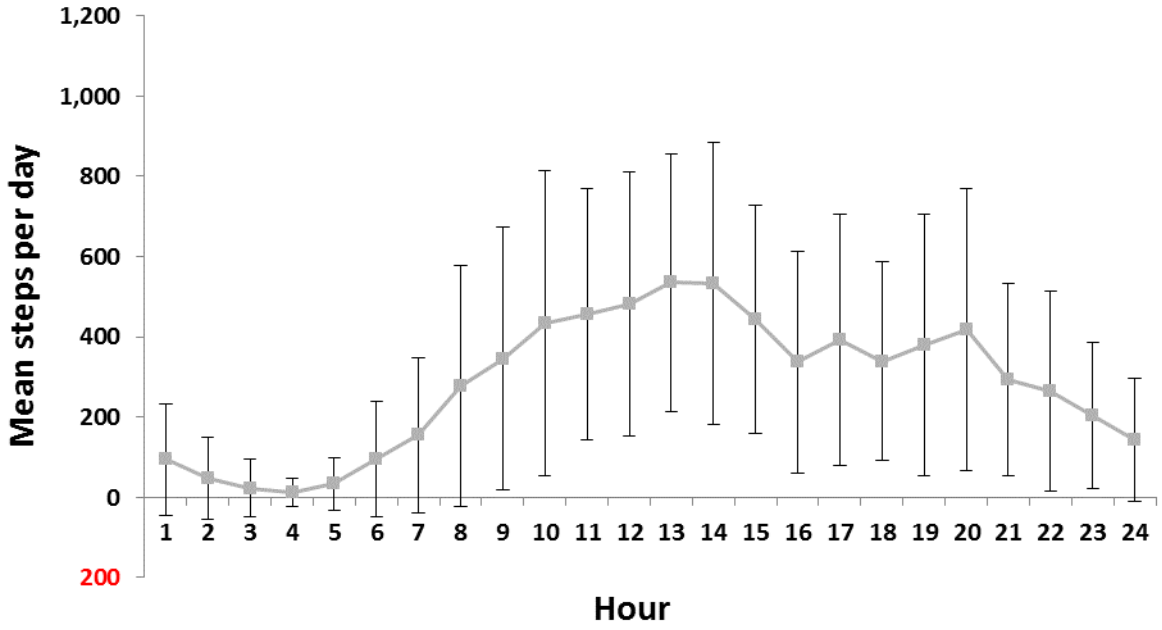


Figure 5.6 Mean step counts according to hour at Time 1 (error bars represent ± SD)

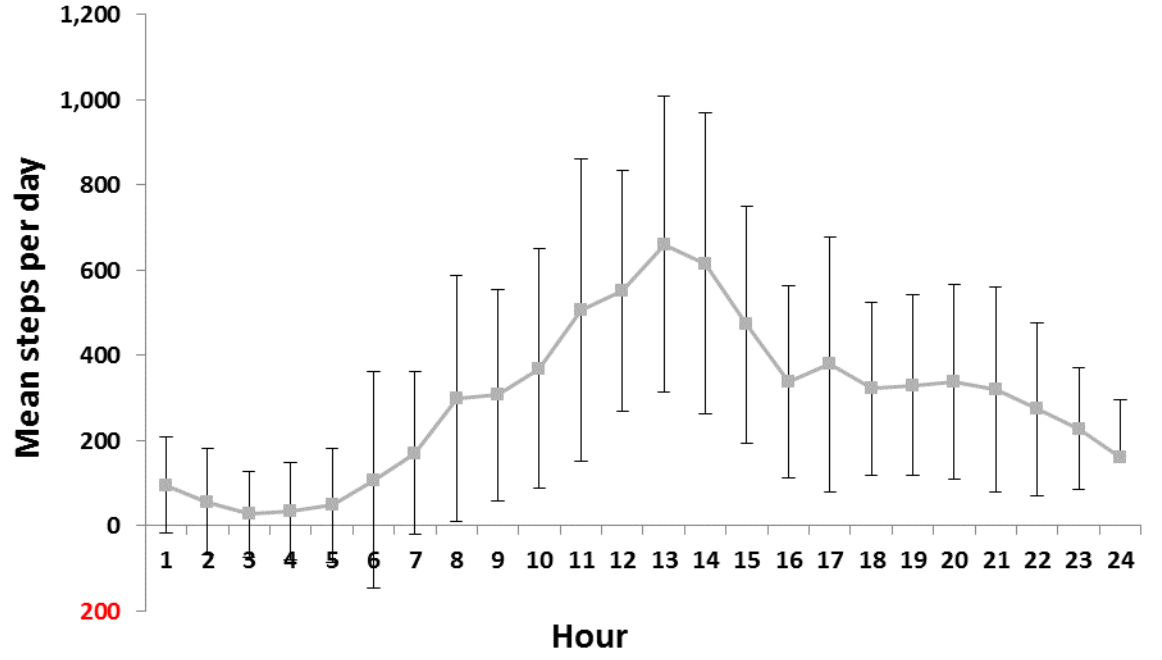


Figure 5.7 Mean step counts according to hour at Time 2 (error bars represent ± SD)

5.6.1.2 Primary Outcome Measure- Stepping Time

5.6.1.2.1 Overall Stepping Time for Time 1 and Time 2

The researcher calculated the mean stepping time per day for all participants. The population mean stepping time per day at Time 1 was 94.2 minutes and at Time 2 was 97.2 minutes. There was considerable variation in stepping time at Time 1 and Time 2 as indicated by the large standard deviation 37.8 minutes and range of 168 minutes at Time 1 and standard deviation 32.4 minutes and range of 156 minutes at Time 2 (Table 5.15). The minimum stepping time recorded on a single day at Time 1 was 25.2 minutes and the maximum stepping time was 193 minutes, and the minimum stepping time per day recorded at Time 2 was 39.6 minutes and the maximum stepping time was 195.6 minutes (Table 5.15). Figure 5.8 shows the mean and standard deviation of the population in a boxplot format. There was no significant change in mean stepping time per day between Time 1 and Time 2 (paired t-test, t (74) =-0.480, p = 0.633).

Table 5.15

Summary Overall- Mean Daily Stepping Time in Time 1 and Time 2

	Mean stepping time per day					
Measurement time	M (mins/ day)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	paired t-Test / p value
Time 1	94.2	37.8	168.2	25.2	193.8	0.633
Time 2	97.2	32.4	156	39.6	195.6	

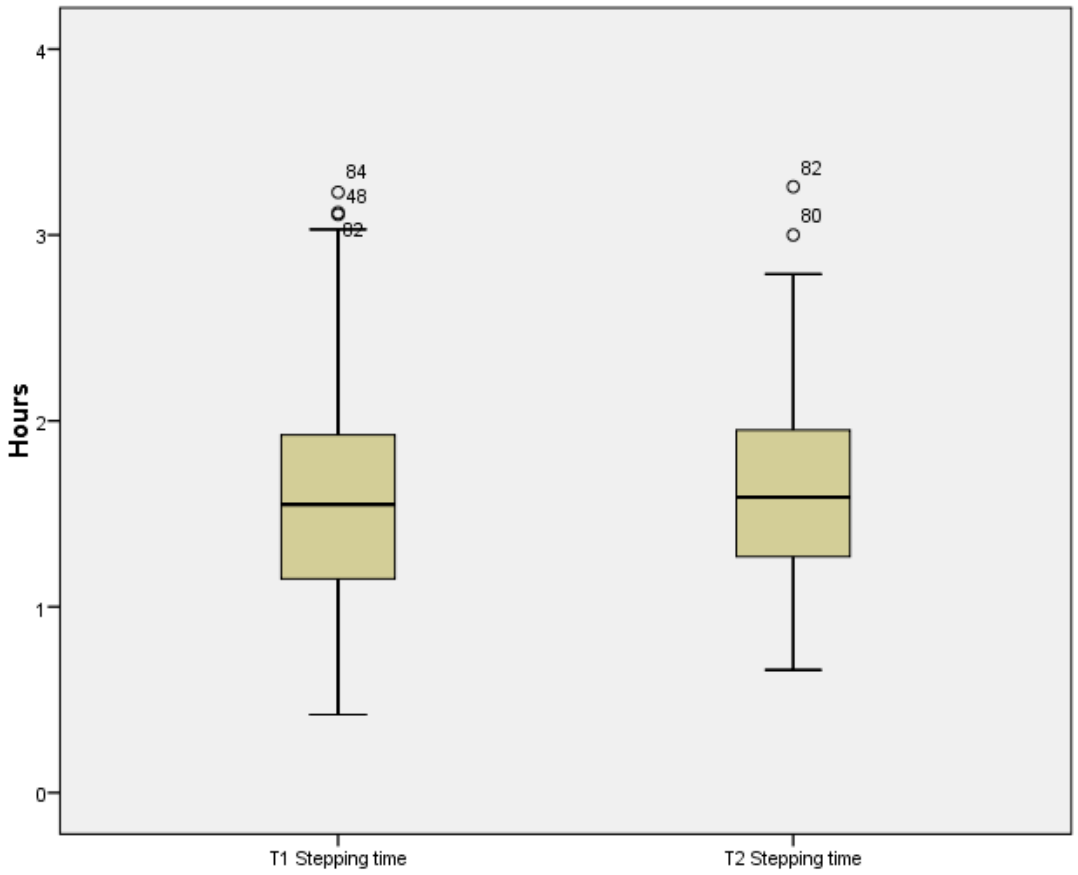


Figure 5.8 Boxplot of mean daily stepping time in Time 1 and Time 2

5.6.1.2.2 Variations of Stepping Time over a Week

The researcher calculated the mean stepping time per day for each day of the week by averaging the stepping time of the participants for both Time 1 and Time 2. The mean daily stepping time was generally lower at Time 1 except for Wednesday (Figure 5.9 and 5.10). There was little difference between days but the greatest mean daily stepping time for both Time 1 and Time 2 occurred on Friday and Saturday, with the smallest mean daily stepping time occurring on Friday 80.69 minutes at Time 1 and 86.39 minutes at Time 2, which are the weekend and an official holiday in Middle Eastern countries. The greatest mean daily stepping time was similar for Time 1 and Time 2. The participants had the greatest mean daily stepping time on Tuesday 100.73 minutes at Time 1 and 106.12 minutes at Time 2 (Appendix O). However, the

comparatively large standard deviation indicates considerable variation within the times, particularly Time 1.

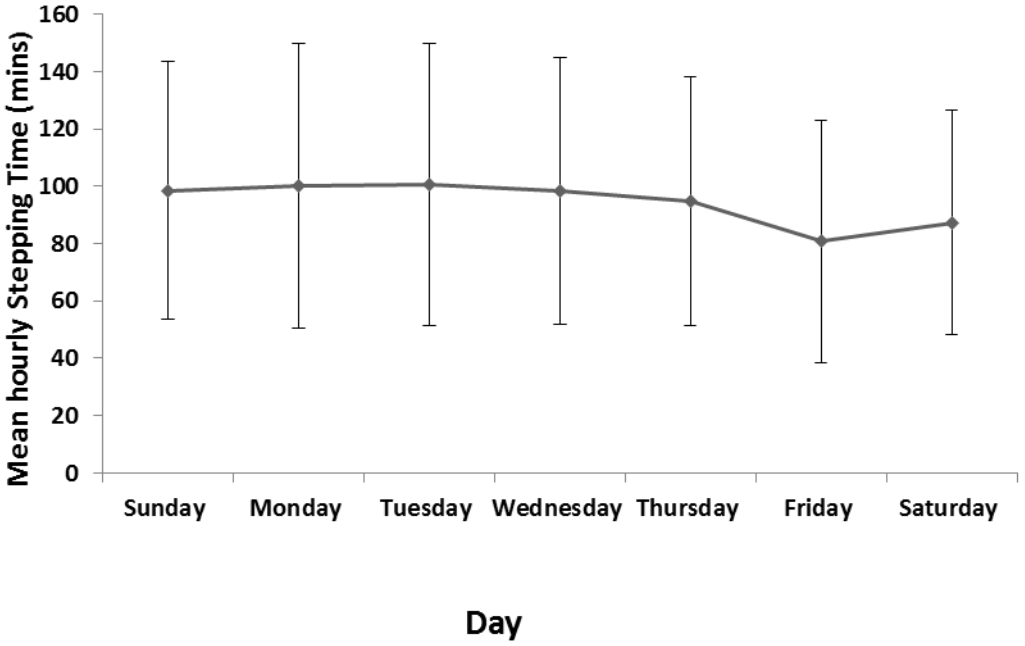


Figure 5.9 Mean stepping time according to day at Time 1(error bars represent ± SD)

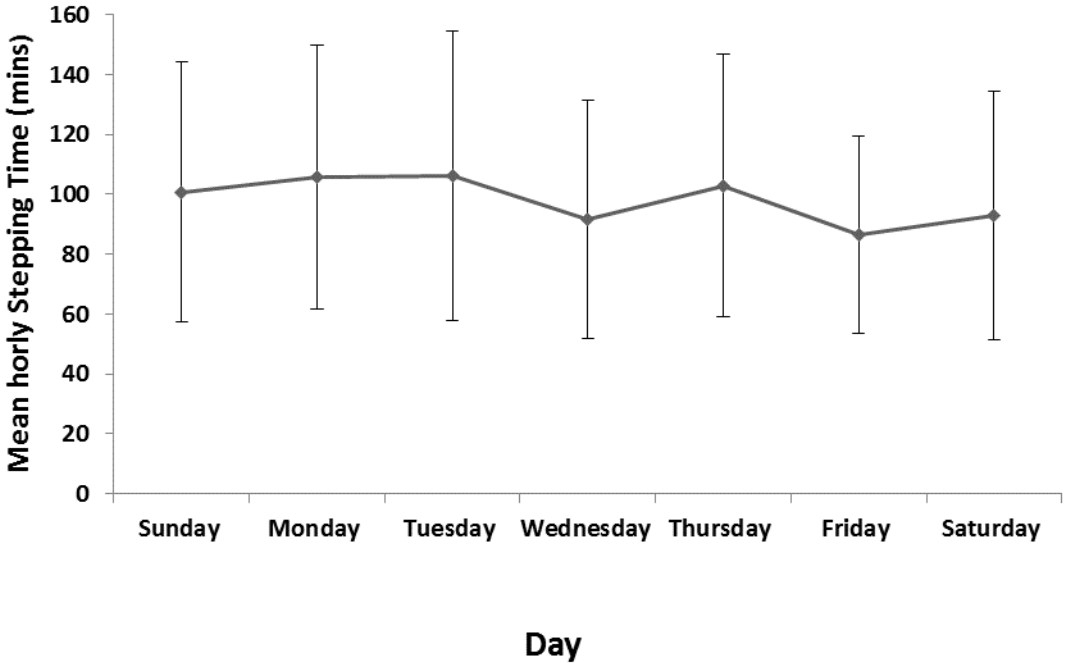


Figure 5.10 Mean stepping time according to day at Time 2 (error bars represent ± SD)

5.6.1.2.3 Stepping Time over a 24-Hour Period

Figure 5.11 shows the mean hourly stepping time across all participants at Time 1. From 05:00, the mean hourly stepping time increased from a level of about 0.5 minutes to 07.32 minutes at 13:00. There were small fluctuations in mean hourly stepping time through afternoon with two small peaks in mean hourly stepping time, at 17:00 and 20:00. After 20:00, the hourly stepping time fell sharply to a night-time level of about 2.2 minutes per hour (Appendix P). In Time 2, mean hourly stepping time was small from 12:00 until 05:00 (Appendix Q). The mean hourly stepping time then increased gradually at 06:00 until (8.6 minutes) at 13:00. After that, mean hourly stepping time decreased to 4.74 minutes at 16:00, and following that, at 17:00, the mean hourly stepping time starts decreasing until it reaches 2.4 minutes at 24:00 (Figure 5.12). The hourly pattern of the stepping time at Time 1 and Time 2 can be compared (Figures 5.11 and 5.12). Mean hourly stepping time was greater at Time 2 throughout the entire day. However, there are relatively low levels of activity throughout the day at both times.

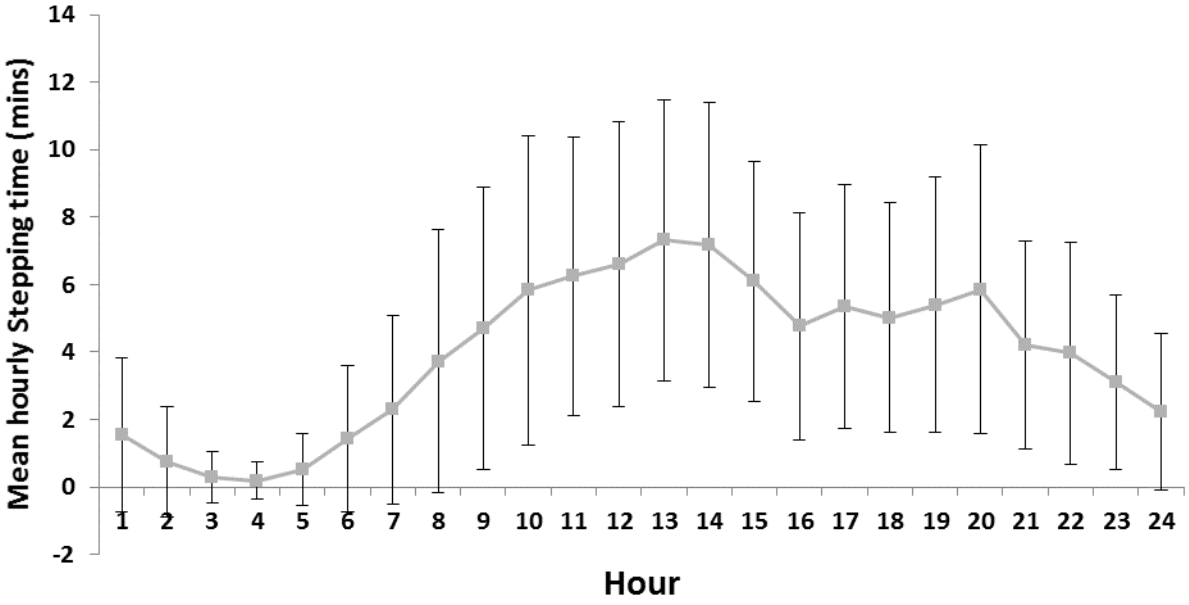


Figure 5.11 Mean stepping time according to hour at Time 1(error bars represent ± SD)

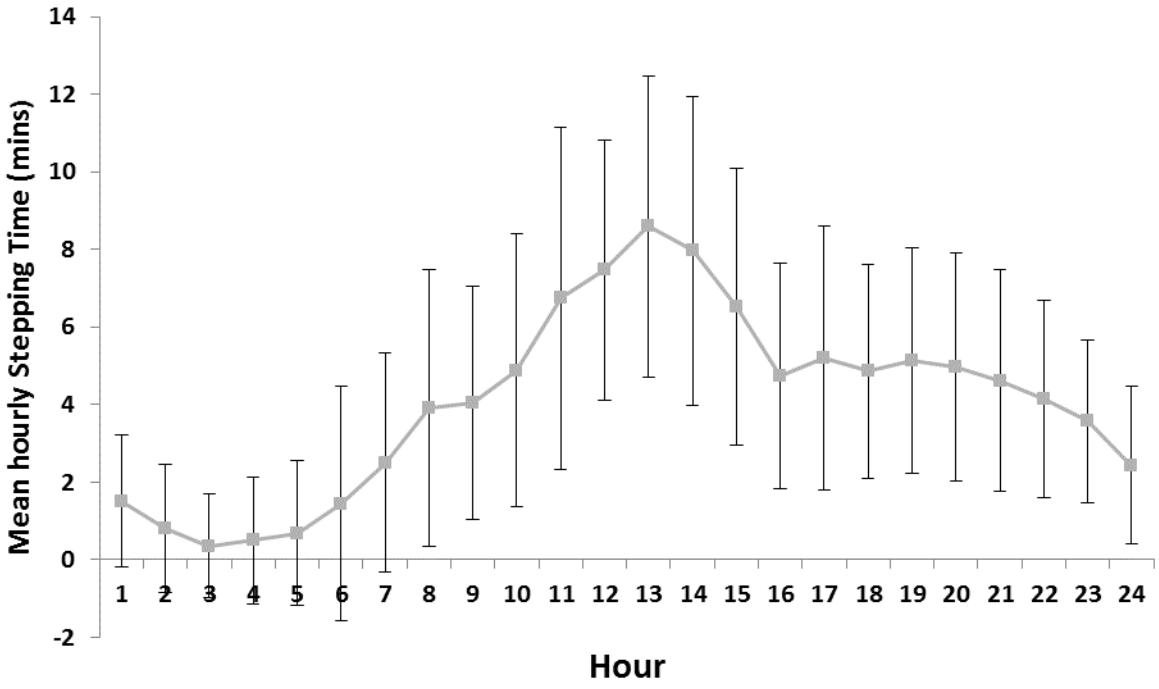


Figure 5.12 Mean stepping time according to hour at Time 2 (error bars represent ± SD)

5.6.1.3 Primary outcome measure- Standing Time

5.6.1.3.1 Overall Standing Time for Time 1 and Time 2

The mean standing time per day for all participants was calculated. The population mean daily standing time at Time 1 was 238.8 minutes and at Time 2 was 231.6 minutes. There was considerable variation in standing time at Time 1 and Time 2 as indicated by the large standard deviation 99 minutes and range of 423 minutes at Time 1 and standard deviation 87 minutes and range of 439.8 minutes at Time 2 (Table 5.16). The minimum daily standing time recorded on a single day at Time 1 was 69 minutes and the maximum daily standing time was 492 minutes, while the minimum daily standing time recorded in Time 2 was 48 minutes and the maximum daily standing time was 487 minutes (Table 5.16). Figure 5.13 shows the mean and standard deviation of the population in a boxplot format. There was no significant change in mean daily standing time between Time 1 and Time 2 (paired t-test, t (74) =1.079, p = 0.284).

Table 5.16

Summary Overall- Standing Time at Time 1 and Time 2

	Mean standing time per day					
Measurement time	M (mins/ day)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	paired t-Test / *p* value
Time 1	238.8	99	423	69	492	0.284
Time 2	231.6	87	439.8	48	487.8	

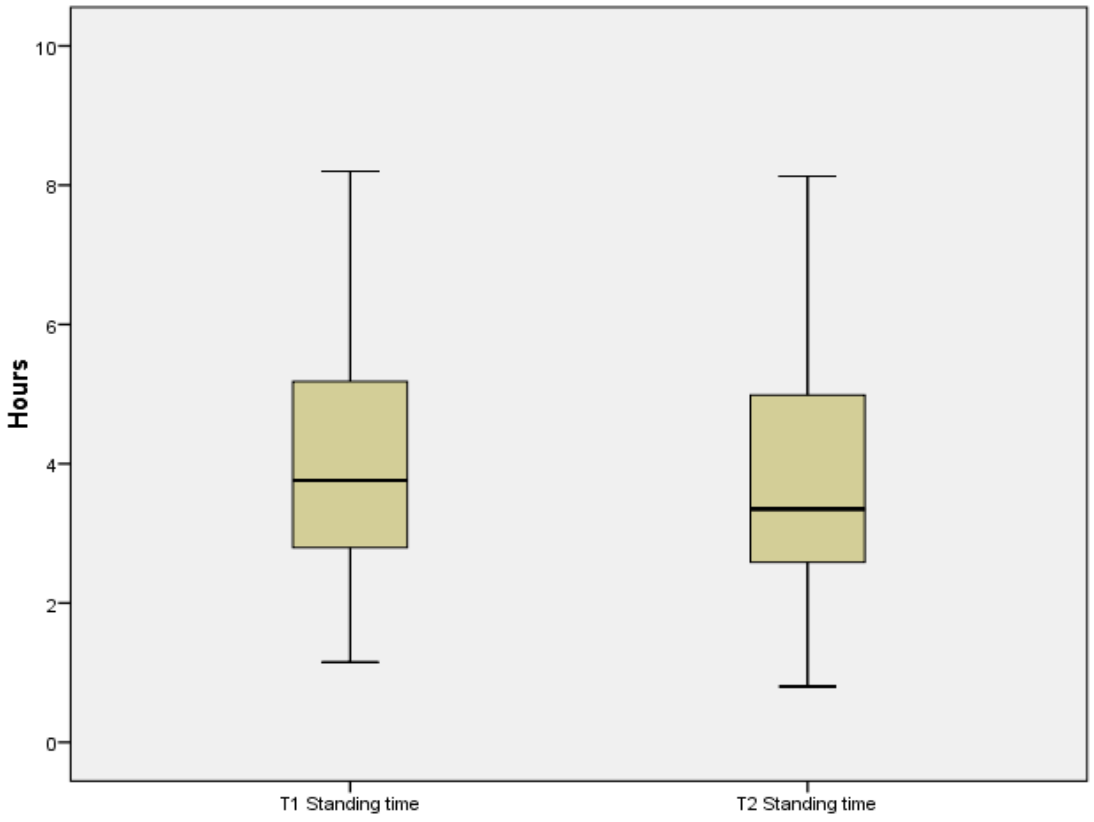


Figure 5.13 Boxplot of mean daily standing time in Time 1 and Time 2

5.6.1.3.2 Variation of Standing Time over a Week

The researcher calculated the mean standing time per day for each day of the week by averaging the stepping time of the participants for both Time 1 and Time 2. At Time 1, there was little difference between days but the smallest mean standing time per day was Friday 199.8 minutes, and the greatest mean standing time per day was Tuesday 249.6 minutes. The mean daily standing time on Monday, Tuesday and Friday was generally lower at Time 1. However, it was higher on Sunday, Wednesday, Thursday and Saturday. Figure 5.14 shows relatively large standard deviation, indicating a considerable variation in mean standing time per day of the participants (Appendix R). At Time 2, there was little difference between days but the smallest mean standing time per day was Friday 217.47 minutes, and the greatest mean standing time per day was Tuesday 257.36 minutes. Figure 5.15 shows relatively large standard deviation, indicating a considerable variation in mean standing time per day of the participants (Appendix R).

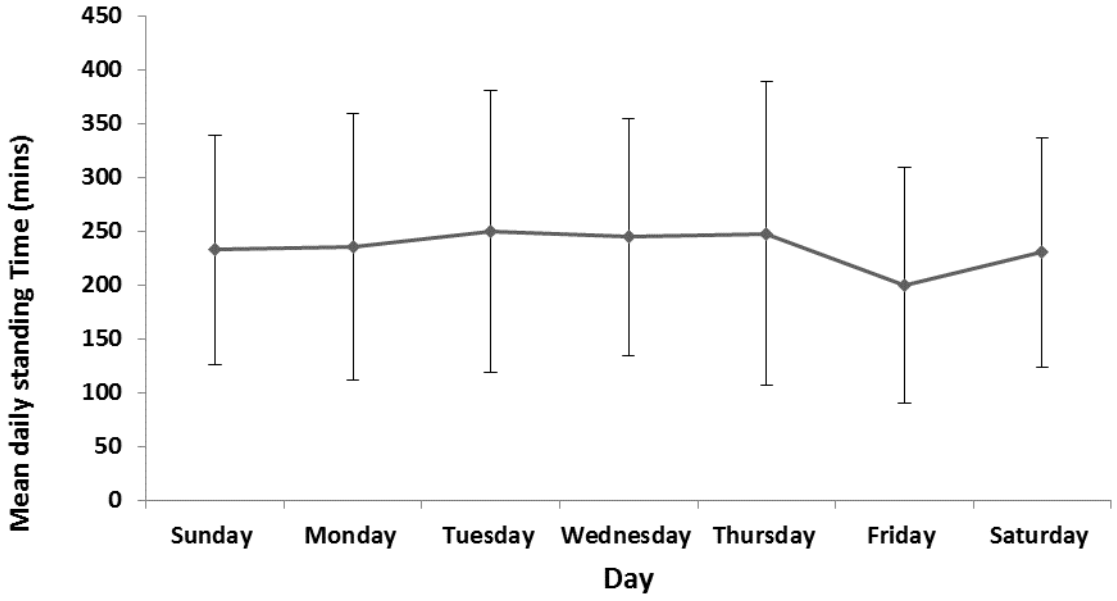


Figure 5.14 Mean standing time according to day at Time 1 (error bars represent ± SD)

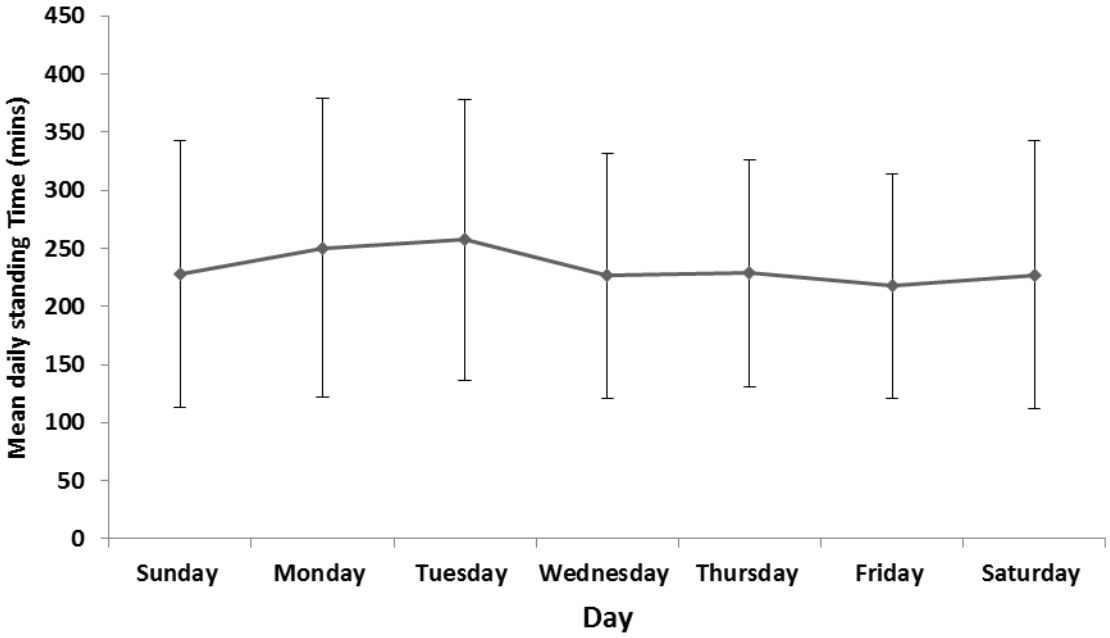


Figure 5.15 Mean standing time according to day at Time 2 (error bars represent ± SD)

5.6.1.3.3 Standing Time over a 24 Hour Period

Figure 5.16 shows the mean hourly standing time across all participants at Time 1. From 05:00, the mean hourly standing time increased from a level of about 3.02 minutes to 17.10 minutes at 13:00. There were small fluctuations in the mean hourly standing time through the day, with one small peak in activity at 13:00. After 13:00, the standing time starts decreasing until it reaches 12.22 minutes at 16:00. There was a stable phase in mean hourly standing time between 16:00 and 20:00. After 20:00, mean hourly standing time fell sharply to a night-time level of approximately 6.1 minutes per hour (Appendix S).

Figure 5.17 shows at Time 2, the mean hourly standing time across all participants. From 05:00, the mean hourly standing time increased from a level of about 3.07 minutes to 17.97 minutes at 13:00. There were small fluctuations in the mean hourly

standing time after noon at 13:00. After 20:00, the mean hourly standing time started decreasing gradually from 11.35 minutes to 05.26 minutes at 24:00 (Appendix T). The hourly pattern of the mean hourly standing time at Time 1 and Time 2 can be compared (Figures 5.16 and 5.17). The mean hourly standing time was greater at Time 1 throughout the entire day, particularly in the afternoon. However, there were relatively low levels of the mean hourly standing time throughout the day at both times.

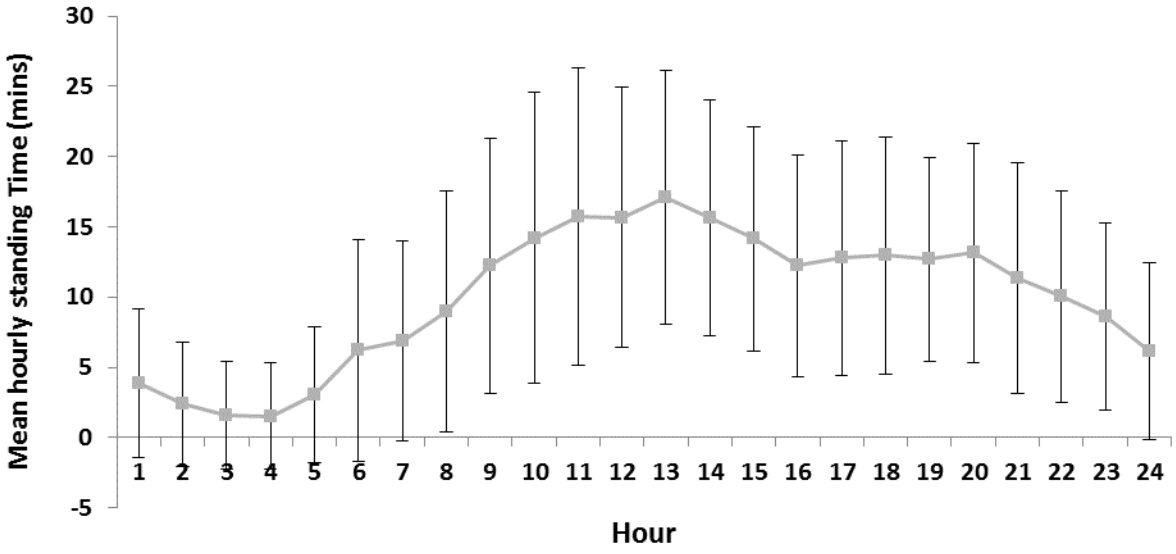


Figure 5.16 Mean standing time according to hour at Time 1(error bars represent ± SD)

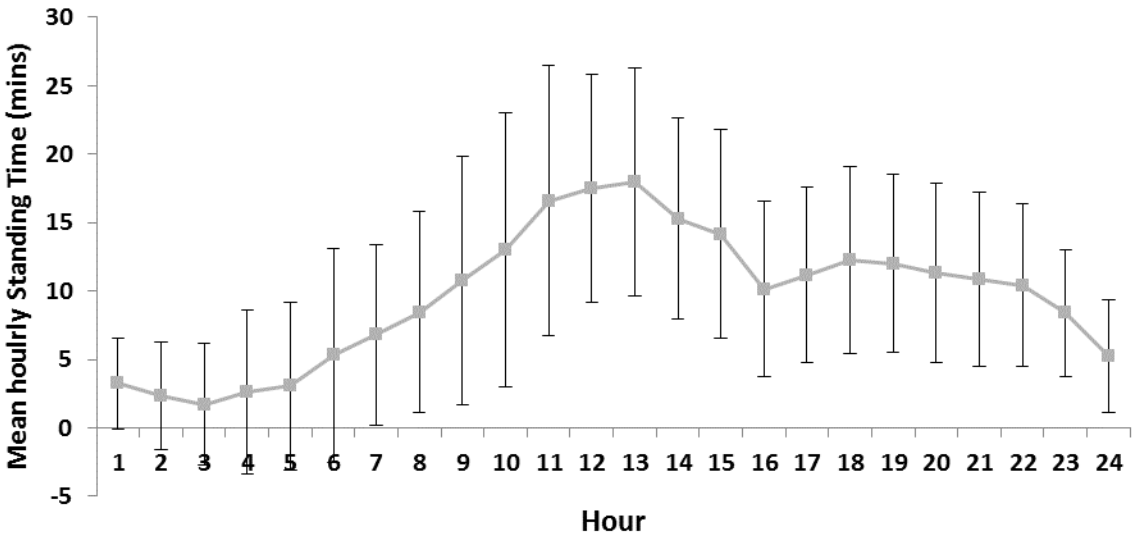


Figure 5.17 Mean standing time according to hour at Time 2 (error bars represent ± SD)

5.6.1.4 Primary outcome measure- Upright Time

5.6.1.4.1 Overall Upright Time for Time 1 and Time 2

The researcher calculated the mean upright time per day across all participants. The population mean upright time per day at Time 1 was 333 minutes and at Time 2 was 327 minutes. There was considerable variation in upright time at Time 1 and Time 2 as indicated by the large standard deviation 123.6 minutes and range of 542 minutes at Time 1 and standard deviation 104.4 minutes and range of 479.4 minutes at Time 2 (Table 5.17). The minimum upright time recorded on a single day at Time 1 was 123.6 minutes and the maximum upright time was 666 minutes, and the minimum upright time recorded in Time 2 was 106.2 minutes and the maximum upright time was 585.6 (Table 5.17). Figure 5.18 shows the mean and standard deviation of the population in a boxplot format. There was no significant change in mean daily upright time between Time 1 and Time 2 (paired t-test, t (74) =0.910, p = 0.366).

Table 5.17

Summary Overall- Mean Daily Upright Time in Time 1 and Time 2

Measurement time	Mean upright time per day					
	M (mins/ day)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	paired t-Test / *p* value
Time 1	333	123.6	542.4	123.6	666	0.366
Time 2	327.6	104.4	479.4	106.2	585.6	

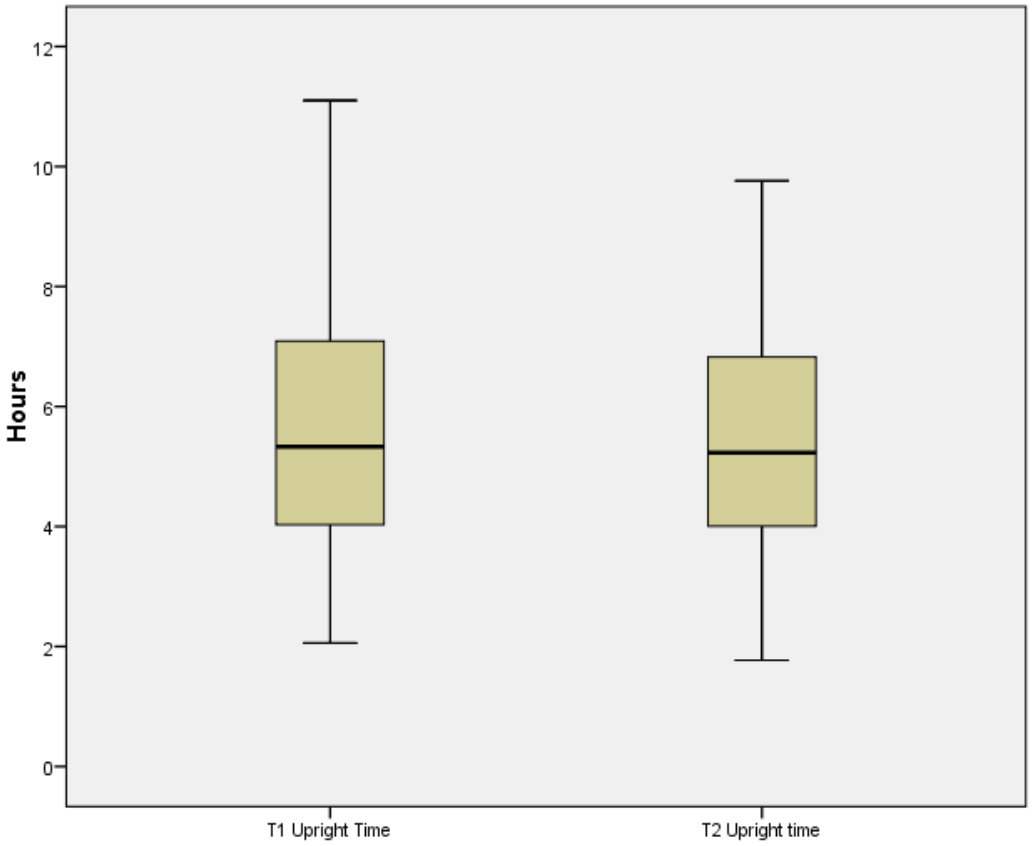


Figure 5.18 Boxplot of mean daily upright time in Time 1 and Time 2

5.6.1.4.2 Variation of Upright Time over a Week

The researcher calculated the mean upright time per day by averaging the upright time of the participants for both Time 1 and Time 2. At Time 1, the mean daily upright time was generally lower at Time 2. There was little difference between days but the smallest mean daily upright time occurred on Friday 280.5 minutes and the greatest mean daily upright time day occurred on Tuesday 354.86 minutes at Time 1 (Appendix U). The mean daily upright time was generally lower on Sunday, Monday, Tuesday and Friday at Time 1. Figure 5.19 shows relatively large standard deviation, indicating a considerable variation in upright time of the participants at Time 1. At Time 2, the smallest mean daily upright time occurred on Friday 303.86 minutes and the greatest mean daily upright time day occurred on Tuesday 363.47 minutes (Figure 5.20). There was a relatively large standard deviation, indicating a considerable variation in mean daily upright time of the participants (Appendix U).

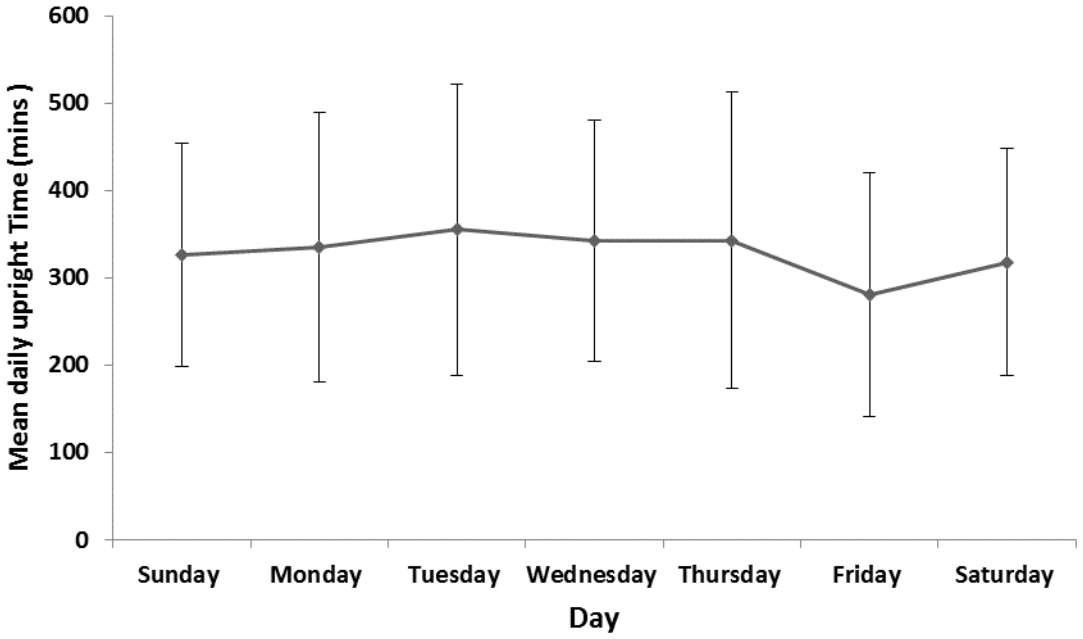


Figure 5.19 Mean upright time according to day at Time 1(error bars represent ± SD)

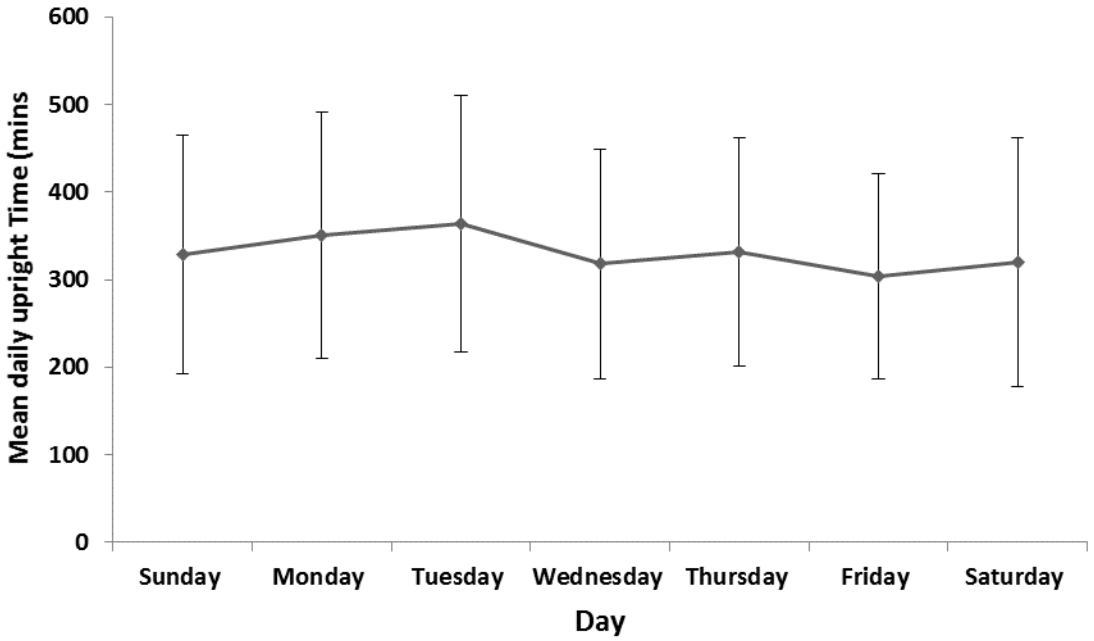


Figure 5.20 Mean upright time according to day at Time 2(error bars represent ± SD)

5.6.1.4.3 Upright Time over a 24-Hour Period

Figure 5.21 shows the mean hourly upright time across all participants at Time 1. From 05:00, the mean hourly upright time increased from a level of about 3.53 minutes to 24.41 minutes at 13:00. After 13:00, the mean hourly upright time started decreasing to 18 minutes. There was a stable phase from 16:00 to 20:00. After 20:00, the mean hourly upright time fell sharply to a night-time level of about 8.34 minutes per hour (Appendix V).

Figure 5.22 shows the mean hourly upright time across all participants at Time 2. From 05:00, the mean hourly upright time increased from a level of about 3.78 minutes to 26.50 minutes at 13:00. After 13:00, the mean hourly upright time decreased to 14.84 minutes at 16.00. At 17:00, the mean hourly upright time started to increase gradually to 17.17 minutes at 18.00. After 20.00, the mean hourly upright time fell sharply to a night-time level of approximately 7.76 minutes per hour (Appendix W). The hourly pattern of the mean hourly upright time at Time 1 and Time 2 can be compared (Figures 5.21 and 5.22). Mean hourly upright time was greater at

Time 1 throughout the entire day, except 11:00 to 15:00. However, there were relatively low levels of activity throughout the day at both times.

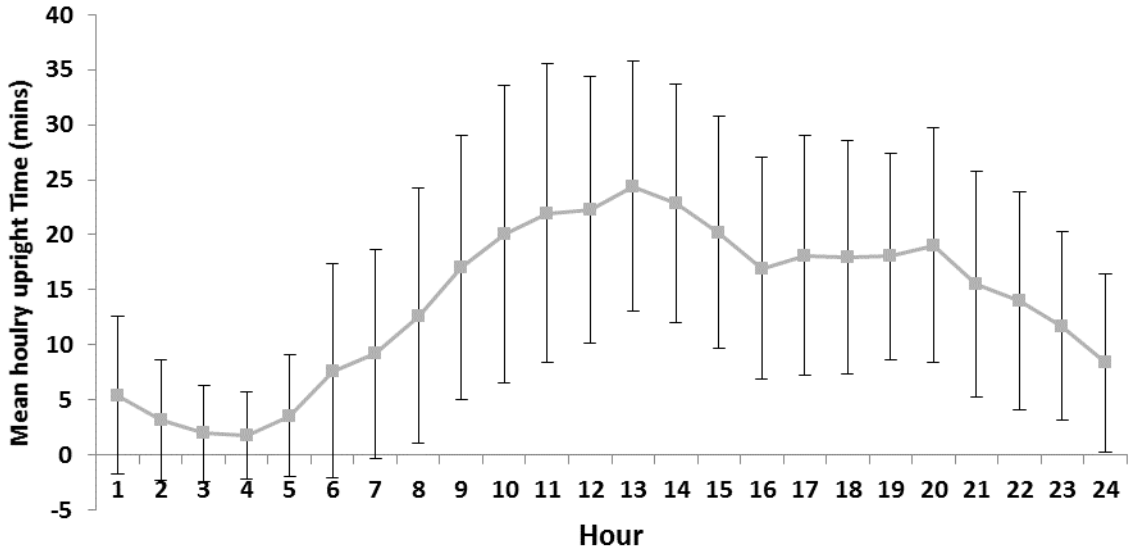


Figure 5.21 Upright time according to hour at Time 1(error bars represent ± SD)

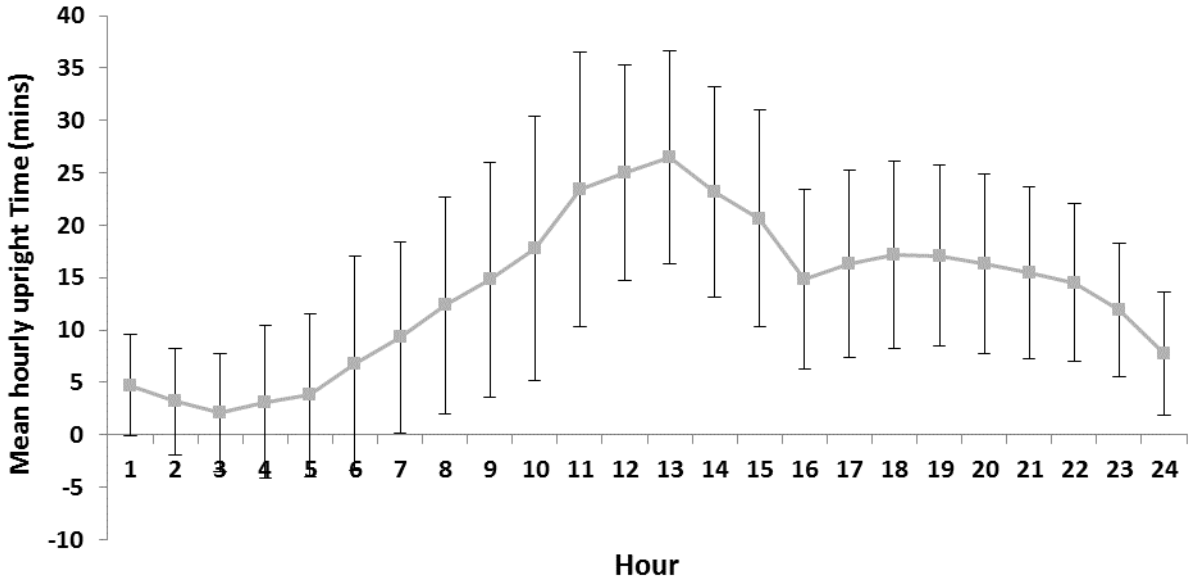


Figure 5.22 Mean upright time according to hour at Time 2 (error bars represent ± SD)

5.6.1.5 Primary outcome measure- Sedentary Time

5.6.1.5.1 Overall Sedentary Time for Time 1 and Time 2

The researcher calculated the mean sedentary time per day across all participants. The population mean sedentary time per day at Time 1 was 1,107 minutes and at Time 2 was 1,112 minutes. There was considerable variation in sedentary time at Time 1 and Time 2 as indicated by the large standard deviation 123.6 minutes and range of 542.4 minutes at Time 1, and large standard deviation 104.4 minutes and range of 480 minutes at Time 2 (Table 5.18). The minimum sedentary time recorded on a single day at Time 1 was 773.4 minutes and the maximum sedentary time was 1,316 minutes, while the minimum sedentary time recorded in Time 2 was 853.8 minutes and the maximum sedentary time was 1,334 minutes (Table 5.18). Figure 5.23 shows the mean and standard deviation of the population in a boxplot format. There was no significant change in mean daily sedentary time between Time 1 and Time 2 (paired t-test, t (74) =-0.884, p = 0.380).

Table 5.18

Summary Overall- Sedentary Time at Time 1 and Time 2

	Mean sedentary time per day					
Measurement time	M (mins/ day)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	paired t-Test / *p* value
Time 1	1,107	123.6	542.4	773.4	1,316	0.380
Time 2	1,112	104.4	480	853.8	1,334	

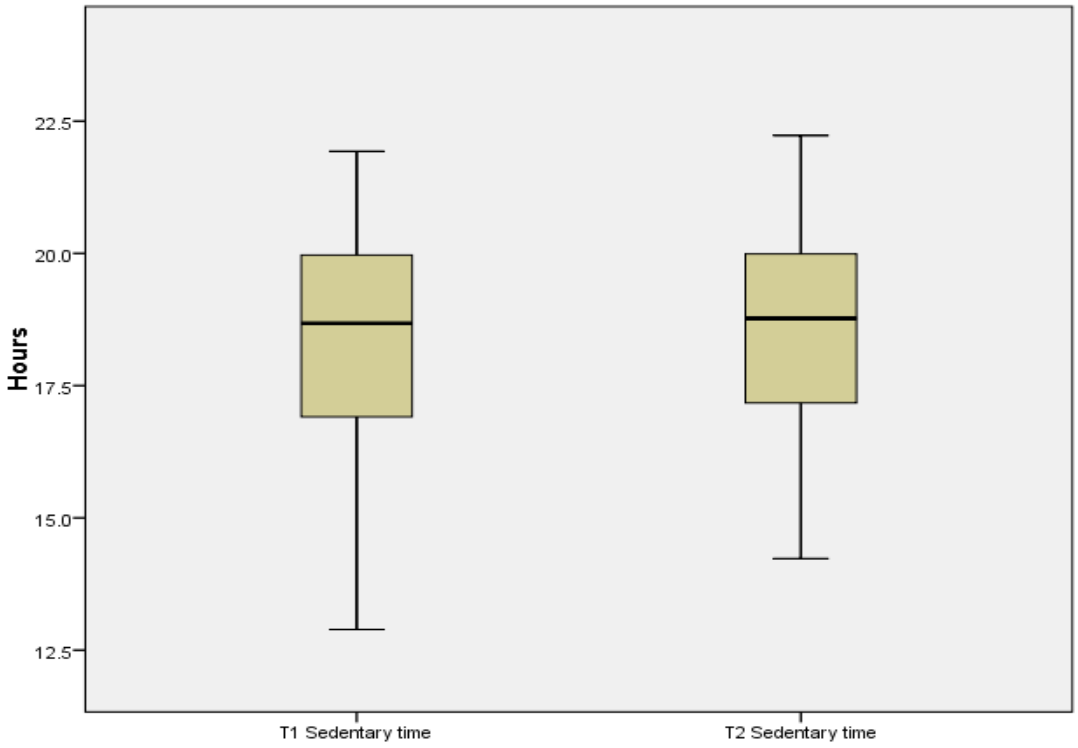


Figure 5.23 Boxplot of mean daily sedentary time in Time 1 and Time 2

5.6.1.5.2 Variation of Sedentary Time over a Week

The researcher calculated the mean sedentary time for each day by averaging the sedentary time of the participants for both Time 1 and Time 2. There was little difference between days but the smallest mean sedentary time per day occurred on Tuesday 1,089.7 minutes and the greatest mean sedentary time per day occurred on Friday 1,159 minutes at Time 1 (Appendix X). Figure 5.24 shows relatively large standard deviation, indicating considerable variation in mean sedentary time per day of the participants. At Time 2, there was little difference between days but the greatest mean sedentary time per day occurred on Friday 1,136 minutes and the smallest mean sedentary time per day occurring on Tuesday 1,076 minutes (Appendix X). Figure 5.25 shows relatively large standard deviation, indicating considerable variation in mean sedentary time per day of the participants. The comparison of the mean sedentary time per day at Time 1 and Time 2 showed that

the mean sedentary time per day was generally lower at Time 2 except on Wednesday and Thursday.

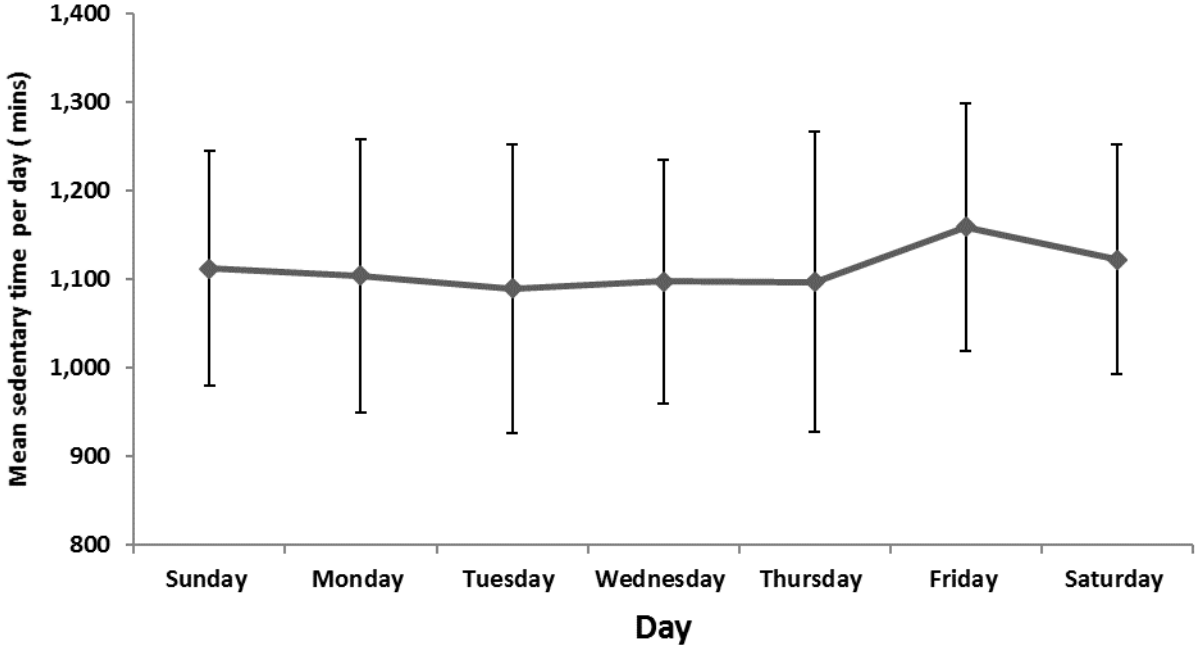


Figure 5.24 Mean sedentary time according to day at Time 1 (error bars represent ±SD)

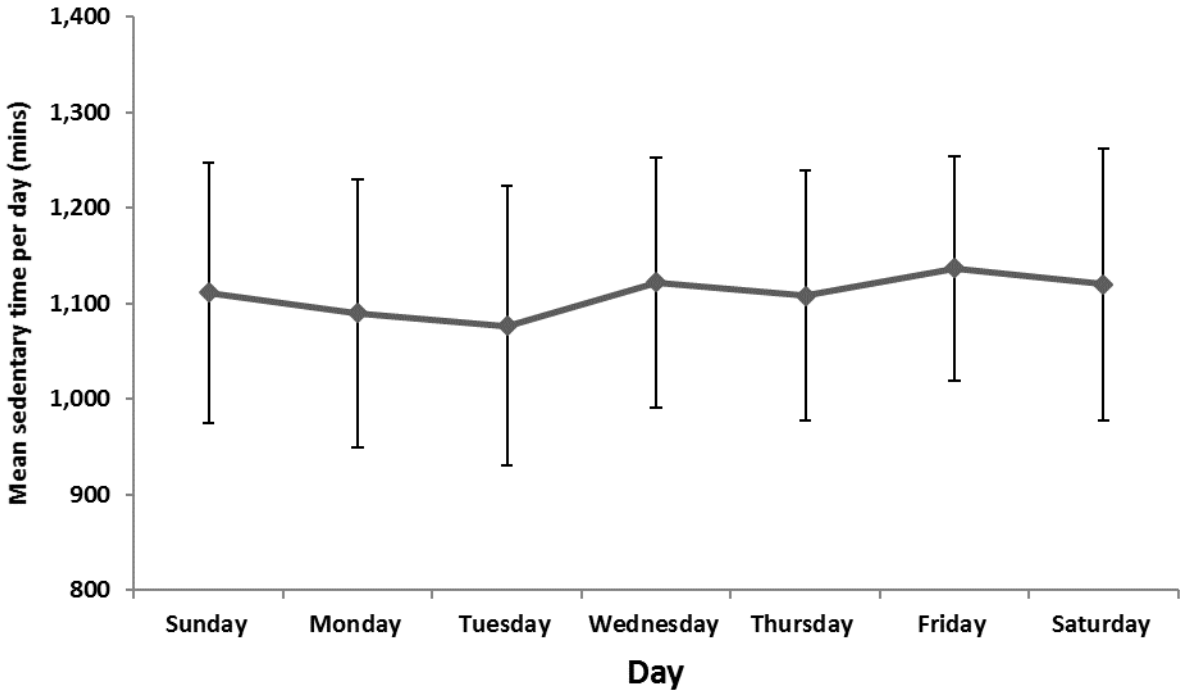


Figure 5.25 Mean sedentary time according to day at Time 2 (error bars represent ± SD)

5.6.1.5.3 Sedentary Time over a 24-Hour Period

Figure 5.26 shows the mean hourly sedentary time across all participants at Time 1. From 05:00, the mean hourly sedentary time decreased from a level of about 56.54 minutes to 35.60 minutes at 13:00. There were very small fluctuations in mean hourly sedentary time throughout the entire day with stable phase in activity from 16:00 to 20:00. After 20:00, the mean hourly sedentary time increased gradually to a night-time level of about 51.66 minutes per hour (Appendix Y).

Figure 5.27 shows the mean hourly sedentary time across all participants at Time 2. From 06:00, the mean hourly sedentary time decreased from a level of about 53.22 minutes to 32.49 minutes at 13:00. There were small fluctuations in mean hourly sedentary time throughout the afternoon. After 20:00, mean hourly sedentary time started increasing gradually to a night-time level of about 52.33 minutes per hour (Appendix Z). Figures 5.26 and 5.27 showed the comparison between the hourly

pattern of the sedentary time at Time 1 and Time 2. The mean hourly sedentary time was greater at Time 2 throughout the entire day. However, there were relatively prolonged periods of sedentary time per hour throughout the day at both times.

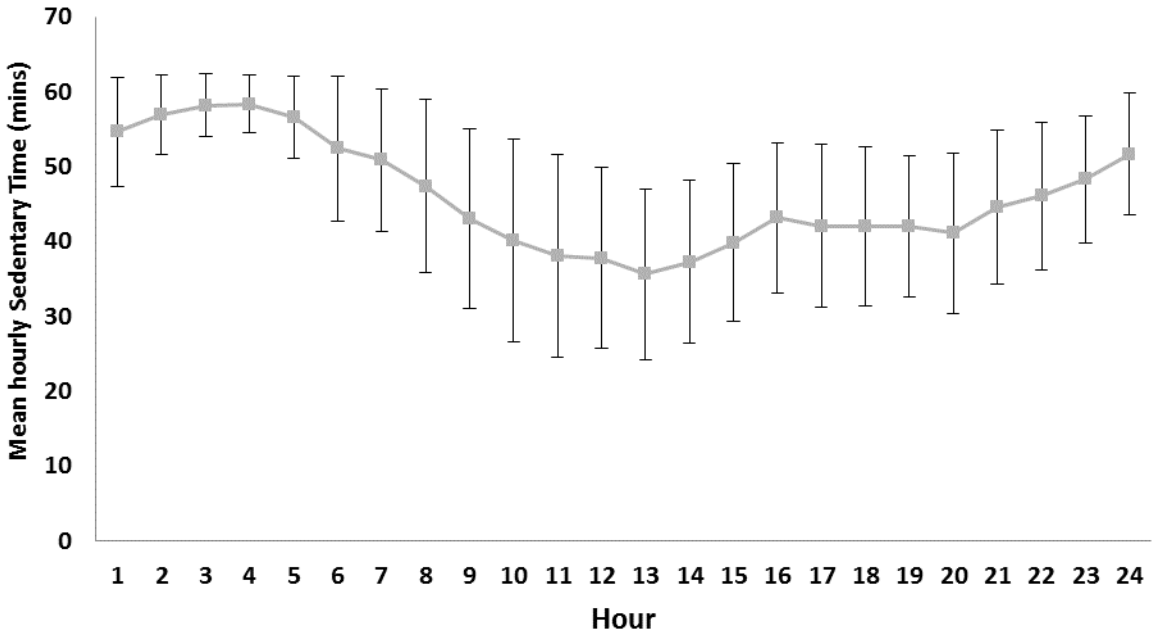


Figure 5.26 Mean sedentary time according to hour at Time 1(error bars represent ± SD)

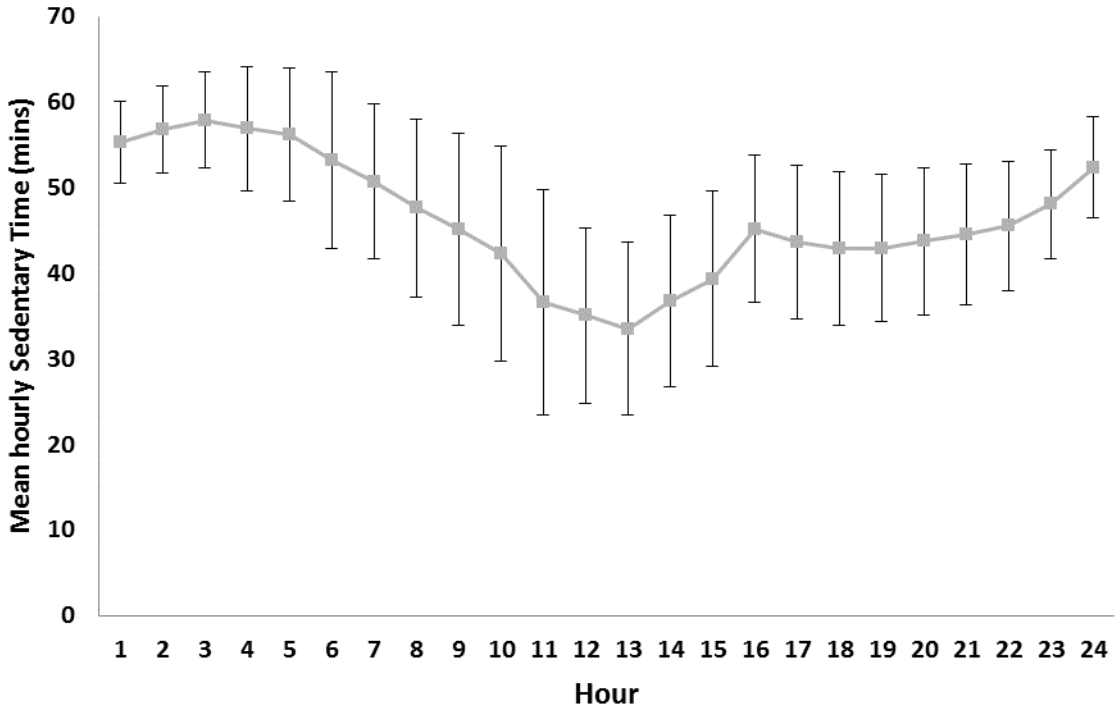


Figure 5.27 Mean sedentary time according to hour at Time 2 (error bars represent ± SD)

5.6.2 Physical Activity Patterns

This section presents a full description of PA patterns for both Time 1 and Time 2. The study assessed the pattern of both upright events (a combination of stepping and standing time) and sedentary events (sitting/lying time) for all participants for both Time 1 and Time 2. The length of events was categorised according to specific percentage cut-off points. In addition, the percentage of events spent in particular fashion was categorised according to specific period cut-off points at both Time 1 and Time 2. Then, the study compared and statistically examined both PA events' results.

5.6.2.1 Pattern of Upright Events

Figure 5.28 shows all the accumulated upright events, sorted from shortest to longest at Time 1 and Time 2, for all events from all participants. At Time 1, 25% of the total accumulated upright times for all participants were less than 5.82 minutes. Fifty percent of their total accumulated upright times were less than 14.64 minutes and 75% of their total accumulated upright time were less than 33.84 minutes. At Time 2, 25% of their total accumulated upright time in less than 5.7 minutes, 50% of their total accumulated upright time in less than 13.68 minutes and 75% of accumulated upright time were less than 32.7 minutes. Comparing the upright events in Time 1 and Time 2, the accumulated total upright events for all three cut-off points are slightly greater at Time 1 than at Time 2. The study calculated the 25%, 50% and 75% cut-off points separately for each individual at both time points. Paired t-tests showed there was no significant differences in accumulated upright events between the cut-off points of 25% at Time 1 (M= 6.49, SD= 3.43) and the cut-off points of 25% at Time 2 (M= 5.9, SD=2.61) t (74) =1.432, p = 0.156. The cut-off points of 50% and 75% were not normally distributed. Therefore, the researcher used an alternative test for nonparametric variables (the Wilcoxon Signed-Rank Test) to examine the difference in accumulated upright events between Time 1 and Time 2. The Wilcoxon Test showed that were no significant differences in accumulated upright events between Time 1 and Time 2 for both the cut-off point of 50% (Z = 1.6, p = 0.106) and the cut-off point of 75% (Z = 0.937, p = 0.349), (Table 5.19).

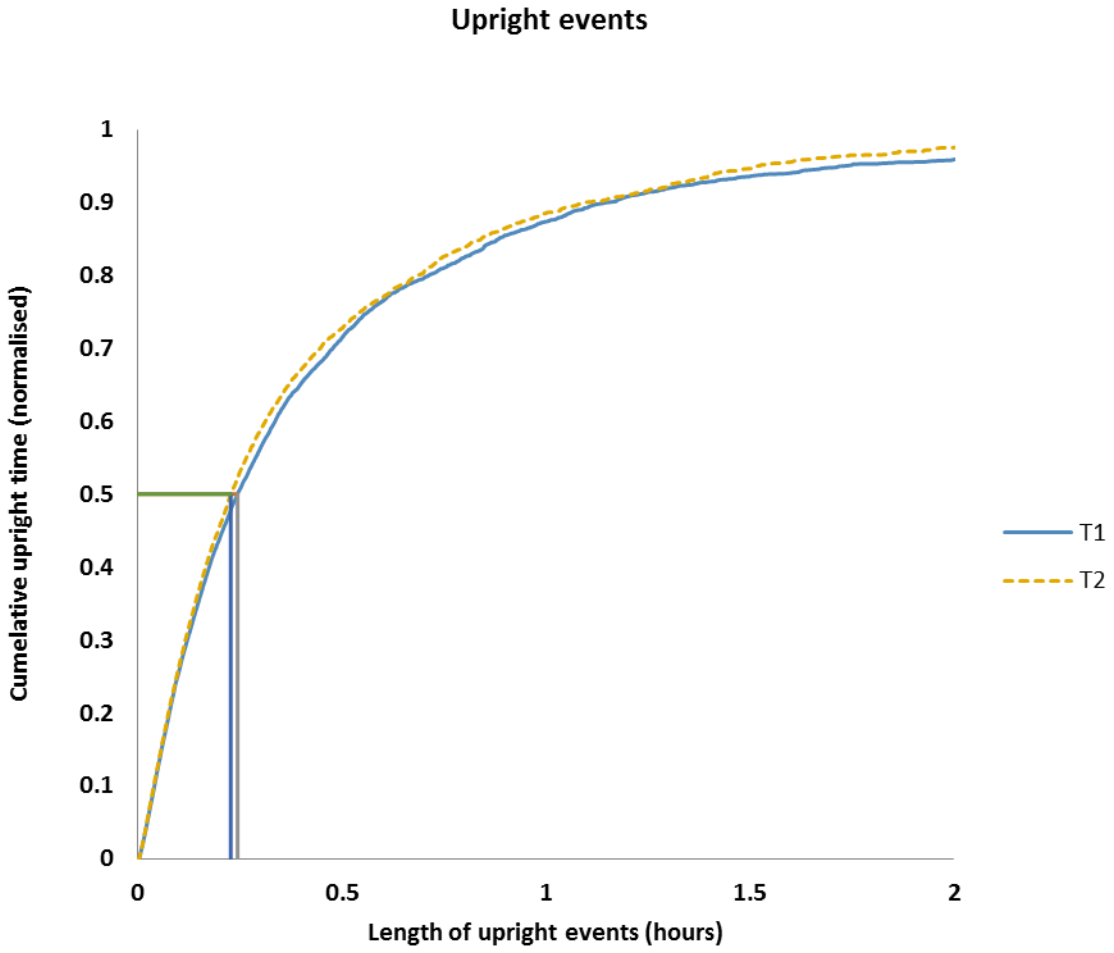


Figure 5.28 Plot of normalized cumulative upright time accumulated by upright events from shortest to longest, at Time 1 and Time 2.

Table 5.19

Length of Upright Events Length According to Percentage Cut-off Points

	Upright events						
	Time 1			Time 2			
Percentage of the events	M (mins)	SD (mins)	Median (mins)	Mean (mins)	SD (mins)	Median (mins)	Statistical test
25	6.49	3.4		5.94	2.61		Paired t-test (*p*= 0.156)
50	18.71	31.6	14.08	13.69	6.64	13.01	Wilcoxon test (*p*=0.106)
75	39.34	72.9	28.49	29.7	16.42	26.26	Wilcoxon test (*p*= 0.349)

Figure 5.29 shows the percentage of the upright events accumulated at the three cut-off points, at 0.5 hour, 1 hour and 1.5 hours. Both times showed similar percentage values, for example, at Time 1, 24% of the total accumulated upright events for all participants were less than 5 minutes. 54.7% of their accumulated total upright times were less than 15 minutes and 74% of their total accumulated upright times were less than 30 minutes. At Time 2, 25.3% of their total accumulated upright time was in less than 5 minutes, 57.8% of their total accumulated upright time was less than 15 minutes and 76.8% of accumulated upright events were less than 30 minutes. Comparing Time 1 and Time 2, the accumulated total upright events for all three cut-off points are slightly greater at Time 2 than at Time 1. The study calculated the 5-minute, 15-minute and 30-minute cut-off points separately for each individual at both time points. Paired t-tests showed there were no significant differences in these values between Time 1 and Time 2 for the three cut-off points of 5-minutes, t (74) = -1.024, p = 0.309, 15-minutes, t (74) = -1.596, p = 0.115 and 30-minutes t (74) = -1.366, p = 0.176, (Table 5.20).

Table 5.20 shows the values of the three cut-off points of 5, 15 and 30 minutes at Time 1 and Time 2. The values of the three cut-off points 5, 15 and 30 minutes were

similar for both times, although there was very little variation at Time 2 as demonstrated by slightly smaller standard deviations. In Table 5.21, the data for percentage accumulated upright events sorted from shortest to longest are similar at both times. Over 40% of the participants' upright events were accumulated in less than 10 minutes at both times, and the upright events decreased gradually with increased periods of time such as between 10-20, and then, 20-30 minutes, as illustrated in Table 5.21.

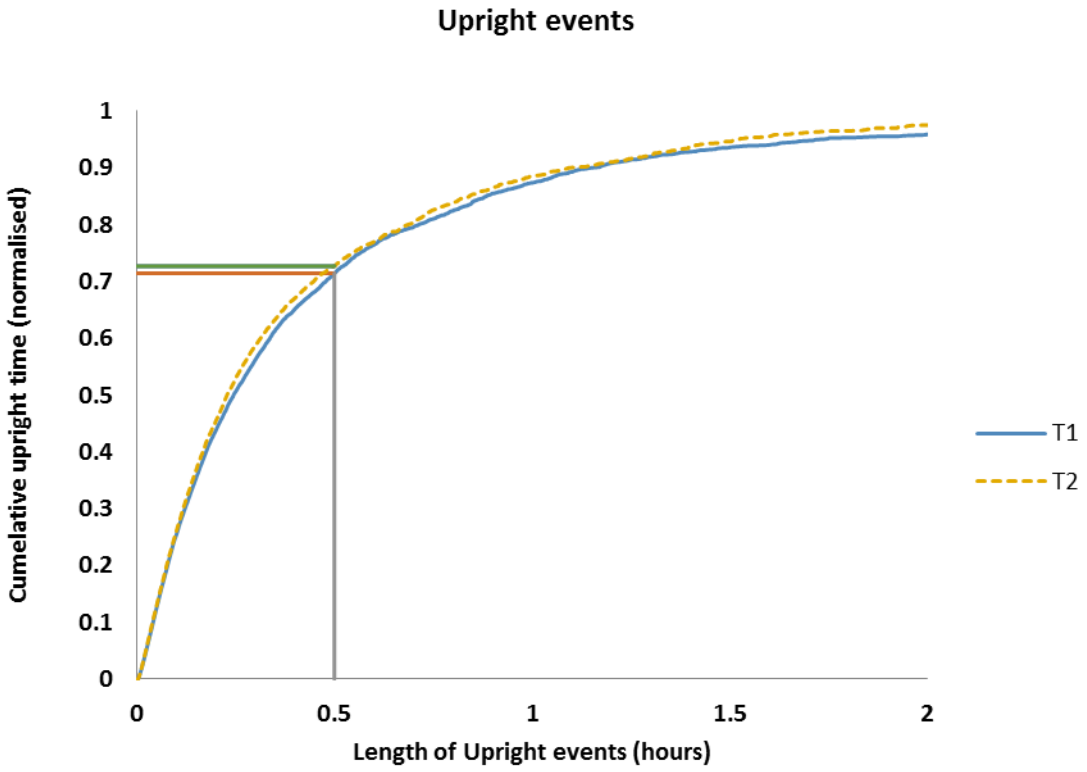


Figure 5.29 Plot of normalized cumulative upright time accumulated by upright events from shortest to longest, at Time 1 and Time 2.

Table 5.20

Percentage of Upright Events According to Length of Events Cut-off Points

	Upright events				
	Time 1		Time 2		
Length of events (mins)	M (percentage)	SD	M (percentage)	SD	Statistical test
5	24.09	12.1	25.35	11.9	Paired t-test (p=0.309)
15	54.72	17.71	57.81	17.5	Paired t-test (p=0.115)
30	74.1	15.85	76.75	14.87	Paired t-test (p=0.176)

Table 5.21

The Difference of Mean of Upright Time Percentage between Time 1 and Time 2 at the Period Cut-off Points

	Time 1	Time 2
Period cut-off points (mins)	Difference of mean upright events (percentage)	Difference of mean upright events (percentage)
0-10	42.2	44.56
10- 20	21.44	22.28
20-30	10.87	9.91

5.6.2.2 Pattern of Sedentary Events

Figure 5.30 shows the accumulated sedentary events sorted from shortest to longest at Time 1 and Time 2 for all sedentary events for all participants**.** At Time 1, 25% of

the total accumulated sedentary time for all participants was in less than 0.47 hours. Fifty percent of their total accumulated sedentary time was in less than 1.6 hours and 75% of their accumulated total sedentary time was in less than 5.2 hours. At Time 2, 25% of their total accumulated sedentary time was in less than 0.46 hours, 50% of their total accumulated sedentary time was in less than 1.74 hours and 75% of accumulated sedentary events were in less than 5.7 hours. For comparison, at Time 1 and Time 2, the accumulated total sedentary events for all three cut-off points are slightly greater at Time 2 than at Time 1.

The study calculated the 25%, 50% and 75% cut-off points separately for each individual at both time points. Because 25% and 50% were not normally distributed, the researcher used the Wilcoxon test to examine the difference in sedentary events between Time 1 and Time 2. Wilcoxon tests showed there were no significant differences in these values between Time 1 and Time 2 for the cut-off points of 25% (Z = -0.651, p=0.515) and 50% (Z = -1.16, p=0.246). Because the cut-off point of 75% was normally distributed, the researcher used paired t-test. This showed that there was no difference in sedentary events between Time 1 and Time 2 t (74) = -1.176, p=0.243 (Table 5.22).

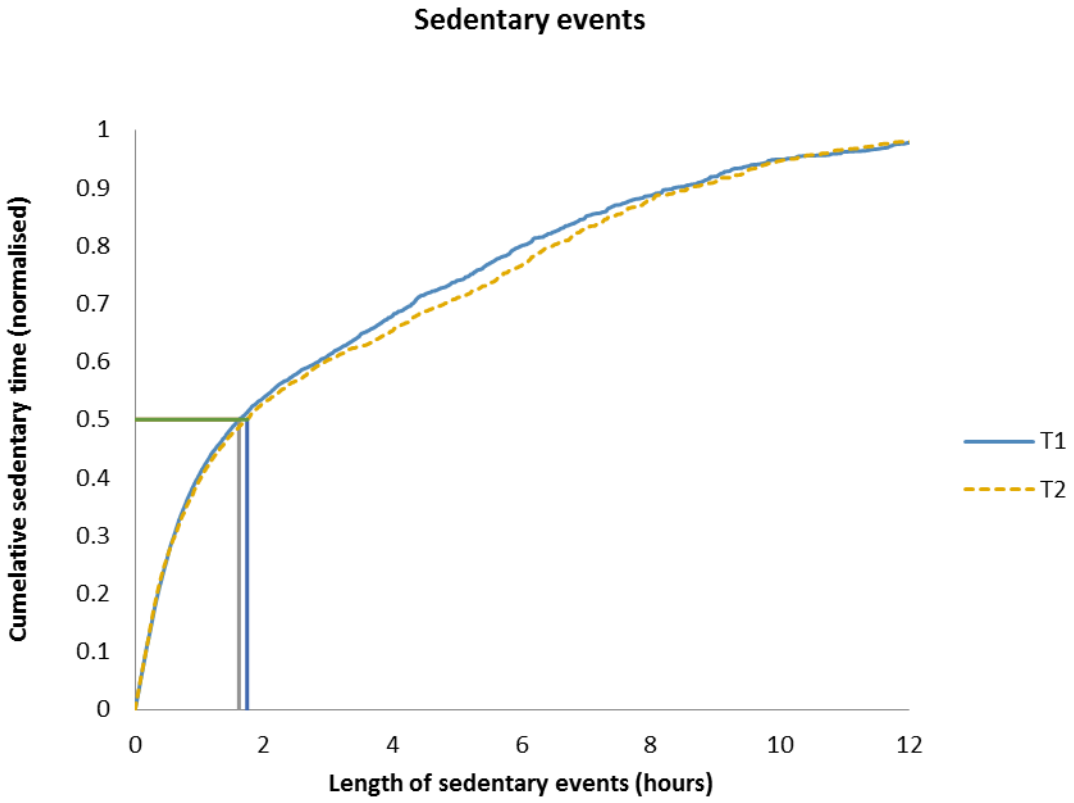


Figure 5.30 Plot of normalized cumulative sedentary time accumulated by sedentary events from shortest to longest.

Table 5.22

Length of Sedentary Events Length According to Percentage Cut-off Points

	Sedentary events						
	Time 1			Time 2			
Percentage of the events	M (Hours)	SD (Hours)	Median (Hours)	M (Hours)	SD (Hours)	Median (Hours)	Statistical test
25	0.45	0.37	0.5	0.48	0.17	0.5	Wilcoxon test (*p*= 0.515)
50	1.82	1.57	1.5	1.71	0.63	1.6	Wilcoxon test (*p*=0.246)
75	4.94	2.18		5.27	1.91		Paired t-test (*p*= 0.243)

Figure 5.31 shows the percentage of sedentary events accumulated at three- time cut-off points, at 30 minutes, 60 minutes and 90 minutes. Both times shows similar percentage values. For example, at Time 1, 26.2% of the accumulation of total sedentary behaviour for all participants was in less than 30 minutes. 40.5% of the accumulation of their total sedentary time was in less than 60 minutes and 48.3% of accumulation of their total sedentary time was in less than 90 minutes. At Time 2, 26.5% the of accumulation of their total sedentary time was in less than 30 minutes, 39.5% of the accumulation their total sedentary time was in less than 60 minutes and 47.5% of their accumulated sedentary events was in less than 90 minutes. Comparing Time 1 and Time 2, the accumulated total sedentary events for all three cut-off points are slightly greater at Time 1 than at Time 2.

The study calculated the 30-minute, 60 minute and 90-minute cut-off points separately for each individual at both time points. Paired t-tests showed there were no significant differences in these values between Time 1 and Time 2 for the three cut-off points of 30-minutes t (74) = -0.269, p=0.789, 60-minutest t (74) = 0.795, p=0.429 and 90-minutes' t (74) = 0.622, p=0.536 (Table 5.23). In addition, Table 5.23 shows the values of the three cut-off points of 30, 60 and 90 minutes at Time 1 and Time 2. The values of the three cut-off points of 30, 60 and 90 minutes were similar for both times, although there was very little variation at Time 2 as demonstrated by slightly smaller standard deviations.

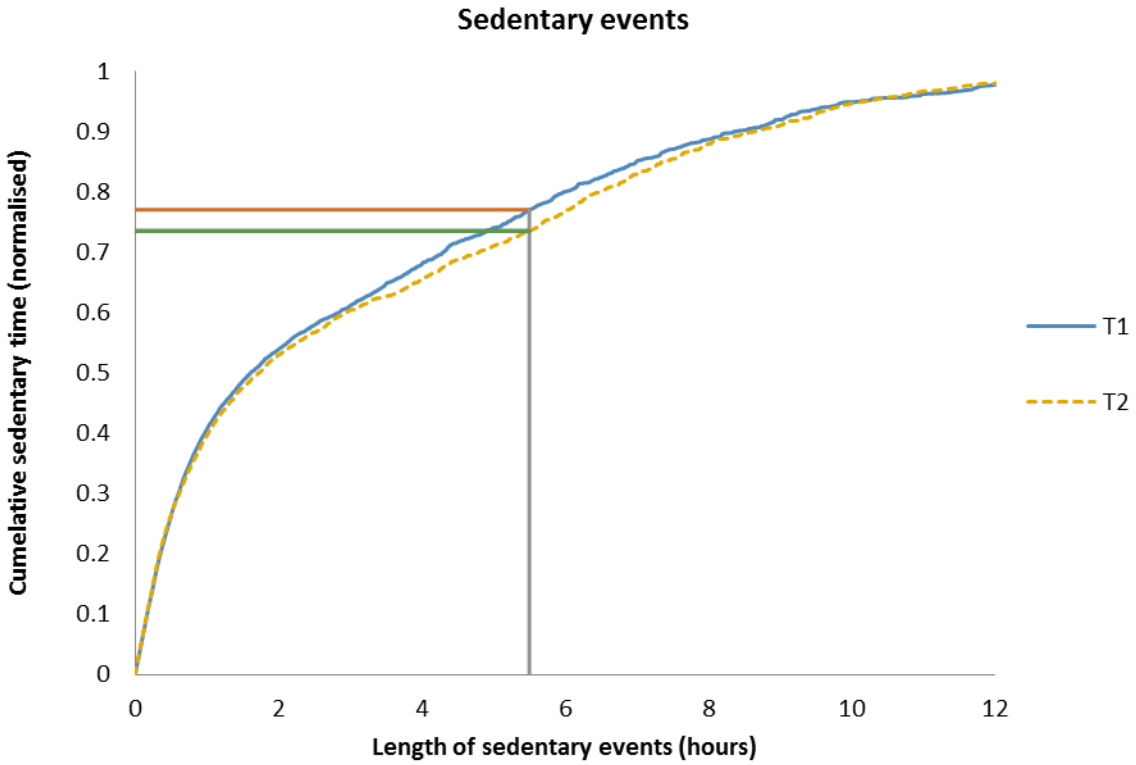


Figure 5.31 Plot of normalized cumulative sedentary time accumulated by sedentary events from shortest to longest.

Table 5.23

Percentage of Sedentary Events According to Length of Events Cut-off Point

	Sedentary events				
	Time 1		Time 2		
Length of events (mins)	M (percentage)	SD (percentage)	M (percentage)	SD (percentage)	Statistical test
30	26.21	6.55	26.46	6.05	Paired t- test *p*=0.789
60	40.51	8.66	39.55	6.85	Paired t-test *p*=0.429
90	48.34	9.72	47.51	6.82	Paired t-test *p*=0.536

In Table 5.24, the data for percentage accumulated by sedentary events sorted from shortest to longest are similar at both times. Over 25% of the participants' accumulated sedentary events were in less than 30 minutes at both times 1 and 2, and the sedentary events decreased gradually with increased period, such as between 30-60, then 60-90 minutes, as illustrated in Table 5.24.

Table 5.24

The Difference of Mean of Sedentary Time Percentage between Time 1 and Time 2 at the Period Cut-off Points

	Time 1	Time 2
Period cut-off points (mins)	Difference of mean sedentary events (percentage)	Difference of mean sedentary events (percentage)
0-30	26.2	26.4
30- 60	14.3	13.1
60-90	7.8	8

5.6.2.3 Physical Activity Level and Clinical Data Variables at Time 1 and Time 2

The researcher used Pearson correlation tests to assess the relationship between PA level (including step count, stepping time, standing time, upright time and sedentary time) and BMI and diagnosis date of CHD. The researcher used one-way ANOVA to examine the difference in PA level among patients treated with three categories of AMI treatment.

At Time 1, Pearson correlation showed that there were a negative correlations between BMI and step count (r = -0.264, p = 0.012) and BMI and stepping time (r = -0.230, p = 0.030), which were statistically significant. In addition, there were negative correlations between diagnosis date of CHD and step count (r = -0.377, p < 0.001),

and diagnosis date of CHD and stepping time (r = -0.368, p < 0.001) (Table 5.25). One-way ANOVA showed there were significant differences in step count among types of AMI treatment groups (*F (2, 87) = 6.105, p=0.003*). There was a significant difference in stepping time among types of in AMI treatment groups (*F (2, 87) = 6.226, p=0.003*) at Time 1, Table 5.26. Tukey post-hoc tests revealed that patients treated with PPCI have mean step count (*M=7516, SD=2829)* significantly higher than patients treated with THROMB and PCI (*M=4911, SD=2125*), *p = 0.002*. In addition, patients treated with PCI have mean step count (*M=7069, SD=2769)* significantly higher than patients treated with THROMB and PCI (*M=4911, SD 2125*), *p = 0.024.* Moreover, Tukey post-hoc tests revealed that patients treated with PPCI have mean stepping time (*M=1.74, SD=0.64)* significantly higher than patients treated with THROMB and PCI (*M=1.15, SD 0.45*), *p = 0.002*.

Table 5.25

Physical Activity and Clinical Data Variables at Time 1

	BMI		Diagnosis date of CHD		
	r	*p*	*r*	*p*	Analysis Test
Step count	-0.264*	0.012	-0.377*	0.001	Pearson correlation
Stepping time	-0.230*	0.030	-0.368*	0.001	Pearson correlation
Standing time	-0.091	0.395	-0.078	0.465	Pearson correlation
Upright time	-0.144	0.177	-0.175	0.100	Pearson correlation
Sitting/lying time	0.146	0.171	0.174	0.101	Pearson correlation

* Correlation significant at <0.05 level (2-tailed)

Table 5.26 *The Difference in PA Level at Time 1 According to AMI Treatment*

		df	Sum of squares	Mean square	*F*	*p*
Step count	Between group	2	88128180	44064090	6.105	0.003*
	Within group	87	627941454	7217717		
	Total	89	716069635			
Stepping time	Between group	2	4.4	2.2	6.226	0.003*
	Within group	87	34	0.357		
	Total	89	35			
Standing time	Between group	2	7.8	3.9	1.454	0.239
	Within group	87	234	2.7		
	Total	89	242			
Upright time	Between group	2	22.6	11.3	2.755	0.069
	Within group	87	357	4.1		
	Total	89	380			
Sedentary time	Between group	2	22	11.2	2.727	0.071
	Within group	87	358	4.1		
	Total	89	380			

At Time 2, Pearson correlation showed negative correlations between BMI and step count (r = -0.378, p <0.001), and between BMI and stepping time (r = -0.344, p <0.001). The diagnosis date of CHD alone has no correlation with PA level at Time 2, (Table 5.27). In addition, one-way ANOVA showed there were no significant differences in PA level among types of AMI treatment groups at Time 2 (Table 5.28).

Table 5.27

Physical Activity and Clinical Data Variables at Time 2

	BMI		Diagnosis date of CHD		
	r	*p*	*r*	*p*	Analysis Test
Step count	-0.378**	0.001	-0.220	0.373	Pearson correlation
Stepping time	-0.344**	0.001	-0.077	0.480	Pearson correlation
Standing time	-0.088	0.425	-0.072	0.512	Pearson correlation
Upright time	-0.153	0.164	-0.015	0.895	Pearson correlation
Sitting/lying time	-0.154	0.162	0.015	0.894	Pearson correlation

**Correlation significant at <0.05 level (2-tailed)

5.7 Self-efficacy Relationship with Physical Activity

The study examined the correlations between global self-efficacy and its subscale and PA at Time 1 and Time 2. Pearson correlation tests found no correlations between self-efficacy and its subscales and PA level parameters including step count, stepping time, standing time, upright time and sedentary time at baseline, Time 1 and Time 2. The exceptions were just two correlations between step count and stepping time at Time 1 with the control symptoms subscale at Time 2 (Table 5.29).

Table 5.28

The Difference in PA Level at Time 2 According to AMI Treatment

		df	Sum of squares	Mean square	*F*	*p*
Step count	Between group	2	9295212	4647606	0.693	0.503
	Within group	81	543461999	6709407		
	Total	83	552757211			
Stepping time	Between group	2	0.560	0.280	0.933	0.397
	Within group	81	24.3	0.300		
	Total	83	24.8			
Standing time	Between group	2	1.5	0.7	0.353	0.704
	Within group	81	173.9	20.		
	Total	83	175			
Upright time	Between group	2	3	1.5	0.492	0.613
	Within group	81	250	3		
	Total	83	253			
Sedentary time	Between group	2	3	4.5	0.494	0.612
	Within group	81	250	3		
	Total	83	253			

Table 5.29

The Relationships between Self-Efficacy and Physical Activity

		Baseline				Time 1				Time 2			
		Global CSEQ	Control symptoms	Maintain function	Healthy lifestyle	Global CSEQ	Control symptoms	Maintain function	Healthy lifestyle	Global CSEQ	Control symptoms	Maintain function	Healthy lifestyle
Time 1	Sedentary time	r=-.151 p=.156	r=-.066 p=.534	r=-.174 p=.102	r=-.182 p=.087	r=-.131 p=.220	r=-.155 p=.144	r=-.097 p=.363	r=-.060 p=.573	r=-.102 p=.356	r=.144 p=.193	r=-.027 p=.808	r=.080 p=.470
	Standing time	r=.164 p=.123	r=-.084 p=.432	r=.186 p=.079	r=.186 p=.080	r=.10 p=.349	r=.136 p=.20	r=.064 p=.549	r=.020 p=.850	r=-.064 p=.562	r=.101 p=.361	r=.022 p=.842	r=-.030 p=.785
	Stepping time	r=.070 p=.514	r=.006 p=.957	r=-.081 p=.448	r=.113 p=.289	r=.180 p=.089	r=.166 p=.118	r=.164 p=.124	r=.151 p=.155	r=.178 p=.106	r=-.222* p=.042	r=-.039 p=.728	r=-.184 p=.094
	Upright time	r=.152 p=.153	r=-.068 p=.525	r=.174 p=.102	r=.183 p=.085	r=.133 p=.211	r=.158 p=.138	r=.099 p=.351	r=.062 p=.564	r=.104 p=.346	r=.146 p=.184	r=.028 p=.798	r=.080 p=.468
	Step count	r=-.062 p=.559	r=-.004 p=.970	r=.081 p=.449	r=-.092 p=.390	r=.149 p=.162	r=.138 p.195	r=.130 p=.223	r=.130 p=.222	r=.186 p=.089	r=.227* p=.038	r=.052 p=.636	r=.194 p=.077

Time 2	Sedentary time	r=-.017 p=.878	r=.046 p=.675	r=-.054 p=.628	r=-.048 p=.664	r=.031 p=.777	r=.032 p=.774	r=-.064 p=.563	r=-.115 p=.296	r=.045 p=.686	r=.012 p=.916	r=.128 p=.245	r=.032 p=.772
	Standing time	r=-.025 p=.824	r=-.031 p=.782	r=-.068 p=.538	r=-.028 p=.797	r=-.025 p=.824	r=-.031 p=.781	r=-.041 p=.713	r=.118 p=.284	r=-.052 p=.639	r=-.003 p=.977	r=-.105 p=.343	r=-.060 p=.590
	Stepping time	r=.037 p=.740	r=-.022 p=.743	r=.039 p=.725	r=.103 p=.350	r=-.006 p=.953	r=-.060 p=.586	r=.060 p=.588	r=-.027 p=.807	r=.020 p=.857	r=.040 p=.719	r=-.063 p=.570	r=-.076 p=.494
	Upright time	r=.016 p=.885	r=-.047 p=.669	r=.053 p=.635	r=.048 p=.666	r=.031 p=.779	r=-.032 p=.771	r=.064 p=.563	r=.115 p=.297	r=-.046 p=.679	r=.010 p=.962	r=-.128 p=.244	r=-.033 p=767
	Step count	r=.038 p=.731	r=.002 p=.985	r=.026 p=.812	r=.087 p=.432	r=-.009 p=.935	r=-.056 p=.614	r=.050 p=.652	r=.020 p=.855	r=.027 p=.810	r=.020 p=.859	r=-.028 p=.800	r=.100 p=.365

* Correlation significant at <0.05 level (2-tailed)

5.8 Summary of the Results

The examination of self-efficacy and its subscales among patients with AMI in the early recovery phase showed there were significant differences in global CSEQ and its subscales between baseline, Time 1 and Time 2. The trends in the self-efficacy subscales showed increases between baseline and Time 1 similar to self-efficacy level increasing between Time 1 and Time 2. However, the increase in the healthy lifestyle subscale between Time 1 and Time 2 was less. The findings of the clinical data found there were few significant correlations between diagnosis date of CHD and global self-efficacy and control symptoms subscale at Time 1 only, with no significant correlations at baseline and at Time 2. BMI had no correlations with self-efficacy and its subscales at baseline, Time 1 and Time 2. The findings showed A few significant differences among types of AMI treatment groups at baseline, but these differences disappeared at Time 1 and Time 2.

Assessment of the PA data revealed no significant changes in PA parameters including, step count, stepping time, standing time, upright time and sedentary time between Time 1 and Time 2. Moreover, there were no significant changes in PA patterns between Time 1 and Time 2, that is, in upright and sedentary events. In addition, the study found significant negative relationships between CHD diagnosis date and step count and stepping time at Time 1, but this correlation disappeared at Time 2. BMI only had significant correlations with step count and stepping time at Time 1 and Time 2. The findings showed a few significant differences in steps count and stepping time among types of AMI treatment groups at Time 1, but these differences disappeared at Time 2. The study revealed that there were very few and small correlations between PA level and self-efficacy and its subscales, which were between step count and stepping time at Time 1 with control symptoms at Time 2. However, these few significant results did not follow a pattern.

In addition, the study assessed the PA volume and pattern and revealed the following findings: PA showed low PA volume, namely step count, stepping time, standing time and upright time at Time 1 and Time 2. In addition to this, there was prolonged

sedentary time at Time 1 and Time 2. The findings showed a similar PA volume at Time 1 and Time 2 among patients with AMI in the early recovery phase.

The mean step count per day was 6,981 steps ± (2,800) per day at Time 1 and 7,149 ± (2,575) steps per day at Time 2. The highest recorded mean number of steps per day was on Monday and Tuesday and the lowest recorded mean step count was on Friday at Time 1 and Time 2. The mean number of steps per day according to hour showed that steps count increased sharply from the morning to midday and decreased gradually in the afternoon and evening, with the highest recorded step count at 13:00 for both Time 1 and Time 2.

The mean stepping time per day at Time 1 for all participants was 94.2 minutes per day, whereas the mean stepping time per day at Time 2 for all participants was 97.2 minutes per day. The mean stepping time per day according to day was similar between Time 1 and Time 2, with the highest recorded mean daily stepping time on Monday and Tuesday and the lowest mean daily stepping time occurring on Friday. The mean stepping time per day according to hour increased sharply from the morning to midday, decreasing gradually in the afternoon, and evening, with the highest recorded step count at 13:00 for both Time 1 and Time 2.

The mean standing time per day was 238.8 minutes at Time 1 and the mean standing time per day was 231.6 minutes at Time 2. The mean standing time per day according to day was similar at Time 1 and at Time 2. Tuesday had the greatest mean standing time per day at both Time 1 and Time 2. Moreover, Friday had the lowest mean standing time per day for both Time 1 and Time 2. The mean standing time was similar at Time 1 and Time 2. The greatest mean standing time per day according to hour was in the afternoon, particularly at 13:00 at Time 1 and Time 2. The lowest mean standing time per day was during the night-time.

The mean upright time per day was 333 minutes at Time 1 and 327.6 minutes at Time 2. The mean upright time per day according to day was similar at both Time 1 and Time 2. Tuesday had the greatest mean upright time per day, and Friday showed the least mean upright time per day for both Time 1 and Time 2. The mean upright time per day according to hour was similar for both Time 1 and Time 2, with the

highest mean upright time per day being during the afternoon and the lowest mean upright time per day being during the night-time for both Time 1 and Time 2.

The mean sedentary time per day was 1,107 minutes (18.45 hours) at Time 1 and the mean sedentary time per day was 1,112 minutes (18.53 hours) at Time 2. The mean sedentary time per day according to day was similar at both Time 1 and Time 2. The highest recorded mean sedentary time per day was on Friday and Saturday and the lowest on Tuesday for both Time 1 and Time 2. The mean sedentary time decreased during the afternoon and increased during the night-time at Time 1 and Time 2.

The PA pattern for upright events and sedentary events was similar at Time 1 and Time 2. Approximately, 75% of the upright events consisted of less than 33 minutes for both Time 1 and Time 2. However, there were no significant changes found between upright events at Time 1 and Time 2. Moreover, sedentary events were similar for all participants at Time 1 and Time 2, and approximately 75 % of the sedentary events consisted of less than 5.2 hours at both Time 1 and Time 2. However, there were no significant changes found between sedentary events at Time 1 and Time 2.

5.9 Conclusion

The analysis of the findings has showed significant changes in global self-efficacy and its subscales between baseline, Time 1 and Time 2. Further, clinical variables occasionally showed a few significant results in self-efficacy level across the measurement times. These few significant results did not follow a pattern. The analysis of PA findings revealed decreased PA level in terms of step count, stepping time, standing time, and upright time. In addition to this, the participants spent prolonged periods in sedentary time at Time 1 and Time 2. Moreover, the study revealed no significant changes in PA levels and PA patterns between Time 1 and Time 2.

The highest PA activity occurred in the afternoon and decreased in the night and morning. In addition to this, there was a decrease in PA levels during the weekends

at Time 1 and Time 2. Clinical data variables showed few significant differences and correlations with PA level. However, these few significant differences did not follow a pattern. The exception is that BMI has negative correlations with step count and stepping time at Time 1 and Time 2. Furthermore, the study findings found no correlations between self-efficacy and its subscales and PA levels at Time 1 and Time 2, which indicates that increased self-efficacy, did not influence PA levels among participants.

Chapter Six: Discussion

6.1 Introduction

This chapter explains the findings from two phases of the study alongside the small body of existing literature, to develop a better offering of the study. The findings of the study have supported some of its hypotheses. The researcher used the study objectives to structure the discussion of the study findings to provide more clarity that for research questions addressed. Four pertinent key points arise from the study findings that warrant discussion:

- Translation and cross-cultural adaptation of the CSEQ
- Self-efficacy level and changes in the early recovery phase
- PA levels, patterns and changes in the early recovery phase
- The relationship between self-efficacy level and PA level

6.2 Translation and Cross-Cultural Adaptation of the Cardiac Self-Efficacy Questionnaire

To the best of the researcher's knowledge, this is the first study aiming to translate and cross-culturally adapt the CSEQ into Arabic. In addition, there is no Arabic version of the CSEQ at present ready for use. The Arabic version of the CSEQ has demonstrated good reliability and validity outcomes for use in Arabic-speaking countries, including test and re-test reliability (internal consistency= 84.6 and ICC= 92.9). The original CSEQ is in English. The study translated and cross-cultural adapted all items in the CSEQ accurately into Arabic after application of the WHO process of questionnaire translation and cross-cultural adaptation (WHO, 2014).

The translation and cross-cultural adaptation of the CSEQ for use in Arabic-speaking countries followed a standardised process recommended by the WHO. The input from the expert panel members resulted in translation and cross-cultural adoption that reflected a simple, clear and easy to use Arabic version of the CSEQ. Further suggestions from the participants who were involved in face validity as recommended

by Beaton et al. (2000) added an excellent user acceptability and comprehension to the Arabic CSEQ.

Using the WHO process of translation and cross-cultural adaptation process closely linked contextual meaning to the target language. Without the careful translation of items, participants may have misunderstood their correct meaning. In addition, using Modern Standard Arabic (Fusha) is recommended during the translation and cross-cultural adaptation process (Khalaila, 2013), for the purpose of making the CSEQ more broadly applicable for a range of cardiac patients in Middle Eastern countries.

The social and cultural differences between Western and Arabic countries are a cause for concern, particularly reflected in discussions around sexual relationships in the original CSEQ as stated in item number 12. The question asks about maintaining sexual relationship with spouse. The laws, regulations and religious rules do not support any sexual relationship outside the marital relationship context in Arabic countries. In addition, the people do not discuss that topic frankly in Arabic-speaking countries. However, the translation of the CSEQ adopted this question and presented the question in the marital relationship context only. Further, the researcher assured the participants that their data were confidential, their privacy was highly regarded, and the objective of this question was only for research purposes. Therefore, the WHO process of translation and cross-cultural adaptation of questionnaires was crucial to ensure accurate conceptual understanding of items.

The implementation of the pre-test and cognitive interviewing stage showed there were no missing items and the completion time for the CSEQ was relatively short, typically 10–15 minutes, which indicated that the user acceptability of the Arabic version of the CSEQ among the participants was excellent. There were no particular problems in the questionnaire translation process, with no items considered confusing or disturbing.

Assessment of the validity and test- retest reliability of the Arabic CSEQ demonstrates good outcomes that confirmed the Arabic version of the CSEQ questionnaire’s ability to produce consistent results, including face validity testing, which showed that the appearance of the CSEQ, the writing style, format and

language of items were all clear. The content validity revealed that there was excellent content relevance of the CSEQ. This is consistent with the original CSEQ of Sullivan et al. (1998) and those of previous studies (Fors et al., 2014; Saengsiri et al., 2013).

The internal consistency of the translated version is good. The three CSEQ subscales: control symptoms, maintain function, and healthy lifestyle, have close internal consistency with each other, 0.841, 0.715 and 0.711 respectively. The test and re-test reliability was acceptable for all the CSEQ's subscales in this study, demonstrating good stability for the CSEQ over time. In addition, all CSEQ items' internal consistency was greater than 0.70, which reflects good stability for all items with time. These results are similar to findings in studies completed in other languages under similar circumstances (Fors et al., 2014; Saengsiri et al., 2013). For example, the Cronbach's alpha for the Swedish version of the CSEQ was 0.89 (Fors et al., 2014), and for the Thai version of the CSEQ it was 0.92 (Saengsiri et al., 2013). Furthermore, the Cronbach's alpha in the original study was 0.90 for the control of symptoms subscale, and 0.87 for the maintenance of function subscale (Sullivan et al., 1998). In general, the Arabic version of the CSEQ revealed similar reliability and validity scores to the original version.

There are three limitations related to the translation and cross-cultural adoption of the CSEQ. First: the WHO process mentioned that the English language should be involved in the back- translation process. However, there were no available translators at that time whose main language was English. The main language of the expert panel and translation members of was the Arabic language, but they are familiar with English. Second: the alternative options were so close to each other as to make the choice between the answers not easy. Therefore, the expert panel added score under each alternative score, which made the Arabic version of the CSEQ is easier to answer. Third: there was a limited time to test the CSEQ and carry out the data collection procedure, thus, the sample size used in the study for testing validity and test-reliability was relatively low, which might affect the findings of the CSEQ reliability.

6.3 Self-Efficacy Levels and Changes

In Chapter three, the study outlined the importance of self-efficacy as a psychological construct that improves adherence to self-management skills (Sol et al., 2011), predicts re-hospitalisation and CVD complications (O'Neil et al., 2013), in addition to mortality (Sarkar et al., 2009), among patients with CHD and heart failure. It is a construct that is potentially increase in order to improve patient's health outcomes. In the study, the researcher collected self-reported CSEQ data from a sample of patients with AMI recruited from a single centre in Jordan. The participants in this study did not have access to cardiac rehabilitation programmes or receive any health intervention that could affect self-efficacy during the collection period.

This study assessed levels and changes in self-efficacy among patients with AMI in the early recovery phase. Self-efficacy referred to the individual's confidence in carrying out specific health behaviours to achieve a desired goal. This is the first study to focus on changes in self-efficacy level in the early recovery phase among patients with AMI. There were very few published studies available, which measured self-efficacy levels during early recovery for patients with AMI not involved in cardiac rehabilitation with which to compare it. Therefore, the researcher compared study's results with previous studies that measured self-efficacy level of patients with CHD after receiving treatment and patients after involvement in cardiac rehabilitation programmes.

6.3.1 Self-Efficacy Levels and Changes at Baseline, Time 1 and Time 2

The study found that patients have a significantly increased self-efficacy level in global self-efficacy and its three subscales from baseline to Time 1 and from Time 1 to Time 2. The global self-efficacy subscale showed significant increase at baseline, Time 1 and Time 2. The trend of changes in global self-efficacy subscale level was stable and similar between baseline and Time 1, and between Time 1 and Time 2. The self-efficacy level was similar to other previous studies in Iran (Boroumand et al., 2015; Jalilian, Mostafavi, & Sharifirad, 2013). The control symptoms and maintain function subscales showed significant increase at baseline, Time 1 and Time 2. The

changes in the observed trends of 'control symptoms' and 'maintain function' subscales level were stable and similar between baseline and Time 1, and between Time 1 and Time 2. Finally, the healthy lifestyle subscale showed significant increase at baseline, Time 1 and Time 2. The trend of changes in the healthy lifestyle subscale level was unstable and dissimilar between baseline and Time 1, and between Time 1 and Time 2. The healthy lifestyle subscale changed relatively less than the other self-efficacy subscales at Time 2. This subscale includes items regarding changes in CVD risk factors, and this indicated that the intention and motivation of patient with AMI to change their unhealthy behaviours decreased. This is consistent with the recommended guideline for patients with AMI to be involved in a cardiac rehabilitation programme within ten days after hospital discharge (NHS, 2016; NICE, 2013d).

According to similar studies in the literature, these results of self-efficacy agree with the researcher's expectations. In comparing self-efficacy level in this study with that found in the previous study that used CSEQ in Iran (Boroumand et al., 2015; Jalilian et al., 2013), the self-efficacy level was similar. The study's results were consistent with many previous studies in the literature that showed patients with CHD had increased self-efficacy levels after being involved in cardiac rehabilitation programmes (Howarter et al., 2014; Maddison et al., 2014). In addition, this result in general is consistent with Blanchard et al. (2006), which showed that self-efficacy level increased from baseline (2 months) to 6 months in CHD patients not involved in cardiac rehabilitation. Blanchard et al. (2006) used different self-efficacy measures and the participants' self-efficacy increased without them being involved in cardiac rehabilitation programmes. However, another previous study among patient with CHD treated by coronary artery angioplasty within six months by Salari et al. (2016) in Iran showed contradictory results as against Boroumand et al. (2015), the study showed that patients had low self-efficacy after coronary artery angioplasty (Salari et al., 2016), this study measures self-efficacy once without follow up measurements for self-efficacy level or even investigating other variables that can affect self-efficacy level. Salari et al. (2016) did not provide possible reasons to explain low self-efficacy level among patients with CHD in Iran.

There are a number of possible reasons might explain increased self-efficacy among patients with AMI in the early recovery phase: according to the self-efficacy theory of Bandura (1997), physiological and affective states are one of the four resources that contribute to self-efficacy, which help us to explain the findings. Chest pain is a physiological symptom and one of the most common AMI symptoms. Chest pain can affect lifestyle change in the following ways. First: physiological and affective states are one of the four sources of self-efficacy, as individuals usually rely on their somatic and emotional condition when judging their capabilities. Therefore, when the patient feels chest pain, the patient will decide to decrease his/her capability to achieve a given task. Second: feeling chest pain related to AMI experience and increased symptoms burden in turn affect self-efficacy level (Sarkar et al., 2007). In this study, a daily diary chest pain showed that patients did not experience chest pain during the early recovery period. Chest pain occurs. This will indicate that there is a coronary re-stenosis. Consequently, patients need to re-admit to the hospital. However, there were no patients re-hospitalised during the collection of the data in the study. Over and above this, affective states, such as anxiety, depression and quality of life, influence self-efficacy level (Allahverdipour et al., 2013; Joekes, Van Elderen, & Schreurs, 2007; Sarkar et al., 2007). This study did not measure these variables. Thus, the study cannot determine the role of physiological and affective states in improving self-efficacy level.

Other factors that may affect the self-efficacy level are age and verbal persuasion (for example social support). The mean age of the participants in the study is young. There is an inverse relationship between age and cardiac self-efficacy, and age is one of the determinants of self-efficacy level among patients with CHD according to (Boroumand et al., 2015). (Boroumand et al., 2015) found that age, gender and functional capability are the determinants of self-efficacy. Thus, in addition, the expectation is for self-efficacy to be at a high level in this sample as their mean age is young. They do not have any disability that prevents their physical capability based on the exclusion criteria of the study. Therefore, self-efficacy level increases gradually

across baseline, Time 1 and Time 2, which is consistent with (Boroumand et al. (2015); Jalilian et al., 2013). Verbal persuasion is such as that received from a spouse, which might affect self-efficacy levels (Maeda et al., 2013). Jalilian et al. (2013) showed that there is a relationship between perceived social support and self-efficacy among patients with CVD. According to Bandura's self-efficacy theory, verbal persuasion is the second source of self-efficacy. The sample of the study included approximately two-thirds of participants who were married. Consequently, for patients with AMI, health care professionals could provide support, as well as encouraging each patient's spouse to provide support to them in order to improve self-efficacy level.

6.3.2 Self-efficacy level and Clinical Variables

The study revealed that there was no relationship between self-efficacy and its subscales and BMI at baseline, Time 1 and Time 2. These results are inconsistent with the literature, which found that improving BMI correlated with improving self-efficacy level among CHD patients (Kang & Yang, 2013; Sol et al., 2011). However, this relationship between self-efficacy and BMI is weak, as reported by Kim, McEwen, Kieffer, Herman, and Piette (2008). Further, abdominal obesity, and not BMI, correlated to the risk factors of patients with AMI in the Middle East (Gehani et al., 2014) .

There was no relationship between self-efficacy and its subscales and diagnosis date of CHD. In addition, AMI types of treatment showed there was no difference self-efficacy and its subscales score at baseline, Time 1 and Time 2. There is no research in the literature showing whether there is a relationship between self-efficacy and CHD diagnosis date or disease duration and whether the AMI types of treatment have influence on self-efficacy level.

There are various possible reasons, which may show why there was no significant association between self-efficacy and its three subscales and clinical variables. First: there is an absence of structured health education or cardiac rehabilitation programmes in Jordan. Accordingly, a patient with AMI is not aware of the AMI

treatment modalities that have been used for them (Eshah, 2011). Therefore, the CHD patients do not have enough information about their disease, AMI types of treatment and related information. Second: the recording of BMI was once at baseline and measurements of self-efficacy levels were at baseline, two and six weeks after hospitalisation. This could indicate that more BMI in-depth follow-up (BMI changes) might be necessary; particularly for BMI measures that need a longer time to detect changes. Third: the researcher used a disease-specific self-efficacy questionnaire. The research results could have been different if the researcher used another type of self-efficacy questionnaire, such as a general self-efficacy questionnaire or phase-specific self-efficacy (task or self-regulatory self-efficacy).

In summary, the discussion has offered reasons for the improvement in self-efficacy results improved significantly across baseline, Time 1 and Time 2. Self-efficacy can play an important role in the patients' health promotion along with disease complication prevention and symptom recurrence. In addition, thorough assessment of self-efficacy of patients with AMI during the early recovery phase will enable greater understanding of changes in self-efficacy levels in the early recovery period. This is useful and provides an overview of self-efficacy, and identifies changes between baseline, Time 1 and Time 2 among patients with AMI. For this, healthcare professionals could use these findings in the clinical context to facilitate discussion of self-efficacy and tailoring of interventions to improve self-management skills based on the needs of patient with AMI. This result is expected and consistent with the previous studies (Blanchard et al., 2006; Howarter et al., 2014; Maddison et al., 2014). The study findings showed similar self-efficacy scores compared to previous study (Boroumand et al. (2015); Jalilian et al., 2013). Consequently, the findings confirmed the first hypothesis, noting improvements in self-efficacy levels in the early recovery phase among treated patients with AMI.

6.4 Physical Activity Behaviours

The previous section presented a detailed explanation of findings related to self-efficacy and its subscales. This section explains changes in PA levels and patterns

for patients at Time 1 (week 2) and Time 2 (week 6). Following this, the researcher linked the findings to the related study context. To the best of the researcher's knowledge, this study provides the first descriptive data on objectively measured PA levels among patients with AMI. In order to realise this aim, the study assessed PA levels and patterns among the AMI population in the early recovery phase in Middle Eastern countries.

This study provides new information on PA during the day and the week in the early recovery phase for a representative sample of patients with AMI. The researcher used the activPAL3™ monitor to measure the PA level and pattern as well as, over a period of seven consecutive days, among patients with AMI. The activPAL3™ monitor is a valid and reliable activity monitor for PA measurement (Ryan et al., 2006) that can be used with older adults (Grant et al., 2008). No participants had access to a cardiac rehabilitation programme or disease self-management programme in the study.

The study assessed the primary outcome measure of PA volume. For this, five parameters of PA volume were measured, namely: step count, stepping time, standing time, upright time (a combination of stepping and standing time) and sedentary time (lying/sitting time), and these have been shown to discriminate PA volume between Time 1 and Time 2. Time spent in these behaviours reflects the mean daily time after hospitalisation during free-living PA.

The study implemented further investigations to determine PA pattern: upright and sedentary events, in order to obtain comprehensive information regarding PA behaviours. The section divides the discussion of this matter into four points: PA level and changes, PA pattern and changes, PA level and clinical variables, and the relationship between PA level and self-efficacy.

6.4.1 Physical Activity Level and Changes

The study investigated several aspects of PA behaviour. Its results revealed important findings. These results revealed low levels of PA in comparison with healthy populations in other studies (Bassett Jr et al., 2014; Fitzsimons et al. (2013)),

and prolonged periods of sedentary behaviour at both Time 1 and Time 2 (Colley et al., 2011; Matthews et al., 2008). In addition, patients with AMI demonstrated step count below those recommended by Tudor-Locke et al. (2011). The findings showed there was no significant change regarding five parameters of PA volume among patients with AMI between Time 1 and Time 2, according to the five parameters discussed in this section. These results of PA disagree with the researcher's expectations.

6.4.1.1 Step Count

The study showed that the mean step count per day for patients with AMI was low at both Time 1 and Time 2. There is clear evidence that 5,000 steps per day is considered inactive or sedentary (Tudor-Locke et al., 2012). Tudor-Locke et al. (2011) showed that 8,000 steps per/day was representative of the physical activity guideline of special populations such as CHD. For healthy older adults the guidelines are 7,000-10,000 steps per/day. Therefore, it is apparent that the population in this study was towards the less active end of the range. These results consistent with (Barghouti, AbuRmaileh, Jallad, & Abd-Qudah, 2015), in which PA was measured by self-reported PA questionnaire, showed that the Jordanian healthy adult population had a low level of PA.

There are no previous studies specifically investigating the step count during the early recovery phase among the CHD population or any other population. Carrying out a comparison step count with other similar studies is feasible, because previous studies expressed PA level through measuring step count among patients with CHD (Houle et al., 2011; Izawa et al., 2006). The mean step count per day is similar to the findings from other studies among ACS and patients with AMI (Houle et al., 2011; Izawa et al., 2006), which showed patients with AMI 3-6 months on from cardiac rehabilitation had approximately 5,845-6,097 steps per day. Moreover, despite assertions in the literature that PA levels of patients with AMI improve after hospitalisation and participation in cardiac rehabilitation (Houle et al., 2011; Izawa et al., 2006), this study found no differences between mean step count per day in Time 1 and Time 2 among patients with AMI in the early recovery phase (p=0.503).

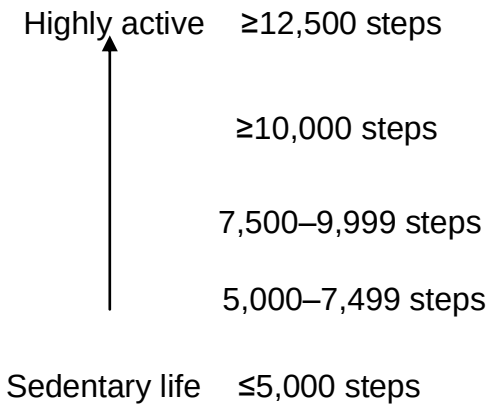


Figure 6.1 Step count preliminary indices for healthy adults adopted from (Tudor-Locke et al., 2012)

The change in step count per day is inconsistent with Houle and colleagues (2011), who reported that there was an increase in step count after 3 months in the experimental group and in the control group (Houle et al., 2011). The change in step count per day is also inconsistent with the study results of Blanchard et al. (2006), who showed improved step count (measured by PA questionnaire) from 2-6 months among CHD patients not attending a cardiac rehabilitation programme. Change in step count per day is consistent with Izawa et al. (2006), who found step count among patients with AMI after cardiac rehabilitation to be 6,565 ± 1,115 in the experimental group and 6,283 ± 1,986 in the control group. However, there was a significant increase in step count after 12 months: 10,459 ± 3,310 in the experimental group and 6,923 ± 3,193 in the control group (Izawa et al., 2006). In addition, the study revealed similar findings to previous studies among the heart failure population conducted by Cowie et al. (2011). The study showed no significant changes in PA in

either home- or hospital- based exercise training for eight weeks at baseline or 8 weeks in terms of step count, bouts (steps per day), and cadence (steps per minute), except for extra-long and long walking in the hospital based group. However, upright duration for the home group significantly improved six months after cessation of training.

Therefore, the fact that mean step count per day did not improve during the early recovery phase among patients with AMI may be disappointing, as the patients received treatment. This indicates the need for cardiac rehabilitation programmes or education sessions for the patients with AMI. In conclusion, the improvement in step count in previous studies occurred after 3 to 12 months after involvement in cardiac rehabilitation programmes or receipt of intervention. However, the two measurement times of the study was short and thus cannot detect the changes in step count.

The data analysis showed mean step count across weekdays is consistent. However, there was an overall drop in mean step count at weekends for both Time 1 and Time 2. This is due to the weekly holiday (Friday and Saturday) in the Middle East, which means that usually there is no work or business at the weekend and social gatherings usually happen in the patient's home as one of the cultural traditions and Islamic rules in Arab countries. The trend in step count was dissimilar across weekdays and weekends, which suggest the patients with AMI, did not modify their PA behaviour, even on their holidays. This drop in step count at the weekend is inconsistent with previous studies, which showed that there was no difference in step count between weekdays and weekends among office-based workers (Smith et al., 2015).

The trends in mean step count showed there was a slight improvement in step count between weekends and weekdays at Time 2. The expectation was that PA would be higher on weekdays than weekends. Many reasons could explain these results, such as the healing process beginning to return to normal within 3 months after AMI, and the sociodemographic data showed that the employment represented two-thirds of the sample. In addition, governmental institutions are not working during the weekends. Therefore, they accomplish their business and related activities on weekdays.

This is the first study that has assessed and compared hourly step count, over 24 hours, in free-living PA, in the early recovery phase among patients with AMI. Data analysis showed that PA for both Time 1 and Time 2 was very closely resembled the mean steps per hour.

Mean step count per hour is consistent with a previous study among office-based workers in the UK (Smith et al., 2015), which showed that the lowest PA level occurred in afternoons and evenings. Copeland and Esliger (2009) reported most long bouts of activity in older participants took place before mid-day. However, Copeland and Esliger noted that the participants were more likely to undertake moderate-to-vigorous activity in the afternoon.

This trend of step count from 07:00 to 20:00 is in concordance with the period for performing prayer time for the Muslim population, and this period is a convenient time for performing their daily life activities. The findings showed the large variations during the daytime and these variations in hourly time across the day as consequences of diurnal variations. Consequently, when promoting PA in older adults, an understanding of the distribution of activity throughout both the day and week may be helpful in scheduling activity programmes.

6.4.1.2 Stepping Time

The study found no significant difference in stepping time per day between Time 1 and Time 2, which indicated that participants' PA level was consistent after hospitalisation. There were no studies showing stepping time in a cardiac population with which to compare these results. However, the stepping time among patients with AMI was lower than healthy adults in the US – 114 minutes (Bassett Jr et al., 2014) - and older adults in UK – 105 (Fitzsimons et al., 2013) – see Table 6.1. Although the stepping time is important for health outcomes, the study found the stepping time to be below the recommended level. A previous European study for cardiac patients in 2015 by Healy, Winkler, Owen, Anuradha, and Dunstan (2015) showed that each hour reallocated from sedentary time to stepping or standing will decrease metabolic risk factors. Further, each additional 2 hours per day of stepping was significantly associated with cardio-metabolic biomarkers such as lower BMI, total and High-

Density Lipoprotein- Cholesterol ratio, triglycerides, waist circumference, and 2-hour plasma glucose and higher High-Density Lipoprotein-Cholesterol ratio. Stepping and standing time is one of the sitting-reduction strategies.

The mean stepping time per day showed a consistent level across the week at Time 1 and Time 2. However, there was a drop in stepping time at the weekend, particularly on Friday. Stepping time coincides with step count in the previous section, with increased stepping time and step count on weekdays and a drop in stepping time and step count at weekends. This could be due to Jordan lacking the open spaces and parks that are preferred among the people over sports facilities (Barghouti et al., 2015). Moreover, cultural norms and a conservative tradition could be major barriers to stepping time, especially among females in Saudi Arabia, as reported by (Amin et al., 2012). However, in Jordan, the culture and traditions are less restrictive than in Saudi Arabia. In addition, the climate and temperature for most of the year are appropriate for performing outdoor activities in Jordan.

Another explanation is due to the lifestyle in Jordan, where there is lack of electronic services such as payment of energy bills, governmental organisations and bank services, whereby Jordanians have to physically visit the related institution site when they need to deal with public services during the working hours in the week (Mohammad, Almarabeh, & Ali, 2009). Therefore, when the governmental organisation and bank services are open, stepping time will increase. This style of living increases the stepping time during weekdays. In addition, when the governmental organisations and banking sector are closed, the stepping time will decrease.

This is the first study to describe hourly stepping time over 24 hours among an AMI population in the early recovery phase. The data showed that participants spent the majority of their stepping time in the late morning and afternoon. The lowest stepping time occurred at night-time for both at Time 1 and Time 2. These findings are consistent with Copeland and Esliger (2009), who showed that 65% of the activity occurred between late morning and afternoon. This may be due to the lifestyle in Jordan, such as opening hours for governmental departments, the bank sector, and

the transportation system in Jordan. Buses are the main means of inter-city transport in Jordan, and operate between cities. There are no fixed pick-up or set-down points for buses or “servis” (shared taxi) (Land Transport Regulatory Commission, 2016).

6.4.1.3 Standing Time

There was no significant change in mean daily standing time between Time 1 and Time 2, which indicated that participants’ standing time was consistent after hospitalisation. The overall mean standing time of participants was lower than healthy adults in the US – 360 minutes (Bassett Jr et al., 2014) - and older adults in UK – 251 (Fitzsimons et al., 2013) - see Table 6.1. In addition, a previous study showed that office-based workers spent 246 minutes per day of their day standing (Smith et al., 2015). Standing time had a dose-response association with all-cause mortality in adults, and increasing standing may alleviate the health risks of prolonged sitting (van der Ploeg et al., 2014). However, the findings show there was a decrease in standing time at Time 2 of approximately 3% from the overall standing time at Time 1 due to lack of awareness of the benefits of a standing position and absence of structured education for patients with AMI in Jordan (Eshah, 2011).

There are three possible reasons that could explain this decrease in standing time. First, there is absence of structured health education programmes. Consequently, the cultural views on illness-recovery lead AMI patients to spend as much time as they can in a lying position during the day and avoid strenuous activities in order to control their condition by themselves. This is patients perception in addition to one of the local traditions, especially in Middle Eastern countries (Mosleh & Almalik, 2016). Second, Muslims pray five times per day, and they perform most of the prayers in standing positions, but according to Islam’s rules, Muslims can perform the prayer in a sitting position when the patients are not able to do them in a standing position. Third, according to Islam’s rules are recommendations, Muslims have not to drink or eat in a standing position. Fourth, there are issues with availability of personal and public transportation: there are no designated stops for public transportation, but the passenger can ask the driver at any point in the bus lane. Furthermore, a Jordanian Central Traffic Department study showed that the number of private cars in Jordan

has doubled over the past decade, with an annual increase of 8.4%. There are 1.43 million vehicles registered in Jordan, meaning that compared to 1971, when there was one vehicle for every 58 residents, one in every five Jordanians now owns a car (The Jordan Times, 2014). The fuel price is 0.77$ US per litre in Jordan (Fuel price Jordan, 2016), compared to 1.44$ US per litre in the UK (Petrol prices UK, 2016), which encourages the Jordanian population to buy a car due to the affordable running costs.

The mean standing time per day showed a consistent level across the week. However, there was a drop in standing time at weekends (Fridays and Saturdays) at Time 1 and at Time 2. This pattern of standing time is in agreement with the step count and stepping time in the previous sections. In this context, the consistent level of standing time is due to unawareness of the importance of standing time among patients with AMI due to the absence of structured education programme, in addition to lifestyle in Jordan such as eating habits and the transportation system.

The trend in standing time according to day was not similar between Time 1 and Time 2. In comparison, the standing time according to day at Time 2 was less than at Time 1 on weekdays by 19.1 minutes, and the difference of standing time between Time 1 and Time 2 at weekends increased by 14.7 minutes. Hence, the findings of the study showed unstable and reduced standing time among the patients with AMI at Time 2.

This is the first study to describe hourly standing time over 24 hours among an AMI population in the early recovery phase. The data show that participants spent the majority of their standing time in the afternoon. The lowest standing time occurred at night-time at Time 1 and at Time 2. Although standing is the healthier alternative position to replace excessive periods of sitting (Katzmarzyk, 2014), the mean hourly standing time tended to be lower at Time 2. However, there were relatively low levels of mean hourly standing time throughout the day at both times. This reduced standing time could be due to the site of PCI catheter insertion after the femoral PCI procedure, in which patients with AMI feel uncomfortable for a few days and perhaps weeks if there is bruising. Therefore, health care professionals advise patients with AMI to avoid heavy lifting and to increase their PA gradually.

6.4.1.4 Upright Time

There was no significant improvement in upright time found between Time 1 and Time 2. The decrease in upright time at Time 2 is due to a decrease in standing time at Time 2. Therefore, the standing time affected the upright time and the sedentary time increased accordingly. This finding of the study is consistent with Cowie et al. (2012), which showed that daily upright duration for the home group was not significantly improved at baseline or at 8 weeks, but only significantly improved six months after the end of training.

The mean upright time per day is low, representing less than 25% of their day, with the remaining time, more than 75%, being sedentary time. There is no similar population in the literature to compare with the upright time of this study. A study of a healthy population in a previous study among older adults in UK found that 356 minutes of their day was upright time (Fitzsimons et al., 2013). In addition, another study among healthy adults in the US found upright time was 474 minutes (Bassett Jr et al., 2014) (Table 6.1).

Upright time is a good indicator of PA as the energy costs of standing and particularly stepping are considerably higher than sitting (Ainsworth et al., 2000). Increased upright time or standing and stepping times improve cardio-metabolic health. Sitting-to-stepping reallocations per 2 hours / day were related to approximately 11% lower BMI, 7.5cm lower waist circumference, 11% lower 2-hour plasma glucose, 14% lower triglycerides, and 0.10 mmol/L higher High-Density Lipoprotein- Cholesterol ratio, while standing-to-stepping reallocations were related to 10% lower BMI, 7cm lower waist circumference, and 11% lower plasma glucose (Healy et al., 2015). Therefore, it is necessary to encourage patients with AMI to increase their upright time.

The mean upright time per day showed a consistent level across weekdays. However, there was a drop in upright time at weekends at Time 1 and Time 2. This pattern of upright time is in harmony with their stepping and standing times in the previous section. Therefore, the participants in this study demonstrated low levels of upright time not only at weekends, but also on weekdays.

The trends of upright time showed there was decrease in the upright time according to day at Time 2 compared to Time 1 on weekdays of 9.1 minutes, and the upright time between Time 1 and Time 2 at weekends increased by 26.1 minutes. There were two reasons for this, first: decreased in patients' awareness of the importance of upright time and absence of an effective education programme for patients with AMI in Jordan. Second: the healing process is still in progress and needs more time for reasons such as discomfort at the catheterisation site**.** Therefore, there should be a focus on increasing the upright time gradually on all days, particularly, during weekends.

This is the first study that describes hourly upright time over 24 hours among an AMI population in the early recovery phase. The data showed that participants' upright behaviour was similar at Time 1 and Time 2. Participants spent the majority of their upright time in the morning and the afternoon. The lowest upright time occurred at night-time at Time 1 and at Time 2. This pattern of upright time is congruent with the five prayer times among the Muslim population. Where the Muslims pray is in a mosque, if they are physically able to do so. If they cannot pray in the mosque and in a standing position, they can conduct the prayer in a sitting position in their home. Another explanation could be due to family responsibility in the local community, caring for children or older people (Barghouti et al., 2015). In addition, the retirement age is 65 years but early retirement is possible when the individual's age reaches 50 years. Further explanation for the study findings is that rural residents are more physically active than urban residents, as Jordan lacks open spaces and parks (Barghouti et al., 2015) and most of the participants in the study were living in Amman or nearby. In addition, married people are less active due to social responsibility and in this study's sample, 62% of the participants are married. Moreover, publicity and promotion of exercise are not formally approached in the country and there is a lack of information on approaches, interventions, community-wide campaigns, mass media campaigns or even health education classes (Barghouti et al., 2015; Eshah, 2013).

6.4.1.5 Sedentary Time

There was no significant change in mean daily sedentary time between Time 1 and Time 2, which indicated that participants' sedentary time was consistent after hospitalisation. The data show that the patients spent prolonged time in sedentary (sitting/lying time) at Time 1 and Time 2, which represented 76.8% and 77.2% of their measurement time respectively. There is no similar study for comparison from the same population. Therefore, the study revealed that the sedentary time among patients with AMI was higher than in other healthy populations. In comparison with the healthy adult population in US, the participants spent 966 minutes of their day in sedentary time (Bassett Jr et al., 2014). Older adults spent 1,083 minutes of their time in sedentary time (Fitzsimons et al., 2013), as shown in Table 6.1. In general, the average objective measurement of sedentary time during waking time ranges from 55–69% (Colley et al., 2011; Matthews et al., 2008). This finding is consistent with a previous survey implemented among healthy adults in Jordan, which revealed that only 12.5% of Jordanians were physically active while over 50% were aware of the recommended PA level (Barghouti et al., 2015).

Table 6.1

Comparison of Physical Activity Level among Patients with AMI, Healthy Adult and Elderly Populations

Physical Activity parameters	Healthy Adult (Bassett Jr et al., 2014)	Patients with AMI	Older Adult (Fitzsimons et al., 2013)
Step count (step per day)	-------	6,819	8,493
Stepping time (mins)	114	94	105
Standing time (mins)	360	239	251
Upright time (mins)	474	333	356
Sedentary time (mins)	966	1107	1083

The data show that the participants spent the majority of their sedentary time at weekends and this decreased during weekdays, which is a mirror image of upright time at Time 1 and Time 2. There was a small variation between days but the greatest mean sedentary time per day at both Time 1 and Time 2 was at the weekends. The lowest mean sedentary time occurred on Mondays and Tuesdays, which are working weekdays in Middle Eastern countries, and the pattern of greatest mean sedentary time per day was similar between Time 1 and Time 2. The participants had the greatest mean sedentary time on Fridays and Saturdays at Time 1 and Time 2.

In addition, the sedentary time represented 76.4% of their time on weekdays and 79.2% on weekends at Time 1, whereas the sedentary time represented 76.5% and 78.3% on weekdays and weekends respectively at Time 2. Thus, there was consistent sedentary time on working days and weekends at both Time 1 and Time 2, but sedentary time was higher during the weekends. Thus, health care professionals would recommend that the patients with AMI reduce sedentary time.

The mean hourly sedentary time was greater at Time 2 through all hours of the day. Comparing standard deviation, the data showed a large standard deviation in the afternoon more than the morning and night-time in both Time 1 and Time 2, which indicates considerable variation in sedentary time in the afternoon. However, there were relatively prolonged periods of sedentary time throughout the day at both times.

This study revealed the same findings from relevant studies in Middle Eastern countries, such as Barghouti et al. (2015), who found that PA is low among healthy adults in Jordan as a result of knowledge and sociodemographic determinants. (Barghouti et al., 2015) raised several concerns about knowledge and sociodemographic determinants, such as the conservative tradition and cultural norms being one of the PA barriers in Arab countries (Amin et al., 2012). Recently, a study conducted in the Middle East found that the majority of the adult population's time was sedentary or spent at reduced activity levels and hence, there were barriers to PA as well as social, cultural, and environmental factors (Sayegh et al., 2016).

There are various possible reasons explaining the prolonged sedentary time among patients with AMI. First, the pain and discomfort at the catheterisation site where the femoral or radial punctures could limit the patients' mobility and increase their sedentary time. Second, the measurement time for the participants was during their sick leave period after hospitalisation, and most of the participants had not returned to work. Third, the absence of any education programme or rehabilitation programme to influence the cultural and religious beliefs, which may contribute to increase the sedentary time, considering that about 90% of Jordan's population are Muslim and they pray five times each day, and every prayer consists of movements in both standing and sitting positions. However, according to Islamic religious rules, if the patients cannot perform prayer in a standing position, they can perform all the prayers' movements in a sitting position.

The study findings indicated that PA in patients with AMI was less than in the healthy population and below the recommended level. These findings are consistent with the literature, which shows that Middle Eastern countries have the highest physical

inactivity levels (Barghouti et al., 2015; Sayegh et al., 2016) and high prevalence of CVD risk factors (WHO, 2015b).

To summarise, the discussion points out various possible reasons for the absence of significant differences between Time 1 and Time 2 in terms of PA volume. First, the study measured the data from patients with AMI after 2 and 6 weeks of hospitalisation, whereas in the literature, PA improvement occurred 3 to 6 months after cardiac rehabilitation. This indicates that more in-depth follow-up might be necessary, particularly for measures that require more time to detect changes. Second, the inconsistency between our study results and the results of other researchers (Houle et al., 2011; Izawa et al., 2006; Matthews et al., 2008; Tudor-Locke, Burton, & Brown, 2009) may also be due to differences in the monitoring methodology used in these studies, such as different populations, varying measurement times, and focusing only on step count. The aforementioned studies used a PA monitoring system to measure AMI in patients with ACS or CHD after cardiac rehabilitation, rather than a healthy population under free-living conditions. Third, physiological factor: the healing of the site of catheterisation procedure is still in progress and needs more time. Fourth, unfortunately there is a lack of infrastructure and legislation in Jordan, such as a lack of open areas for walking, bicycle lanes and a national strategy to improve PA levels. In addition, lack of cardiac rehabilitation programmes in Jordan (Eshah, 2011) and this might limit the behavioural change opportunities of patients with AMI in the study. Fifth, a previous study, conducted in Jordan, showed that patients with ACS lacked knowledge about lifestyle changes after hospitalisation (Eshah, 2011). In addition, social and cultural factors influences such as conservative norms, traditions, and lifestyle do not support an individual in demonstrating the recommended PA level. Advice and information given by the healthcare team are important factors in increasing patients' knowledge for behavioural change (Luszczynska et al., 2007)**.** Sixth, the study did not include data related to levels of PA before hospitalisation and the co-morbidity of patients with AMI. These are considered one of the determinants of PA after hospitalisation for patients with CHD (Reid et al., 2006).

For these reasons, the results of this study highlight the need to enhance behavioural change strategy and reduce the sedentary time through the establishment of cardiac rehabilitation programmes among Jordanian patients with AMI. Consequently, the findings did not confirm the second hypothesis, which predicts improvements in PA levels in the early recovery phase among treated patients with AMI.

6.4.2 Physical Activity Pattern and Changes

This is the first study aimed at assessing PA pattern in the early recovery phase among patients with AMI. In order to meet this objective, further analysis was conducted to assess PA pattern for all participants to show the distribution of duration of the PA events, particularly upright and sedentary events, through plotting the proportion of total time spent in the event against the length of the event.
Upright events were similar in frequency at Time 1 and Time 2. There were no significant differences in event accumulation regarding upright events. Approximately, 50 % of accumulated upright time was in instalments of less than 10 minutes for both Time 1 and Time 2. This gives an insight into the accumulation of upright events in AMI populations.

There was a similar frequency of sedentary events at Time 1 and Time 2. There were no differences in event accumulation regarding sedentary events. The results showed limited changes in PA pattern regarding upright time and sedentary time at Time 1 and Time 2. Approximately, 75 % of accumulated sedentary time was in instalments of less than 5.2 hours for both Time 1 and Time 2. Therefore, there were no significant differences in event accumulation regarding sedentary events.

These findings are consistent with a previous study, which showed neither home nor hospital training had any immediate effect on PA level (Cowie et al., 2011). In addition, it found no significant differences in PA levels in the long-term for both home and hospital training groups with heart failure. There were only significantly increased steps taken per day during ‘extra-long’ and ‘long’ walks in hospital-based training (Cowie et al., 2011).

6.4.3 PA level and Clinical Variables

This is the first study that examined the relationship between clinical variables, such as BMI, CHD diagnosis date and AMI type of treatment with PA volume, namely: step count, stepping time, standing time, upright time, and sedentary time. The study found there were no significant relationships between clinical variables and PA level except that there were significant relationships between BMI and both step count and stepping time at Time 1 and Time 2, which is consistent with a previous study that showed a relationship between BMI and PA (Li et al., 2014). In addition, BMI is one of the PA determinants as reported by (Britton, Brunner, Kivimaki, & Shipley, 2011; Oliveira et al., 2014). Therefore, optimising BMI is very important to increase stepping time and step count among patients with AMI.

There was no relationship between diagnosis date of CHD and PA level. In addition, there were no differences in PA level among type of AMI treatment groups at Time 1 and Time 2. This is due to the lack of an education programme from health professionals and the impact of culture on day-to-day activity (Sriskantharajah & Kai, 2007). Consequently, the patients lack knowledge about their disease and AMI treatment modalities.

6.5 Association between Self-Efficacy and Physical Activity

This study aimed to explore associations between self-efficacy and PA among the AMI population. Despite self-efficacy having been identified as one of the important predictors for a number of health behaviours including PA (Poortaghi et al., 2013; Sol et al., 2011), this study found that among patients with AMI, there was no statistically significant association between self-efficacy, and its three subscales, and PA in the early recovery phase.

Application of Bandura's self-efficacy theory showed that self-efficacy is an important component of behavioural change, that self-efficacy has been used widely among patients with CHD, and that CHD patients with higher self-efficacy levels have greater self-management skills (Katch, 2010; Poortaghi et al., 2013; Sol et al., 2011). The

findings of the study are inconsistent with Bandura's self-efficacy theory and the literature as reported by (Blanchard et al., 2006; Izawa et al., 2006; Luszczynska & Sutton, 2006), who found a relationship between self-efficacy and PA level. However, this study examined the association between self-efficacy and PA outside the cardiac rehabilitation context, in addition to which the study did not investigate other relevant variables, such as anxiety and depression.

A few studies found no association between self-efficacy and PA, such as a recent study among a rheumatoid arthritis population, in which self-efficacy was assessed by using the rheumatoid arthritis self-efficacy questionnaire and PA was measured by using the Yale PA Survey (Larkin, Gallagher, Fraser, & Kennedy, 2016). Another study found that self-efficacy can explain only 7.6% of PA level (Yates et al., 2003). This indicates that the association between self-efficacy and PA is more complex. In addition, self-efficacy alone cannot determine PA level of patients with AMI in the early recovery phase outside the cardiac rehabilitation context.

One of the possible factors affecting the association between self-efficacy and PA was the use of the CSEQ. This occurred when the study measured the association between the confidence of patients in their ability to do such tasks related to their cardiac disease and PA behaviour. The study considered both self-efficacy and PA level as part of their overall cardiac disease self-management behaviour. Interestingly, the results did not demonstrate a significant association between self-efficacy and PA levels among the AMI population as reported in the literature. It might be due to the CSEQ measures self-efficacy for CVD self-management skills and not their confidence in ability to involve themselves in PA behaviour. Thus, the findings relating to assessing cardiac self-efficacy as part of CVD patients' self-management could not guarantee the existence of association with PA level. Hence, using a tool to assess self-efficacy for PA would be more appropriate in order to identify the association with PA behaviour.

CSEQ is a task self-efficacy questionnaire. Generally, studies related to cardiac rehabilitation programmes have frequently used task self-efficacy questionnaires. However, a few studies have used maintain, coping and scheduling self-efficacy

questionnaires for actions that facilitate adherence to secondary prevention. With little attention to the use of long-term maintenance self-efficacy questionnaires as systemically reviewed by Woodgate and Brawley (2008). This is consistent with another study by Luszczynska and Sutton (2006), who showed that different types of self-efficacy such as maintenance and recovery of self-efficacy (phase-specific self-efficacy) after cardiac rehabilitation should be considered to predict PA. The association between self-efficacy and PA can vary according to the action asked for in the questionnaire, the context under which exposure to activity is experienced and the temporal nature of the exercise exposure (McAuley et al. (2011).

In the literature, association between self-efficacy and PA has clearly been examined in the cardiac rehabilitation context (Woodgate & Brawley, 2008). However, some studies found that there was no association between self-efficacy and PA among rheumatoid arthritis patients (Larkin et al., 2016). Therefore, using self-efficacy in different contexts would have an effective influence on self-efficacy, as reported by (McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003), which reveals that social context significantly influences self-efficacy.

Another possible reason for the lack of association between self-efficacy and PA is the fact that self-efficacy measures the belief in an individual's ability to do a task but does not measure their motivation and intentions, such as their willingness to do it. The study found that increased self-efficacy did not increase PA level. This may be due to the participants overestimating their confidence, while their actual performance in PA was low. Further, it might be there was a lack of motivation among the participants to increase their PA level. This discrepancy raises the question of considering the mismatch between self-efficacy in a specific task and actual ability related to that task.

The implementation of this study in Jordan, where there was no cardiac rehabilitation. It is important to highlight the social and cultural influence context on the study results, as this is clearly linked to affect the four sources of self-efficacy and free living PA, and in turn, to the association between self-efficacy and PA. McAuley et al. (2003) showed social support and affective states can also influence self-efficacy. These

factors are considered to influence self-efficacy and that need to be considered when developing health interventions (McAuley et al., 2003). For example, a socially supportive group has high self-efficacy level in home-based activity programmes (McAuley & Blissmer, 2000).

Certain key factors have been found in understanding PA among cardiac patients, such as personal factors, and health barriers such as symptom distress and negative well-being (Yates et al., 2003). In addition, other factors that may influence PA of patients with AMI are lack of infrastructure such as open spaces and parks, and legislation, transportation systems and the conservative culture and traditions of Jordan.

PA barriers and self-efficacy barriers such as, individuals having high confidence in their ability to partake in PA but being unaware of importance of PA, feelings of pain, and adverse weather, have been found to affect the association between self-efficacy and PA(Blanchard et al., 2007). The study has not investigated these barriers. Moreover, data on PA was not measured at the prior hospitalisation point, and this information could have been valuable, as a previous study found self-efficacy levels to be related to a patient's pre-hospitalisation PA level (LaPier et al., 2009). Furthermore, the early recovery period is a short period after hospitalisation. Given this relatively short period of study, a longer follow-up could be beneficial, particularly for the study of self-efficacy and PA measures that require a longer time to detect changes.

This study has revealed that the associations between self-efficacy and PA level results are more complex. Previous studies have investigated the effectiveness of behaviour change techniques in changing self-efficacy for enhancing PA among different populations of older adults (Ashford et al., 2010), among obese people (Olander et al., 2013), and among elderly people (French et al., 2014). The findings of these studies showed that effective interventions for changing PA self-efficacy in healthy adults are not the same in older adults and the obese population. In addition, each patient population has different self-efficacy mechanisms that are more effective in enhancing PA levels.

The study aims to measure self-efficacy to determine PA behaviour. However, behavioural change is a complex process to achieve, with many factors that can interact and influence it (Michie, Atkins, & West, 2014). The Behaviour Change Wheel by Michie, van Stralen, and West (2011) shows several factors such as training, education, and persuasion. In addition, health policy, legislation and guidelines are fundamental components in the Behaviour Change Wheel, which could help individuals to change their lifestyles. Therefore, patients with AMI should have enough belief in their capabilities and motivation and goal-setting are among the strongest variables associated with PA maintenance (Amireault, Godin, & Vézina-Im, 2013).

Nonetheless, this lack of association between self-efficacy and PA is an important finding, indicating that other mechanisms could influence the association between self-efficacy and PA, such as socio-cultural context. In addition, Bandura's self-efficacy theory provided inadequate explanation of the association between self-efficacy and PA level among patients with AMI not attending cardiac rehabilitation. Consequently, the study findings did not confirm the third hypothesis, which predicted association between self-efficacy and PA level among treated patients with AMI in the early recovery phase.

6.6 Conclusion

This chapter has provided a discussion of the study findings, alongside existing evidence. Further, the chapter considers the meaning of the study's findings, concerning PA levels of patients with AMI. The chapter structured the discussion by using the study's questions to demonstrate the extent to which the study answered each question.

The study showed following WHO guidelines in order to translate and cross-culturally adapt the CSEQ was successful, and the CSEQ demonstrated good reliability and validity outcomes for use in Arabic-speaking countries. The study found that self-efficacy level increased after treatment. However, increased self-efficacy level did not influence PA levels in the early recovery phase. PA levels and patterns remained

steady during the early recovery phase, but did not meet the internationally recommended PA level.

The study found no association between self-efficacy measured using the CSEQ measure and PA. It is therefore possible to conclude that, although self-efficacy has association with PA in the cardiac rehabilitation context, but this association does not occur in outside cardiac rehabilitation context. The study's findings were inconsistent with the literature, which could be a result of both using a task self-efficacy questionnaire and other mechanisms such as social and cultural factors. These might influence the association between self-efficacy and PA outside of a cardiac rehabilitation setting. These finding have added new knowledge regarding the AMI patient population in the early recovery phase.

Chapter Seven: Conclusion and Recommendations

7.1 Introduction

The research reported here developed an Arabic version of the CSEQ, assessed, explored, and identified the relevant information of patients concerning AMI patients' self-efficacy and PA levels and patterns, and more importantly, gathered evidence revealing that Jordanian patients with AMI have low PA and increased self-efficacy levels. The study found no relationship between self-efficacy and PA level among patients with AMI in the early recovery phase. This chapter outlines the contribution the research has made to existing knowledge. Then, the chapter identifies and discusses the limitations of the research. Following that, it outlines the implications for clinical practice, policy and future research. Finally, this chapter presents the study's conclusion.

The aim of the study was to use the WHO guidance (WHO, 2014) to inform the translation and adaptation of the CSEQ measure to Arabic. In addition, changes in self-efficacy and PA level and pattern among patients with AMI in the early recovery phase were assessed and associations between self-efficacy and PA explored. The study had four objectives.

The first objective was the translation and cross-cultural adaptation of the CSEQ to Arabic, and testing of the validity and reliability of the Arabic version. The Arabic CSEQ was translated and demonstrated good validity and reliability outcomes. The Arabic version of the CSEQ would be beneficial for the healthcare profession, through using the CSEQ in any study with different health interventions, which aims to measure self-efficacy as a health intervention outcome in order to improve self-management skills.

The second objective of the study was to assess the changes in self-efficacy at baseline, two weeks and six weeks by using the self-reported Arabic CSEQ among patients with AMI following hospitalisation. The study found statistically significant changes in self-efficacy levels and its subscales at baseline, two weeks and six

weeks after hospital discharge. Therefore, there is an increase in self-efficacy occurred after receiving treatment in the early recovery period.

The third objective of the study was to determine changes in PA level and pattern. The study found no significant changes in PA among patients with AMI at two weeks and at six weeks following hospitalisation. In conclusion, many factors can influence PA level and pattern. Consequently, patients with AMI need to be involved in such programmes that aim to increase their PA levels to meet the internationally recommended level of PA.

The fourth objective was to explore whether there was an association between self-efficacy and PA level. Although self-efficacy is a prominent predictor for PA in the literature, there were no associations found between self-efficacy and its subscales and PA level. It seems that the relationship between self-efficacy and PA is complex and requires further investigation. In conclusion, other mechanisms can affect PA behaviour among patients with AMI after treatment in Jordan, such as socio-cultural factors.

7.2 Contribution to Existing Knowledge

The study has successfully translated and cross-cultural adapted of the CSEQ into Arabic. The CSEQ demonstrated good reliability and validity outcomes for use in Arabic-speaking countries. Changes in self-efficacy levels increased significantly. PA levels did not change; Increase in self-efficacy did not influence PA levels among patients with AMI. These study findings contribute new knowledge in the following ways:

1- This study translated and cross-culturally adapted the CESQ to Arabic and created a valid and reliable tool measuring self-efficacy, available in the Arabic language. In addition, this will enable future researchers to use this questionnaire in Arabic-speaking countries for patients with AMI, confident in the knowledge that it is a reliable and valid tool.

2- To the researcher's knowledge, this is the first study to seek to assess the changes in self-efficacy and its subscales and PA level and pattern in the early recovery phase after treatment for AMI.

3- This study showed that there a need for further research to investigate the relationship between self-efficacy and PA level among patients with AMI not involved in a cardiac rehabilitation programme in the early recovery phase.

4- This is the first study that focuses solely on the early recovery phase for patients with AMI after receiving treatment and considers those who have no access to cardiac rehabilitation or disease self-management programmes.

5- This is the first study to measure PA level and pattern among patients with AMI after receiving treatment in Middle Eastern countries, through using body-worn activity monitors. The use of body-worn activity monitors adds an accurate, specific and sensitive measurement, sufficient to meet the study's objectives. This is of particular relevance when conducting a PA measurement at two time points, preferred over using self-administered PA recall questionnaires, which are subject to bias and overestimation.

6- This study contributes to enhancing secondary prevention practice, establishing cardiac rehabilitation programmes and promoting PA behaviour among patients experiencing AMI in Jordan through addressing the changes in PA levels and patterns among patients with AMI after treatment in the early recovery phase.

7- To researcher's knowledge, this is first study in this field related to secondary prevention in the Middle East to use new research tools such as an Arabic CSEQ and body-worn activity monitors among AMI populations.

7.3 Limitations of the Study

The following limitations should be borne in mind when considering the results of the research:

- The implementation of the study was in one setting, a cardiac centre only. This limits the generalisability of the study findings among the Jordanian population, even though the JUH receives patients with AMI from throughout the country.
- Although the translation and cross-cultural adaptation of the CSEQ into Arabic was successful, the validity and reliability test was in small sample sizes of patients with CHD. In addition, further validity and reliability tests are required to test the Arabic version of the CSEQ.
- Using a disease-specific self-efficacy questionnaire in a specific and short period of measurement may have affected the study findings. With this in mind, a different phase-specific self-efficacy questionnaire, such as a recovery, maintain or coping self-efficacy questionnaire, might be recommended for future research.
- There are many factors able to influence self-efficacy level. The study did not measure psychological factors such as health beliefs, anxiety and depression, which could affect self-efficacy level (Allahverdipour et al., 2013; Joekes, Van Elderen, & Schreurs, 2007; Sarkar et al., 2007).
- The study sample was recruited from a convenient group of patients with AMI admitted to JUH, and more than 50% of screened patients with AMI were ineligible, such as patients with AMI with heart failure or previous AMI, or those that could not read and write. In addition, there was the exclusion of patients with AMI treated by CABG. Furthermore, about 30% of eligible patients with AMI refused to participate and 62% were male.
- The study setting was in Jordan where there are no formal cardiac rehabilitation programmes or structured health education programmes in hospitals. This may have had an impact on the study findings. In other

countries where patients with AMI have access to cardiac rehabilitation programmes, patients might have more motivation and a greater understanding of the nature of their illness and the ways to change their behaviour.

- The collection of study's data was after patients' hospitalisation over a short period (up to six weeks), so a longer follow-up time for measurements such as six or twelve months might have revealed further changes in patients' self-efficacy levels and in PA volume and pattern.
- The recording of PA measurement for patients with AMI was during the early recovery phase, when most of the patients had not returned to work. Therefore, it should be borne in mind that PA level might have changed had they returned to their work.

7.4 Recommendations

This research has explored several crucial findings regarding translation and cross-cultural adaptation of an Arabic CSEQ and using the CSEQ to measure self-efficacy level among CHD patients. The study findings showed no improvement in PA levels among patients with AMI in the early recovery phase. The following section identified a number of recommendations from this research. The researcher has made a dissemination plan to publish these recommendations, (Appendix AA).

7.4.1 Implications for Practice

Previous studies have shown the importance of cardiac rehabilitation programmes for patients with AMI (Dalal et al., 2015; Giannuzzi et al., 2008). Cardiac rehabilitation has been shown to increase patients' awareness and knowledge of coronary risk factors, specifically PA level, and self-efficacy (Dalal et al., 2015). However, patients with AMI in Jordan do not have access to structured education programmes or cardiac rehabilitation centres (Eshah, 2011). Despite this, using the Arabic version of the CSEQ should be useful in the assessment of self-efficacy when developing health interventions for patients with AMI.

Patients' PA levels did not meet international recommendations. Reducing sedentary time leads to clinically important reductions in CVD risk factors in the AMI population. Therefore, the healthcare professional should consider developing effective intervention in order to help patients with AMI increase PA levels and decrease sedentary time.

The study findings highlight the importance of a sedentary time reduction strategy for patients with AMI, through promoting PA by placing more emphasis on awareness of the importance of PA, optimising BMI, and a healthy and active lifestyle. Patients with AMI must be encouraged to understand that lifestyle changes are not optional, but a necessary part of the recovery process that can contribute to improved health outcomes. In addition, patients with AMI should be encouraged to increase their awareness of benefits and outcomes of secondary prevention practice.

Healthcare professionals play a key role in promoting a sedentary reduction strategy and improving upright time among AMI populations. One suggested strategy is to replace sitting events with standing events during daily activities. In addition, scheduling more PA during the weekends and in the morning and evening is important, as these are the times when the AMI population was less active.

The study found that PA level in Jordan is below the international recommendations. Therefore, the health intervention developers have to establish a suitable and effective health intervention that helps patients with AMI improve their PA levels. There is now the necessary health intervention to motivate patients with AMI to increase adherence to secondary prevention strategies, such as cardiac rehabilitation programmes or disease self-management programmes for Jordanian patients with AMI. Using health technology such as text messaging, Internet, and mobile phones is now feasible and widely accessed by individuals. For this reason, health technology provides an ideal opportunity to deliver health interventions and cardiac rehabilitation programmes to increase physical activity levels. For the short term, there is an essential need for more effort to establish such educational activities at the hospital.

7.4.2 Implications for Health Policy

In order to keep up to date with wider changes along with health concerns, the health policy makers have to update secondary prevention policies regularly and check them frequently, in order to ascertain the importance of a secondary prevention strategic plan within the healthcare setting. This could draw upon the Ministry of Health in Jordan, which should update its strategies regularly. Health policy makers in Jordan have to develop a new healthcare policy, national health plan, and legislation to improve PA behaviour at two levels: community and individual. In addition, they need to produce a national PA report to monitor the PA status in Jordan annually.

The health policy makers have to focus more and pay special attention to health education programmes by considering AMI populations' needs. These national health policies act as a framework for all healthcare sectors and hospitals and should be evaluated and updated frequently in order to accomplish their aims. More attention and special care is required to determine the suitable environmental factors and managerial support that will enhance the process of health education, including educational materials.

Health policymakers have to make greater efforts to ensure the continuity of health care provided to patients with AMI after their discharge from the hospital. The health policymakers should consider involving patients with AMI in education programmes after hospitalisation that improve their skills and enhance their adherence to the treatment – such as establishing cardiac rehabilitation programmes – in order to ensure that patients with AMI obtain appropriate secondary prevention.

Finally, the researcher strongly advise the Jordanian government to develop strategies that focus on promoting PA and act in a supporting role in reducing sedentary behaviours in different settings such as healthcare settings, workplaces, schools and transport systems, making the active choice the easy choice. In addition, health policymakers should aim to promote PA among people in their daily activity. Furthermore, in order to achieve its endeavour to improve PA levels, the Jordanian government should establish infrastructure such as cycle lanes, tracks, paths and

parks at a local level to promote walking and cycling, this can replace many car trips and increase PA behaviours.

7.4.3 Implications for Future Research

The successful application of the WHO process of translation and cross-cultural adaptation of the Arabic version of the CSEQ leads to good findings of validity and reliability. However, more psychometric property evaluations are highly recommended, such as construct validity and confirmatory factors analysis on a more representative sample size. It would also be valuable to test using the Arabic version of the CSEQ in different Arabic-speaking countries.

Usage of other types of self-efficacy questionnaires such as general self-efficacy questionnaire or phase-specific self-efficacy scale, to assess self-efficacy levels in specific periods, could improve the research. Further, assessment psychological factors such as anxiety and depression is required when measuring self-efficacy level. In addition, Bandura's self-efficacy theory is widely used in much research to explain the relationships between variables. However, using Bandura self-efficacy theory would be more applicable in investigating self-efficacy level among patients in the cardiac rehabilitation context rather than measuring self-efficacy in socio-cultural context, where many factors may influence self-efficacy level.

Measurement of PA level is now feasible through using objective devices. The researcher strongly recommends that this study be replicated using different research methods. Further, the researcher recommends implementing the study in many Arabic-speaking countries, especially in those with established cardiac rehabilitation programmes. In addition, subsequent studies should test different cardiac populations, add further variables, and have a longer follow-up times such as up to six or twelve months.

There is a need to implement further research to explore the determinants of PA behaviours and PA barriers in the future, in order to gain a better understanding of PA behaviours among Jordanian patients with AMI, and the role of nurses in supporting and providing health education for patients with AMI and improving the environment

and health education sessions. In addition, it is desirable to develop further methodological approaches such as qualitative studies to explore AMI patients' beliefs, attitudes and knowledge about different methods of education styles, including the use of mobile smart phones and outside resources. Further, the investigation of other variables and relevant CVD risk factors in the future, such as quality of life, smoking cessation, diet, blood pressure and blood lipids control, would be beneficial. Consequently, these studies could reveal related results that might support a secondary prevention strategy.

7.5 Conclusion

This study extends the knowledge of secondary prevention for the AMI population. The study has revealed many new findings. The CSEQ is available now in Arabic. It would be beneficial for the healthcare profession, to use the CSEQ in any study with different health interventions that aims to measure self-efficacy as an outcome in order to improve self-management skills.

The researcher recommends further qualitative and quantitative studies to investigate self-efficacy constructs among patients with AMI in Jordan, with consideration of the use of generic and phase-specific self-efficacy tools. This study showed the feasibility of measuring PA after AMI accurately, and indicated PA levels below the recommended level. Therefore, there is a need for further qualitative studies to explore the barriers and enablers of PA among patients with AMI. In addition, there is a need for a wider national strategy, an updated health policy, effective health intervention and a health campaign in Jordan to improve PA behaviour for patients with AMI.

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Appendices

Appendix A : Quality appraisal assessment for the selected studies

	Author date setting	Title / Key Findings	Objectives of the Study	Study Design / Sample / Ethical Approval	Group Comparability	Outcomes Measurement	Data Collection and Analysis	Policy and practice Implications	Comments
1	**Izawa, at el 2005 / In hospital / Japan**	Effect of the Self-Monitoring Approach on Exercise Maintenance During Cardiac Rehabilitation: A Randomized, Controlled Trial. Significant difference in mean self-efficacy PA score between two groups and mean objective PA (10,458.7 vs. 6922.5 steps/week,) at 12 months after self-efficacy PA score showed significant positive correlation with objective PA	To evaluate the effect of the self-monitoring approach on self-efficacy for PA, exercise maintenance, and objective PA level over a 6-mo period after a supervised 6-mo cardiac rehabilitation program.	RCT / (n=45) MI Patients recruited after completion of an acute-phase, exercise-based CR program/ Approved from St. Marianna University School of Medicine Hospital	Patients were compared to self-efficacy for PA, exercise maintenance, and objective PA level over a 6-months period after a supervised 6 months' cardiac rehabilitation program	Peak VO2 was measured as an Index of exercise capacity, self-efficacy for PA questionnaire and electronic pedometer	distributing the questionnaire after cardiac rehabilitation Data was analysed by Statistical analyses were performed with SPSS 12.0J statistical software	self-monitoring approach during supervised cardiac rehabilitation may effectively increase exercise maintenance, self-efficacy for PA, and objective PA at 12 months after myocardial infarction onset	No

2	**Robert D. at el 2006 / In hospital / Canada**	Determinants of PA after hospitalization for coronary artery disease: The Tracking Exercise After Cardiac Hospitalization Study PA declined from 2 months after hospitalization. Specific subgroups (e.g. less educated, younger, women, PCI, CHF, and patients with DM) demonstrated lower PA	Exploring the trajectory of PA after hospitalization for CHD, who are not engaged in cardiac rehabilitation at 2, 6 and 12 months., and examined the effects of demographic, medical, and activity-related factors	A prospective cohort study/ (N=782) CHD patients (AMI, PCI, or CABG) / Approval was obtained from the Research Ethics Committee	Patients were compared leisure-time PA, Sex, age, education, reason for hospitalization, congestive heart failure (CHF), DM, 2, 6 and 12 months after hospitalization	Energy expenditure levels were assessed using a telephone-administered 7-day PA recall interview Levels of prehospitalization PA were assessed by the leisure score index (LSI) of the Godin Leisure-Time Exercise Questionnaire And demographic and medical data from patients files	Distributing the questionnaire after cardiac rehabilitation and follow up 1 year Data was analysed by Statistical analyses were performed with SPSS	PA levels declined from 2 months after hospitalization. Specific subgroups (e.g. less educated, younger) were at greater risk of decline and other subgroups (e.g. women, and PCI, CHF, and patients with DM) demonstrated lower PA. These groups need tailored interventions	PA was measured energy expenditure by recall interview

3	**Eshter at, el 2006 / In-hospital / Netherlands**	PA measurements affected participants' behaviour in a randomized controlled trial. Self-efficacy, knowledge, awareness, and PA showed positive trends, except stages of change and measurements of PA affect participant's PA behaviour, possibly triggered by a raised awareness about their own PA level.	Assessing levels and determinants of PA as outcome measurements in a randomized controlled trial promoting regular PA in Dutch general practice	RCT / (N=635) CHD patients/ Approved from The Medical Ethical Committee of the VU University Medical Centre in Amsterdam	Patients were compared to level of PA meeting American College of Sports Medicine/ Centres for Disease Control Guideline for regular PA, stage of change, and determinants of PA at base line, 2 and 6 months	Two measurement tools of PA: self-reported questionnaire SQUASH questionnaire and accelerometers the CSA monitor A five-item scale was used to assess stage of change for regular PA	Data was collected by distributing the questionnaire and accelerometer after cardiac rehabilitation and follow up 6 months Data was analysed by Statistical analyses were performed with SPSS 10	Measurements of PA affect participant's PA behaviour, possibly triggered by a raised awareness about their own PA level.	accelerometer worn for 3 consecutive days

4	**Blanchard at el 2006 / In Hospital / Canada**	Correlates of PA Change in Patients Not Attending Cardiac Rehabilitation The increase in PA from baseline to 6 months significantly related to an increase in self-efficacy and PA intentions and a decrease in the impact of health-related barriers. Furthermore, the decrease in PA from 6 to 12 months significantly related to a decrease in health-related benefits and PA intentions and an increase in time and health-related barriers. Finally, the increase in PA from baseline to 12 months significantly related to an increase in health-related benefits and intentions and a decrease in health-related barriers.	To determine whether changes in self-efficacy, PA intension, perceived severity and susceptibility and PA benefits/ barriers were associated with PA in hospital,6 and 12 months	Longitudinal study / (N=555 CHD) not attending cardiac rehabilitation / Approved from ethical committee	Patients were compared to changes in self-efficacy; PA intention, perceived severity and susceptibility, and PA benefits/barriers were associated with changes in PA at baseline, 6 and 12 months	Self-reported PA questionnaire, PA intentions questionnaire and self-efficacy questionnaire	Data were collected by distributing the Questionnaire and after hospitalization and follow up 6 months Data was analysed by Statistical analyses were performed with SPSS	Changes in PA levels over a 12-month period were associated with changes in various theoretical variables. and, the associations among these variables with PA varied as a function of time after hospitalization	NO

5	**Luszczynska and Stephen 2006 / In hospital / Poland**	PA After Cardiac Rehabilitation: Evidence That Different Types of Self-Efficacy Are Important in Maintainers and Relapsers Maintenance self-efficacy predicted PA in a subgroup of participants who maintained regular activity at 8 months after MI, and recovery self-efficacy predicted PA Among participants who had relapsed by 8 months after MI	To test whether maintenance self-efficacy predicts PA among individuals who maintain an active lifestyle and whether recovery self-efficacy predicts PA among those who relapse to a less active lifestyle	Longitudinal study / n=114) MI patients after cardiac rehabilitation / Nothing mentioned about the Ethics at all	Patients were compared to self-efficacy; PA at 2 and 8 months after MI/	Maintenance and recovery Self-efficacy questionnaire and PA scale	Data were collected in hospital by questionnaire, and PA was measured by asking questions and the response scale from 0 -10. Nothing about the Application that used in data analysis	Patients who conduct interventions among cardiac rehabilitation patients should aim to increase recovery self-efficacy among those patients who are at risk for relapse and to increase maintenance self-efficacy among those patients who are likely to maintain their level of PA	No

6	**Blanchard at el 2007 / In hospital Canada**	Barrier Self-Efficacy and PA Over a 12-Month Period in Men and Women Who Do and Do Not Attend Cardiac Rehabilitation Significant declines in PA over time, which especially among women , the association between barrier self-efficacy and PA became significantly weaker over time, especially for women. This trend was similar for participants who did and did not attend cardiac rehabilitation	To examine (a) changes in PA in 2, 6 and 12-month period in people living with cardiac disease who did not attend cardiac rehabilitation, and (b) the role of barrier self-efficacy in explaining these changes from a gender perspective. A secondary objective was to examine whether attending cardiac rehabilitation (or not) moderated the gender–barrier self-efficacy relationship with PA	Longitudinal study / (N=801) (n=247) patients attended cardiac rehabilitation (n=554) not attending cardiac rehabilitation / Approval of the study procedures was obtained from the Research Ethics Committee in Ottawa and Kingston, Canada	Two groups, one group who attended cardiac rehabilitation and the second group who didn't attend cardiac rehabilitation 259	Barrier self-efficacy was measured with a five-item scale developed by Plotnikoff and Higginbotham Assessment of pre-hospitalization PA by the leisure score index (LSI) of the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1985) The frequency of PA at each intensity level multiplied by its metabolic equivalent based in fixed formula. Follow-up assessment of PA after hospitalization using a telephone-administered PA recall interview.	Data collection was at baseline in hospital and follow up data by telephone and mail. Nothing about the Application that used in data analysis	Interventions that focus on increasing barrier self-efficacy in people living with heart disease after hospitalization will likely equally benefit men and women in the short term but may disproportionately benefit men in the longer term regardless of participation in cardiac rehabilitation.	Self-reported questionnaire were used in both self-efficacy and PA

7	**Yohannes at el 2010 / In hospital / UK**	The long-term benefits of cardiac rehabilitation on depression, anxiety, PA and quality of life The total energy expenditure between baseline values and all subsequent measures over time PA was significantly higher for men compared to women	To investigate the long-term benefits of a six-week comprehensive cardiac rehabilitation program me on PA	Repeater measures at baseline, 6 and 12 months after cardiac rehabilitation / (n=105) MI patents / Approved by the local ethics committee	No group	Patients completed the PA energy expenditure (seven-day recall activity) measured by self-administered questionnaire, MacNew Heart Disease Health-Related Quality of Life (MacNew) and Hospital Anxiety and Depression scale at baseline, six weeks, six and 12 months	All questionnaires were administered via the hospital postal service and mailed to the patient's home address with a prepaid envelope All data were analysed by SPSS 16	A six-week cardiac rehabilitation programme is beneficial in improving quality of life, PA status, Anxiety and depression These benefits maintained at 12 months. Elevated levels of depression were associated with Impaired quality of life	No

8	**Houle at el 2011 / Hospital based / Canada**	Innovative program to increase PA following an acute coronary syndrome: Randomized controlled trial At baseline, averages steps/day were similar between groups (5845 ±3246 vs. 6097 ±3055 steps/day; p = 0.812). At 3-month follow-up, both groups increased their averages steps/day (p < 0.05). This increase was higher in the experimental group (3388 ± 844 vs. 1934 ±889 steps/day; p < 0.001). At 12-month, interaction effects (group ×time) in PA and waist circumference were different between groups (p < 0.05), whereas self-efficacy expectation increased in both groups similarly (p < 0.05).	To evaluate the impact of a socio-cognitive interventi on associate d with a pedometer-based program on PA, CVDs risk factors and self-efficacy expectati on during one year following ACS	RCT / (n=65) ACS / Approved by the research ethics committee s of Quebec	Patients were compared to steps count in the experiment al group and patients in the usual care group	Pedometers with a 7-day memory	distributing the pedometer for ACS patients after hospitalizati on Data was analysed by SAS Version 9.2	The intervention is useful to improve average steps/day and waist circumference during the first year following an acute coronary syndrome. This study supports development of the home-based cardiac rehabilitation program using socio-cognitive intervention associated with a pedometer after an acute coronary syndrome.	No

9	**Fitzsimons at el 2013 / UK** **Community** dwelling friends and family	Using an individualised consultation and activPAL™ feedback to reduce sedentary time in older Scottish adults: Results of a feasibility and pilot study There was reduction in total time spent sitting/lying was 24 min/day. Total time spent in stepping activities, such as walking increased by 13 min/day. Self-report data suggested participants achieved behaviour change by reducing time spent using motorised transport and/or watching television.	To explore an individualised intervention strategy aimed at reducing sedentary behaviours in older Scottish adults	a pre-experimental (one group pre-test–post-test) 24 healthy older adults Nothing mentioned about the Ethics at all	No comparative groups	Sedentary behaviour was measured objectively using the activPAL™ monitor. Sedentary behaviour was measured subjectively using the Sedentary Behaviour Questionnaire	SPSS version 19 Paired t tests or Wilcoxon Signed Rank Test were used to compare objectively measured	Study suggested a consultation approach might help individuals reduce time spent in sedentary behaviours. A larger, RCT is warranted with a diverse sample to increase generalisability.	

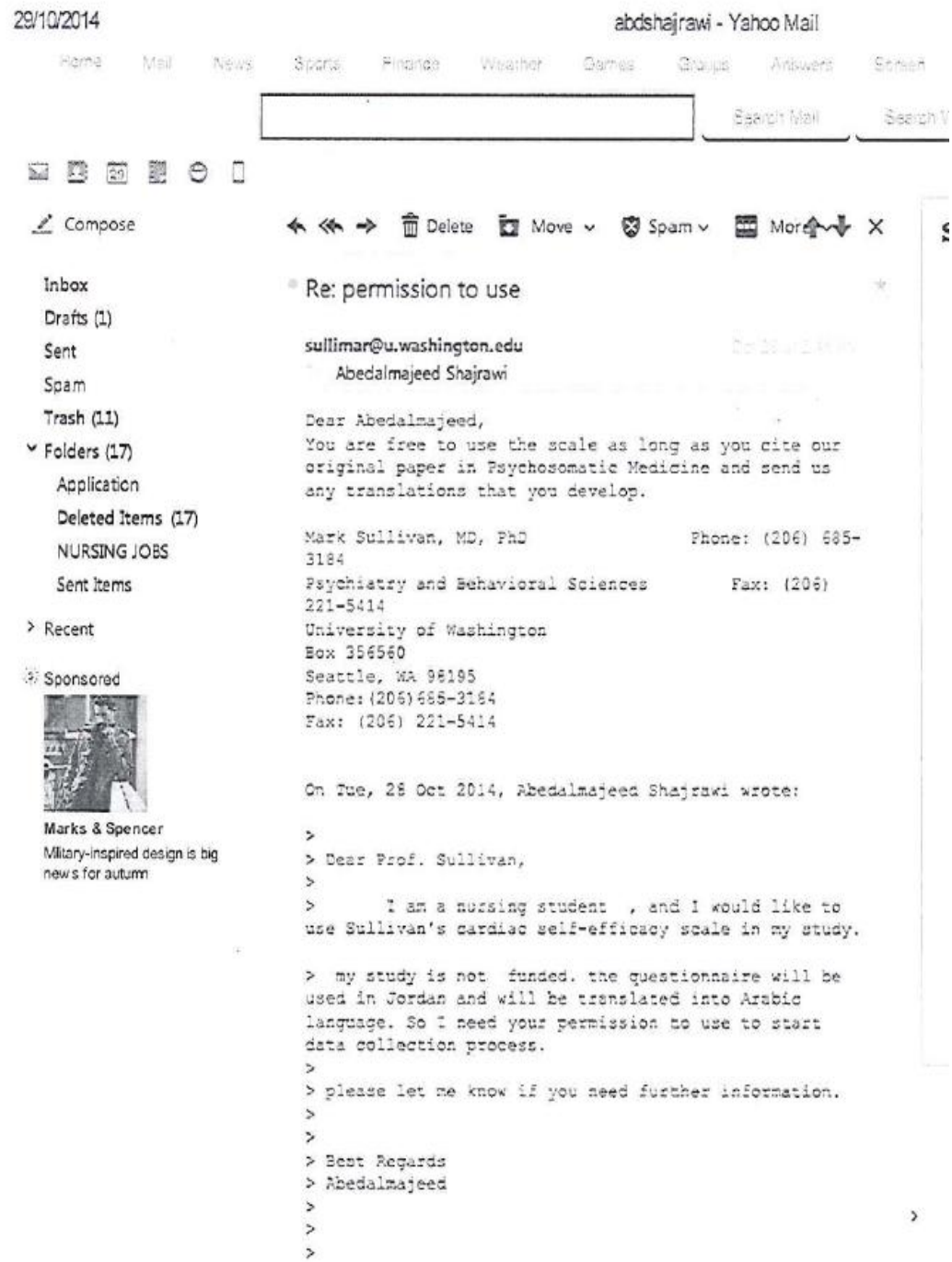
10	**Maddison at el / 2014/ New Zealand / hospital based**	The HEART mobile phone trial: the partial mediating effects of self-efficacy on PA among cardiac patients Change in self-efficacy at 24weeks significantly mediated the treatment effect on leisure-time PA by 13%, but only partially mediated the effect on walking by 4% at 24weeks.	To evaluate the mediating effect of self-efficacy on PA levels in an mHealth delivered exercise cardiac rehabilitation program	RCT (n= 171) / CHD were randomly assigned to either receive the HEART mobile Health intervention (n=85) in addition to usual cardiac services (n = 86) within the previous 3–24month / nothing mentioned about the ethical approval	PVO2 was determined using respiratory gas analysis during a standardized treadmill exercise testing protocol. Self-reported PA levels were assessed using the inter-national PA questionnaire long form (IPAQ-LF)	Self-reported Self-efficacy and PA questionnaires	All outcomes were measured at baseline and 24weeks All statistical analyses were performed using SAS version 9.3	Mobile Health intervention involving text messaging and Internet support had a positive treatment effect on leisure-time PA and walking at 24weeks, and changes in self-efficacy mediated this effect	There was no information about RCT registration and ethical approval.

11	**Howarter at el / 2014 / US / hospital based**	Exercise Self-efficacy and Symptoms of Depression after Cardiac Rehabilitation Predicting Changes over Time Using a Piecewise Growth Curve Analysis Self-efficacy levels were highest at the beginning of cardiac rehabilitation, significantly declined 6 months after cardiac rehabilitation, and levelled off over the next 18 months.	To assess temporal pattern of patients' exercise self-efficacy after cardiac rehabilitation program completion	Repeated measures (n=133) / All study procedures were approved by appropriate hospital and university institutional review boards.	No groups	Data were collected by Cardiac Exercise Self-Efficacy Instrument at baseline the 6 months' interval until 2 years	Data were collected by mail Analysis of data by using SPSS 19.0	That patients show unrealistic optimism surrounding the ease of initiating and maintaining an exercise program and that integrating efficacy-building activities into cardiac rehabilitation, especially for patients who show signs of distress, is advisable	No

12	**Smith et al / 2015 / UK / Office- based workers**	Weekday and weekend patterns of objectively measured sitting, standing, and stepping in a sample of office-based workers: the active buildings study. Total sitting/standing time was similar on weekdays (10.6/4.1 hours) and weekends (10.6/4.3 hours). Total step count was also similar over weekdays (9682 ± 3872) and weekends (9518 ± 4615). The highest PA levels during weekdays accrued at 0700 to 0900, 1200 to 1400, and 1700 to 1900; and during the weekend at 1000 to 1700. During the weekday, the greatest amount of sitting accrued at 0900 to 1200, 1400 to 1700, and 2000 to 2300, and on the weekend between 1800 and 2300. During the weekday, the greatest amount of standing accrued between 0700-1000 and 1700-2100, and on the weekend between1000-	Understanding the total amount and patterns of sitting, standing and stepping in office-based workers	Cross section study Ethical approval was obtained through the University College London Research Ethics Committee	There were no groups, a sample of 164 office-based workers	Measurements of PA were for 24 hours a day for five consecutive days, always including Saturday and Sunday and during bathing. Daily amounts and patterns of time spent sitting, standing, stepping and step counts and frequency of sit/stand transitions	Office workers SPSS , descriptive statistics and t-test	Office based-workers demonstrate high levels of sitting during both the working week and weekend. Interventions that target the working day and the evenings (weekday and weekend) to displace sitting with activity may offer most promise for reducing population levels of sedentary behaviour and increasing PA levels, in office-based workers residing in England.	No

13	**Alsaleh et al. / 2016 /Jordan / hospital based**	Behavioural intervention to increase PA in adults with coronary heart disease in Jordan Moderate PA significantly increased in the intervention group compared with control group (mean change (SD) of frequency: 0.23 (0.87) days/week versus -.06 (0.40); duration: 15.53 (90.15) minutes/week versus −3.67 (22.60) minutes/week; intensity: 31.05 (105.98) METs versus 14.68 (90.40) METs). Walking significantly increased in the intervention group compared with control group (mean change (SD) of frequency: 3.15 (2.75) days/week versus 0.37 (1.83) days/week; duration: 150.90 (124.47) minutes/week versus 24.05 (195.93) minutes/week; intensity: 495. 12 (413.74) METs versus14.62 (265.06) METs). Intervention	To assess the efficacy of a behavioural intervention to increase PA in patients with coronary heart disease not attending structured cardiac rehabilitation programmes	Parallel randomised controlled trial comparing 6-month multi-component behavioural change intervention Ethical approval for the study was granted in the UK by the local institutional review board, and in Jordan by the institutional review boards at both participating hospital sites (Jordan University Hospital and King Abdullah University Hospital)	Jordanian outpatients with CHD, group 1 received usual care from their physicians, which consisted of general (rather than tailored) advice about the benefits of PA and instructions to engage in moderate-intensity PA, such as brisk walking. Group 2 received usual care, plus a six-month behavioural intervention delivered by a cardiac nurse	PA, blood pressure, body mass index, Exercise self-efficacy and health-related quality of life at 6 months after hospitalisation.	Outcome data were collected at two time points: baseline (immediately after recruitment) and immediately post-intervention (6 months after randomisation). The researcher collected questionnaire measures via structured interview, and at the same appointment, collected physiological and body composition measures. Three months after the end of the intervention (9 months after randomisation), participants in the intervention group were invited to complete a questionnaire survey to assess their perceptions	Multi-component behavioural intervention increases PA, and improves body composition, physiological and psychological outcomes in CHD patients not attending structured rehabilitation programmes.	No

Appendix B: Permission to use from the author of cardiac self-efficacy questionnaire



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Abedalmajeed Shajrawi

Dear Abedalmajeed,
You are free to use the scale as long as you cite our original paper in Psychosomatic Medicine and send us any translations that you develop.

Mark Sullivan, MD, PhD Phone: (206) 685-3184
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University of Washington
Box 356560
Seattle, WA 98195
Phone: (206) 685-3184
Fax: (206) 221-5414

On Tue, 28 Oct 2014, Abedalmajeed Shajrawi wrote:

> Dear Prof. Sullivan,
>
> I am a nursing student , and I would like to use Sullivan's cardiac self-efficacy scale in my study.
>
> my study is not funded. the questionnaire will be used in Jordan and will be translated into Arabic language. So I need your permission to use to start data collection process.
>
> please let me know if you need further information.
>
>
> Best Regards
> Abedalmajeed
>
>
>

Appendix C: Arabic Cardiac Self-Efficacy Questionnaire

مقياس مستوى الثقة لمرضى القلب

الرجاء الإجابة على الأسئلة التالية بوضع علامة × على الإجابة المناسبة أو اختيار أقرب أجابه ممكنة:

	السؤال	لا ثقة على الإطلاق 0	واثق إلى حد ما 1	ثقة متوسطة 2	واثق الى حد كبير 3	واثق تماما 4
	ما مدى درجة الثقة لديك بقدرتك على :					
1	التحكم بألم الصدر عن طريق تغيير مستوى نشاطك البدني					
2	التحكم بضيق التنفس عن طريق تغيير مستوى نشاطك البدني					
3	التحكم بألم الصدر عن طريق أخذ الأدوية الخاصة بك					
4	التحكم بضيق التنفس عن طريق أخذ الأدوية الخاصة بك					
5	الاتصال أو زيارة طبيب القلب عند الضرورة					
6	امكانية شرح مخاوفك حول مرض القلب الى طبيبك					
7	تناول الأدوية الخاصة بك لعلاج مرض القلب					
8	ممارسة النشاط البدني لما له من فوائد على صحتك					
9	المحافظة على أنشطتك الاجتماعية المعتادة					

10	المحافظة على أنشطتك المعتادة في البيت مع أسرتك					
11	المحافظة على أنشطتك المعتادة في العمل					
12	المحافظة على علاقتك الجنسية مع زوجك					
13	ممارسة التمارين الرياضية بانتظام (التمرين حتى التعرق وزيادة معدل نبضات القلب)					
14	انقاص وزنك (إذا كنت بدينا)					
15	التوقف عن التدخين (إذا كنت مدخنا)					
16	تغيير النظام الغذائي الخاص بك (إذا أوصى الطبيب بذلك)					

شكرا لك على المشاركة

Appendix D: Sociodemographic data sheet

Measurement of PA Levels and Self-Efficacy during Early Recovery after Acute Myocardial Infarction:

عنوان الدراسة:

دراسة طويلة المدى لقياس سلوك النشاط البدني ومستوى الثقة بالنفس بين مرضى احتشاء عضلة القلب في مرحلة الشفاء المبكر في الاردن

- **Socio-demographic variables: please put × in appropriate box**

العوامل الاجتماعية: ضع علامة × في المربع المناسب

1. Sex — الجنس 1
   - Male ☐ دكر
   - Female ☐ أنثى

2. Age ☐ ☐ المرحلة العمرية 2

3. Educational level — المستوى التعليمي 3
   - Secondary school or less ☐ شهادة ثانوية أوأقل
   - Higher Diploma or less ☐ دبلوم عالي أوأقل
   - Bachelor degree ☐ درجة جامعية أو أكثر
   - Higher education ☐ درجة الماجستير او الدكتوراه

4. Marital Status — الحالة الاجتماعية 4
   - Single/ widow ☐ أعزب او أرمل
   - Married ☐ متزوج
   - Divorced ☐ مطلق

5. Occupation — الحالة الوظيفية 5
   - Employed ☐ موظف
   - Un employed ☐ غير موظف
   - Retired ☐ متقاعد
   - Self-employed ☐ موظف لحسابه الخاص

Appendix E: Diary daily record for chest pain

Study Title:

Measurement of PA Levels and Self-Efficacy during Early Recovery after Acute Myocardial Infarction:

Have you felt any chest pain in last week? Yes No

If yes, please fill the question from 1 to question 4.

1. **What days _____**

2. What is the chest pain level?

The Lowest the Highest

1	2	3	4	5	6	7	8	9	10

3. What is the duration of chest pain?

----

4. What is frequency of the pain?

4, or more, times per day □

1-3 times per day □

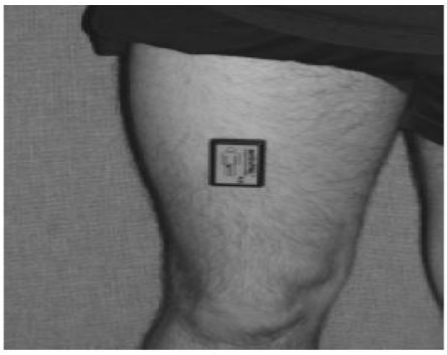
3 or more times per week, but not every day □

Appendix F: activPAL3™ using instruction

activPAL3™ is PA monitor to determine inclination of one or more body segment. The activPAL3™ is worn on the midpoint of the anterior side of the thigh as shown in the Figure below; it is lightweight about 20 gm and small size.

activPAL3™ is safe monitor and has been used in more than 300 scientific researches since 2001. activPAL3™ is attached to the skin by using dual layer hydrogel adhesive pad. In addition, it is reusable and long lasting gel. If you will remove activPAL3™ monitor for any period, just placed it on clean and dry plastic surface

Participants will wear the activPAL3™ monitor for seven full days, 24 hours a day including sleeping period. activPAL3™ is not waterproof. In case of exposure to water, you can only remove the monitor when, swimming or before any water-based activities. You will notice green flashlight on the activPAL3™ every 3 seconds that is indicating recording on progress. After completing a full 7 days, the researcher will contact you to collect the activPAL3™ monitor. If you would like to know your record result, please contact the researcher after three working days from the collecting date.



The *activ*PAL™ physical activity monitor.

Do not hesitate to call me on my mobile or, submit an email, if you need any help or query please contact on my details below:

Abedalmajeed Shajrawi **Mobile number: +962-789615640**

Email: a.m.shajrawi@edu.saldford.ac.uk

Appendix G: Participants information sheet

Study Title: Measurement of PA Levels and Self-Efficacy during Early Recovery after Acute Myocardial Infarction:

Invitation paragraph

I would like to invite you to take part in this study, which will explore the confidence levels and PA levels of heart attack patients following hospitalization in Jordan.

Purpose of the study

The main aim of the study is to measure the changes in confidence levels and PA behaviours at 2 & 6 weeks following hospitalization for a heart attack

Why I have been invited?

You have been invited to participate in this study because you have recently suffered a heart attack and been treated in Jordan University Hospital.

Do I have to take part?

Participation in this study is optional. You are free to refuse to participate or discontinue at any time. If you decide not to participate in the study, your participation will not affect future treatment and care.

What will happen to me if I take part?

If you agree to participate in this study, you should sign a consent form. The nursing staff will then contact me so I can arrange to meet with you. Then the research will ask you to complete a questionnaire whilst in hospital. Your role in the study will then consists of two phases: The first time, 2 weeks after hospital discharge. The researcher will meet with you 30 minutes before you follow up appointment in cardiac patients' clinic in Out Patients Department (OPD and give you all the information needed). You will complete a questionnaire such as how much confidence you have to do some tasks. In addition, you will attach a PA monitor on the mid-thigh of your right leg for 7 days as per enclosed written instructions. After 7 days, the researcher

will contact you to collect the activity monitor from your home address. A Jordanian driver will visit your house to collect the questionnaire and monitor. The researcher will give you details about the driver and his car. The second time: at 6 weeks following hospitalization, the researcher will repeat the same steps.

Expenses and payments No payment is required for your participation in this study; all participants will participate for free.

What will I have to do?

The study has two parts: in the first part, the researcher will meet with you in the OPD, 2-weeks following hospitalization. During this meeting, the researcher will ask you to complete a questionnaire and I will attach an activity monitor to your thigh, which you will need to wear for the following 7 days. At the end of the 7 days, the researcher will contact you and arrange for collection of the activity monitor.

In the second part, the researcher will meet you again at 6 weeks following hospitalization, and repeat the same process as in part one. For more information about activity monitor, please see the activity monitor using instructions.

What are the possible disadvantages and risk of taking part?

There are no disadvantages or any risk to you in this study.

What are the possible benefits of taking part?

There are no individual benefits associated with your participation in this study. However, this study may help the researcher to understand the confidence levels and PA behaviours among heart attack patients following hospitalization in Jordan, which in turn may help us improve care of patients after a heart attack.

What if there is a problem?

If you have questions or wish to report a research-related problem, you may contact:

Dr. Ian Jones
Senior Lecturer in Cardiovascular Nursing
School of Nursing, Midwifery, Social Work & Social Sciences
Room MS230, Mary Seacole Building, University of Salford, Salford M5 4WT
Telephone: +44 (0) 1612957278 **| Mobile:** +44 (0)7725910761
Email: i.jones@salford.ac.uk

Will my taking part in the study be kept confidential?

The researcher will strictly maintain your privacy of your records and identity. Identifying information appears only on consent forms, which the researcher will lock it in a secure locker, after completion of study, the researcher will keep the anonymous records for 3 years for further analysis, and then the researcher will discard them. To keep the privacy of the data, each person will get a random secret number to keep track of data produced. Results of the study in any presentation or magazine will include only group results, and the researcher will not ever use identifying information. In addition, the researcher will handle all collected data according to Data Protection Act 1998 UK.

Involvement of the General Practitioner/Family Doctor (GP)

There is no need to involve your doctor during or after the study.

What will happen to the results of the research study?

The researcher will use all data from the questions and activity monitor for analysis. The data will be protected and remain anonymous. It will be analysed only by the researcher and his supervisor. In addition, the researcher will keep the data during the study in locked lockers or in a password-protected computer, which only the researcher can gain access. After completion of the study, the data will remain anonymized but the researcher will keep them for 3 years for further analysis. At the end of the 3 years, the researcher will erase all data. Each participant can receive a copy of his/ her result by contacting the researcher three working days after the

collection date. At the end of the study, the researcher will give an executive summary of the study to the Jordan University Hospital administration.

Who is organizing or sponsoring the research?

The researcher organises this study by himself, under the supervision of an academic team from University of Salford / at Manchester / UK.

Further information and contact details

Abedalmajeed Shajrawi,
Mobile number: +962- 789615640
Email: a.m.shajrawi@edu.salford.ac.uk

Appendix H: Participant's consent form

Please read the sentences below and put your initial in the small boxes below if you agree.

- I confirm that I have read and understood the information sheet for the above study (version (3) x 4th of Dec 2014) and what my contribution will be. ☐
- I have been given the opportunity to ask questions (face to face, via telephone and e-mail).
- I agree to take part in the study completing the questionnaires and attaching the PA monitor 2 weeks and 6 weeks after hospital dischar ☐
- I understand that my participation is voluntary and that I can withdraw from the research at any time without giving any reason. ☐
- I understand how the researcher will use my responses, who will see them and how the data will be stored. ☐
- I agree to take part in both parts of the study (questionnaires and PA monitor) In the case of a participant withdrawing all his/her related data will be erased. ☐
- I am aware that I can withdraw from the study at any time. In case I withdraw, my data will not form any part of the study. ☐
- I have read the above, and I agree to take part in the study. ☐

Name of participant ……

Signature ……

Date ……..

Name of the researcher who collect the consent:

Signature: **Date**

Appendix I: Participants invitation letter

Dear Participant

I am writing to you to invite you to take part in a study. I am a PhD student at the University of Salford, Manchester/ UK. This study is part of my PhD programme. I am interested in how people manage their PA levels after a heart attack.

This study is entitled:

Measurement of PA Levels and Self-Efficacy during Early Recovery after Acute Myocardial Infarction:

PA, such as walking, has significant benefits to an individual's health. However, a persons' confidence may influence such activity. I would like to gain a better understanding of people's activity levels after heart attack. In addition, how confident they feel to become more active.

If you agree to take part in the study, your role would consist of two parts: the first part, the researcher will meet with you 2 weeks after hospital discharge. The second part, the researcher will meet with you again 6 weeks after hospitalization. The researcher will give you all the information needed and dates at the time of enrolment.

The ethical committees from University of Salford / UK and Jordan University Hospital/ Jordan have approved this study.

Your willingness to participate in the study will be highly appreciated

Further information and contact details:

Abedalmajeed Shajrawi

Mobile number: +962- 789615640 Email: a.m.shajrawi@edu.salford.ac.uk

Appendix J: The University of Salford ethical approval

University of Salford MANCHESTER

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 2280
HSresearch@salford.ac.uk

www.salford.ac.uk/

5 March 2015

Dear Abedalmajeed,

RE: ETHICS APPLICATION HSCR14/120 – A longitudinal study to measure physical activity behaviour and self-reported self-efficacy among patients with acute myocardial infarction in early recovery phase in Jordan

Based on the information you provided, I am pleased to inform you that application HSCR14/120 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,

Sarah Starkey

Sarah Starkey
Engagement & Innovation Assistant

Appendix K: JUH ethical approval

Jordan University Hospital

مستشفى الجامعة الأردنية

Ref. _____

Date: _____

الرقم: ١٥٣٦ /٢٠١٥/١٠

التاريخ: ٢٠١٥/١/٢٧

الأستاذ الدكتور نائب المدير العام للشؤون الطبية

نائب المدير العام للشؤون الادارية

الدكتور مدير مكتب البحث العلمي

مدير دائرة الشؤون المالية

تحية طيبة وبعد ،،،

ناقشت اللجنة التنفيذية في اجتماعها رقم (٢٠١٥/٢) المنعقدة بتاريخ (٢٠١٥/١/٢٠) بحث طالب الدكتوراة عبد المجيد منقال شجراوي بعنوان:

A Longitudinal Study to measure physical behavior and self reported self efficacy among patients with Acute myocardial infarction in early recovery phase in Jordan

وقد قررت اللجنة ما يلي :

القرار رقم ٢٠١٥/٧ :

١- الموافقة على إجراء البحث المذكور أعلاه وشريطة ذكر اسم مستشفى الجامعة الأردنية في البحث وتزويد مكتب البحث العلمي بنتائج الدراسة خلال سنة اعتباراً من موافقة اللجنة التنفيذية وعلى أن تكون فترة الموافقة على البحث هي سنة واحدة واعادة أخذ الموافقات اللازمة بعد مرور سنة من تاريخ الموافقة اذا تطلب الأمر ذلك.

٢- اضافة الدكتور حنا مخامرة مشرف مساعد على البحث

٣- الطلب من الدكتور مدير مكتب البحث العلمي متابعة تنفيذ الشروط الواردة بالبندين أعلاه

يرجى التكرم باجراء اللازم.

مدير عام مستشفى الجامعة الأردنية

الأستاذ الدكتور [illegible] التميمي

نسخة:

- الديوان المركزي

Appendix L: Mean steps count according to day at Time 1 and Time 2

Mean steps count according to day at Time 1

Day	Mean step count T1 (Step)	SD (Step)	Minimum (Step)	Maximum(Step)	Range(Step)
Sunday	7,069.89	3,402.34	1062	15964	14902
Monday	7,382.00	3,838.02	1514	17266	15752
Tuesday	7,505.10	3,702.34	1192	16784	15592
Wednesday	7,269.23	3,599.01	788	14476	13688
Thursday	6,965.10	3,373.01	1096	15654	14558
Friday	5,661.19	3,109.47	680	18916	18236
Saturday	6,135.40	3,047.79	478	18144	17666

Mean steps count according to day at Time 2

Day	Mean step count T2 (Step)	SD (Step)	Minimum (Step)	Maximum (Step)	Range (Step)
Sunday	7,474.1	3,495.41	1750	15154	13404
Monday	7,804.63	3,624.53	472	14126	13654
Tuesday	7,791.87	4,062.07	1780	19804	18024
Wednesday	6,570.87	3,134.34	214	14014	13800
Thursday	7,632.91	3,623.89	2144	16976	14832
Friday	5,965.95	2,538.35	2190	12432	10242
Saturday	6,597.02	3,320.06	2118	14964	12846

Appendix M: Mean steps count according to hour at Time1

Hour	Mean steps count (step)	Median (Step)	SD (step)	Range (step)	Minimum (step)	Maximum (step)	Interquartile range (step)
1	94.10	47.67	138.58	819.00	0.00	819.00	115.2
2	48.07	9.17	102.10	584.40	0.00	584.40	47.89
3	23.50	4.57	71.63	525.33	0.00	525.33	17.69
4	12.90	0.43	34.81	254.00	0.00	254.00	14.58
5	33.51	2.67	65.00	299.33	0.00	299.33	38.14
6	95.93	27.14	144.17	747.60	0.00	747.60	150.84
7	155.89	78.33	193.53	1026.29	0.00	1026.29	232.68
8	277.91	158.71	301.47	1415.50	0.00	1415.50	403.45
9	345.70	279.67	327.68	1602.00	0.00	1602.00	389.07
10	434.04	336.67	381.42	2128.00	0.00	2128.00	420.41
11	455.84	418.57	313.00	1291.67	0.00	1291.67	476.48
12	481.95	424.86	329.41	1534.86	0.00	1534.86	446.03
13	534.80	504.29	320.91	1364.29	0.00	1364.29	474.64
14	532.56	454.29	352.09	1452.00	5.00	1457.00	450.38
15	442.50	403.67	284.11	1253.17	3.50	1256.67	442.62
16	336.78	263.00	275.10	1803.60	0.00	1803.60	332.06
17	393.09	345.14	312.87	1881.60	0.00	1881.60	406.98
18	339.53	256.29	248.64	1316.67	0.00	1316.67	325.74
19	378.91	304.00	326.06	1716.53	14.33	1730.86	289.23
20	417.37	300.00	351.06	1862.04	27.67	1889.71	391.96
21	293.74	209.71	238.73	1472.00	10.00	1482.00	260.95
22	264.93	210.00	249.09	1892.33	0.00	1892.33	244.82
23	203.90	180.00	183.08	1192.06	3.14	1195.20	207.39
24	143.98	113.43	153.07	761.25	0.00	761.25	128.31

Appendix N: Mean steps count according to hour at Time 2

Hour	Mean steps count (step)	Median (Step)	SD (step)	Range (step)	Minimum (step)	Maximum (step)	Interquartile range (step)
1	95.33	56.29	112.33	634.00	0.00	634.00	110
2	56.82	15.36	124.12	943.14	0.00	943.14	67.5
3	27.32	0.29	101.04	762.86	0.00	762.86	9.62
4	35.53	0.00	114.20	557.43	0.00	557.43	9
5	48.78	0.00	134.47	697.14	0.00	697.14	16.29
6	108.03	18.77	255.04	1976.86	0.00	1976.86	79.07
7	170.67	130.80	190.99	883.71	0.00	883.71	240.07
8	299.62	196.43	287.98	1333.14	0.00	1333.14	469.21
9	307.34	274.77	247.82	1237.00	0.00	1237.00	299.22
10	368.98	325.83	280.44	1396.86	0.00	1396.86	390.22
11	505.91	454.29	355.57	1584.67	7.33	1592.00	504.06
12	552.36	564.57	283.13	1353.43	47.71	1401.14	369.29
13	660.81	669.43	346.54	1658.00	0.00	1658.00	464.15
14	615.25	604.74	353.67	1668.50	0.00	1668.50	483.32
15	472.51	430.41	279.10	1079.71	0.00	1079.71	441.66
16	338.71	300.00	225.01	1051.86	0.00	1051.86	331.32
17	379.77	338.57	299.39	1876.67	0.00	1876.67	271.14
18	322.35	299.43	203.48	1338.79	13.71	1352.50	253.14
19	330.56	273.71	210.78	1100.85	48.86	1149.71	199.14
20	338.23	279.77	228.92	1309.72	41.71	1351.43	250.96
21	320.55	251.00	239.52	1079.71	4.29	1084.00	228.14
22	274.76	232.02	202.80	1364.57	0.00	1364.57	200.86
23	228.35	201.43	143.60	810.29	0.00	810.29	137.92
24	161.30	129.48	136.06	808.86	0.00	808.86	149.29

Appendix O: Mean stepping time according to day at Time 1 and Time 2

Mean stepping time according to day at Time 1

Day	Mean stepping time at T1 (mins)	SD (mins)	Minimum (mins)	Maximum (mins)	Range (mins)
Sunday	98.57	45.12	13.8	234.6	220.8
Monday	100.03	49.6	0	234.6	234.6
Tuesday	100.73	49.15	0	266.4	266.4
Wednesday	98.29	46.65	12	218.4	206.4
Thursday	94.84	43.42	17.4	216.6	199.2
Friday	80.69	42.19	9.6	257.4	247.8
Saturday	87.3	39.24	7.2	220.2	213

Mean stepping time according to day at Time 2

Day	Mean stepping time at T2 (mins)	SD (mins)	Minimum (mins)	Maximum (mins)	Range (mins)
Sunday	100.8	43.33	27.6	201	173.4
Monday	105.91	44.16	7.8	194.4	186.6
Tuesday	106.12	48.49	31.2	232.2	201
Wednesday	91.54	39.76	3	213	210
Thursday	102.95	43.79	36	213.6	177.6
Friday	86.39	32.9	34.8	205.8	171
Saturday	92.99	41.42	36	209.4	173.4

Appendix P: Mean stepping time according to hour at Time 1

Hour	Mean stepping time at Time 1 (mins)	Median (mins)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	Interquartile range (mins)
1	1.55	0.6	2.28	12	0	12	2.4
2	0.74	0	1.64	9	0	9	0.6
3	0.28	0	0.77	4.8	0	4.8	0.6
4	0.19	0	0.54	3.6	0	3.6	0
5	0.52	0	1.06	5.4	0	5.4	0.6
6	1.44	0.6	2.16	9	0	9	2.4
7	2.29	1.2	2.81	14.4	0	14.4	3.6
8	3.73	2.4	3.89	18	0	18	5.4
9	4.70	3.9	4.20	19.8	0	19.8	5.4
10	5.83	4.8	4.58	23.4	0	23.4	6
11	6.25	5.4	4.14	18	0	18	6.6
12	6.60	6	4.22	24	0	24	6
13	7.32	6.9	4.16	22.8	0	22.8	6
14	7.18	6.6	4.21	16.2	0	16.2	6
15	6.10	5.7	3.55	15.6	0	15.6	6
16	4.76	3.9	3.36	16.8	0	16.8	4.2
17	5.35	4.8	3.63	18	0	18	4.8
18	5.02	3.9	3.41	17.4	0	17.4	4.8
19	5.40	4.8	3.79	16.8	0.6	17.4	4.8
20	5.86	4.8	4.27	21.6	0.6	22.2	4.8
21	4.21	3.6	3.08	19.2	0	19.2	4.8
22	3.97	3	3.29	21.6	0	21.6	3.6
23	3.12	3	2.59	13.8	0	13.8	3.6
24	2.22	1.8	2.32	10.8	0	10.8	2.4

Appendix Q: Mean stepping time according to hour at Time 2

Hour	Mean stepping time at T 2 (mins)	Median (mins)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	Interquartile range (mins)
1	1.51	1.20	1.70	9.60	0.00	9.60	1.8
2	0.81	0.00	1.64	12.00	0.00	12.00	1.2
3	0.36	0.00	1.34	9.60	0.00	9.60	0
4	0.50	0.00	1.64	9.00	0.00	9.00	0
5	0.68	0.00	1.87	10.80	0.00	10.80	0
6	1.45	0.30	3.03	21.00	0.00	21.00	1.2
7	2.50	1.80	2.82	14.40	0.00	14.40	3.6
8	3.92	3.00	3.57	18.00	0.00	18.00	5.4
9	4.04	3.60	3.00	13.20	0.00	13.20	4.2
10	4.88	4.80	3.51	15.60	0.00	15.60	4.8
11	6.74	6.30	4.40	18.00	0.00	18.00	7.2
12	7.47	7.80	3.35	15.00	0.60	15.60	4.8
13	8.59	8.70	3.88	17.40	0.00	17.40	4.8
14	7.96	7.80	3.97	17.40	0.00	17.40	6
15	6.52	6.60	3.56	15.60	0.00	15.60	4.8
16	4.74	4.80	2.91	16.80	0.00	16.80	3.6
17	5.20	4.80	3.40	18.00	0.00	18.00	4.2
18	4.86	4.80	2.76	15.60	0.00	15.60	3
19	5.13	4.50	2.91	13.20	0.60	13.80	3
20	4.96	4.20	2.94	15.60	0.60	16.20	3
21	4.61	3.90	2.86	13.20	0.00	13.20	3
22	4.14	3.60	2.54	15.60	0.00	15.60	3
23	3.58	3.60	2.10	10.80	0.00	10.80	1.8
24	2.44	1.80	2.03	12.60	0.00	12.60	2.4

Appendix R: Mean standing time according to day at Time 1 and Time 2

Mean standing time according to day at Time 1

Day	Mean standing time according to day at T1 (mins)	SD (mins)	Minimum (mins)	Maximum (mins)	Range (mins)
Sunday	232.40	106.18	70.80	577.80	507.00
Monday	235.46	124.03	68.40	609.60	541.20
Tuesday	249.64	130.62	25.20	724.20	699.00
Wednesday	244.33	110.18	37.80	600.60	562.80
Thursday	247.73	140.81	58.20	986.40	928.20
Friday	199.82	109.40	51.60	500.40	448.80
Saturday	230.11	106.24	51.00	484.20	433.20

Mean standing time according to day at Time 2

Day	Mean standing time according to day at T2 (mins)	SD (mins)	Minimum (mins)	Maximum (mins)	Range (mins)
Sunday	227.54	114.47	36.60	701.40	664.80
Monday	250.31	128.96	37.80	819.60	781.80
Tuesday	257.36	120.95	52.20	673.20	621.00
Wednesday	226.47	105.50	5.40	497.40	492.00
Thursday	228.86	97.61	49.80	472.80	423.00
Friday	217.47	96.19	36.00	463.80	427.80
Saturday	227.12	115.46	61.80	697.20	635.40

Appendix S: Mean standing time according to hour at Time 1

Hour	Mean standing time according to hour at T1 (mins)	Median (mins)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	Interquartile range (mins)
1	3.85	0.18	5.28	26.4	0	26.4	4.8
2	2.36	0.06	4.40	20.4	0	20.4	3
3	1.60	0	3.83	21.6	0	21.6	1.2
4	1.54	0	3.76	22.8	0	22.8	0.6
5	3.02	0.03	4.85	19.8	0	19.8	4.2
6	6.20	0.24	7.89	27	0	27	9.6
7	6.88	0.54	7.15	29.4	0	29.4	10.8
8	8.94	0.63	8.58	37.2	0	37.2	12.6
9	12.24	0.96	9.08	40.8	0	40.8	13.8
10	14.21	1.23	10.37	40.2	0	40.2	13.2
11	15.72	1.41	10.59	38.4	0	38.4	16.8
12	15.67	1.5	9.28	41.4	0	41.4	14.4
13	17.10	1.74	9.01	35.4	0	35.4	15
14	15.66	1.5	8.39	42	0	42	9.6
15	14.14	1.29	7.97	34.8	0	34.8	10.8
16	12.22	1.05	7.91	33.6	0	33.6	9
17	12.77	1.14	8.36	39	0	39	10.8
18	12.97	1.17	8.43	45.6	0	45.6	11.4
19	12.67	1.2	7.26	40.8	0.6	41.4	8.4
20	13.15	1.08	7.79	34.8	0.6	35.4	9.6
21	11.35	0.9	8.23	49.2	1.2	50.4	10.2
22	10.03	0.9	7.55	30.6	0	30.6	10.8
23	8.62	0.78	6.68	30.6	0	30.6	9
24	6.14	0.42	6.31	33	0	33	7.8

Appendix T: Mean standing time according to hour at Time 2

Hour	Mean standing time according to hour at T2 (mins)	Median (mins)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	Interquartile range (mins)
1	3.25	1.8	3.302	14.4	0	14.4	4.2
2	2.35	0.6	3.95	19.8	0	19.8	3
3	1.71	0	4.46	27	0	27	1.2
4	2.61	0	5.99	30	0	30	1.2
5	3.07	0	6.12	33.6	0	33.6	2.4
6	5.31	1.8	7.82	42.6	0	42.6	7.8
7	6.82	4.8	6.59	33.6	0	33.6	9.6
8	8.46	6.9	7.37	26.4	0	26.4	12
9	10.76	7.8	9.04	30.6	0	30.6	15.6
10	13.01	11.7	10.01	41.4	0	41.4	15.6
11	16.60	16.2	9.85	37.8	0.6	38.4	18
12	17.53	16.2	8.31	34.8	0.6	35.4	12
13	17.97	17.4	8.30	41.4	0	41.4	12
14	15.28	14.7	7.37	36.6	0	36.6	9.6
15	14.14	12.6	7.62	38.4	0	38.4	7.8
16	10.15	9.9	6.40	37.8	0	37.8	7.2
17	11.17	9.6	6.41	27	0	27	7.2
18	12.3	11.1	6.82	27.6	1.2	28.8	10.2
19	12	11.4	6.48	29.4	2.4	31.8	7.2
20	11.31	10.5	6.57	31.8	1.2	33	7.2
21	10.84	9.6	6.37	37.2	0.6	37.8	7.2
22	10.41	9.6	5.92	28.2	0	28.2	6.6
23	8.39	7.8	4.64	19.8	0	19.8	6.6
24	5.26	4.8	4.10	19.2	0	19.2	4.8

Appendix U: Mean upright time according to day at Time 1 and Time 2

Mean upright time according to day at Time 1

Day	Mean upright time according to day at T1 (mins)	SD (mins)	Minimum (mins)	Maximum (mins)	Range (mins)
Sunday	326.15	127.24	137.40	765.60	628.20
Monday	334.40	154.51	70.20	791.40	721.20
Tuesday	354.86	166.47	25.20	816.60	791.40
Wednesday	342.61	138.26	49.80	669.00	619.20
Thursday	342.57	169.51	78.60	1117.80	1039.20
Friday	280.51	139.79	85.20	634.20	549.00
Saturday	317.42	130.02	87.00	600.60	513.60

Mean upright time according to day at Time 2

Day	Mean upright time according to day at T 2 (mins)	SD (mins)	Minimum (mins)	Maximum (mins)	Range (mins)
Sunday	328.34	136.37	108.60	767.40	658.80
Monday	349.90	140.49	61.20	709.20	648.00
Tuesday	363.47	146.72	96.00	813.00	717.00
Wednesday	318.01	131.07	8.40	604.20	595.80
Thursday	331.82	130.31	98.40	652.20	553.80
Friday	303.86	117.49	70.80	627.60	556.80
Saturday	320.11	142.18	108.60	796.80	688.20

Appendix V: Mean upright time according to hour at Time 1

Hour	Mean (mins)	Median (mins)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	Interquartile range (mins)
1	5.41	3.00	7.19	38.40	0.00	38.40	7.65
2	3.14	0.60	5.44	23.40	0.00	23.40	3
3	1.93	0.30	4.37	22.20	0.00	22.20	1.8
4	1.74	0.00	3.97	23.40	0.00	23.40	1.2
5	3.53	0.60	5.52	19.80	0.00	19.80	5.4
6	7.64	3.00	9.71	34.80	0.00	34.80	11.1
7	9.18	6.90	9.52	37.80	0.00	37.80	14.25
8	12.63	9.60	11.58	46.20	0.00	46.20	17.25
9	16.99	13.80	12.03	53.40	0.00	53.40	20.85
10	20.02	17.70	13.51	54.00	0.00	54.00	21.75
11	21.95	21.60	13.55	50.40	0.00	50.40	23.85
12	22.24	21.60	12.10	49.80	0.00	49.80	18.9
13	24.41	24.90	11.40	46.80	0.00	46.80	20.55
14	22.82	21.30	10.85	48.00	0.60	48.60	16.2
15	20.22	19.20	10.56	44.40	0.00	44.40	16.2
16	16.95	15.60	10.07	43.80	0.00	43.80	12
17	18.09	17.10	10.90	49.20	0.00	49.20	14.85
18	18.00	16.20	10.61	57.00	0.00	57.00	15.3
19	18.04	17.40	9.40	48.00	1.20	49.20	11.4
20	19.03	15.90	10.69	44.40	1.20	45.60	16.8
21	15.53	12.00	10.26	55.80	1.80	57.60	13.5
22	13.97	12.30	9.92	41.40	0.00	41.40	12.9
23	11.70	10.80	8.53	36.00	0.00	36.00	12.45
24	8.34	6.30	8.13	36.00	0.00	36.00	10.65

Appendix W: Mean upright time according to hour at Time 2

Hour	Mean (mins)	Median (mins)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	Interquartile range (mins)
1	4.71	3.00	4.84	24.00	0.00	24.00	5.4
2	3.17	1.20	5.06	31.20	0.00	31.20	4.05
3	2.10	0.00	5.61	33.00	0.00	33.00	1.2
4	3.12	0.00	7.27	39.00	0.00	39.00	1.8
5	3.78	0.00	7.79	44.40	0.00	44.40	3
6	6.79	2.40	10.21	54.60	0.00	54.60	9.6
7	9.29	7.20	9.12	45.00	0.00	45.00	13.2
8	12.36	10.20	10.34	44.40	0.00	44.40	18.75
9	14.81	12.60	11.21	38.40	0.00	38.40	20.25
10	17.81	15.90	12.58	48.60	0.00	48.60	21.15
11	23.39	23.10	13.10	50.40	0.60	51.00	23.1
12	25.00	24.60	10.31	45.00	1.80	46.80	14.7
13	26.50	27.00	10.12	50.40	0.00	50.40	14.85
14	23.19	23.10	10.00	46.20	0.00	46.20	14.25
15	20.66	19.50	10.30	48.60	0.00	48.60	12.45
16	14.84	13.20	8.59	48.00	0.00	48.00	9.3
17	16.38	13.80	8.94	37.80	0.00	37.80	12.15
18	17.17	15.00	8.96	39.00	1.20	40.20	13.65
19	17.11	16.20	8.61	40.80	3.60	44.40	10.8
20	16.29	15.30	8.58	40.20	2.40	42.60	10.2
21	15.44	14.10	8.23	43.20	0.60	43.80	10.2
22	14.54	13.50	7.58	36.00	0.00	36.00	9.45
23	11.93	10.80	6.33	30.00	0.00	30.00	8.4
24	7.76	6.60	5.90	31.80	0.00	31.80	7.05

Appendix X: Mean sedentary time according to day at Time 1 and Time 2

Mean sedentary time according to day at Time 1

Day	Mean sedentary time according to day at T1 (mins)	SD (mins)	Minimum (mins)	Maximum (mins)	Range (mins)
Sunday	1,112.09	132.53	673.20	1302.00	628.80
Monday	1,103.91	154.31	648.60	1368.60	720.00
Tuesday	1,089.70	163.14	623.40	1414.80	791.40
Wednesday	1,097.35	138.35	769.80	1390.20	620.40
Thursday	1,097.21	169.60	320.40	1362.60	1042.20
Friday	1,159.39	139.88	807.60	1353.60	546.00
Saturday	1,122.57	129.65	839.40	1353.00	513.60

Mean sedentary time according to day at Time 2

Day	Mean sedentary time according to day at T 2 (mins)	SD (mins)	Minimum (mins)	Maximum (mins)	Range (mins)
Sunday	1,111.42	136.28	672.00	1330.80	658.80
Monday	1,089.85	140.33	731.40	1378.20	646.80
Tuesday	1,076.32	146.52	627.60	1343.40	715.80
Wednesday	1,122.02	131.06	835.80	1431.60	595.80
Thursday	1,108.06	130.34	787.80	1341.00	553.20
Friday	1,136.35	117.50	812.40	1369.80	557.40
Saturday	1,119.84	141.92	644.40	1330.80	686.40

Appendix Y: Mean sedentary time according to hour at Time 1

Hour	Mean Sedentary time according to hour at T1	Median	SD	Range	minimum	maximum	Interquartile range
1	54.61	57.00	7.27	38.40	21.60	60.00	7.20
2	56.98	59.40	5.33	23.40	36.60	60.00	3.00
3	58.15	60.00	4.23	22.20	37.80	60.00	1.80
4	58.31	60.00	3.86	23.40	36.60	60.00	1.20
5	56.54	59.40	5.44	19.80	40.20	60.00	4.80
6	52.40	57.00	9.67	34.80	25.20	60.00	10.20
7	50.83	53.10	9.57	37.80	22.20	60.00	13.20
8	47.36	50.40	11.58	46.20	13.80	60.00	17.40
9	43.03	46.20	12.04	54.00	6.00	60.00	19.80
10	40.08	42.30	13.58	54.00	6.00	60.00	21.60
11	38.06	38.10	13.55	50.40	9.60	60.00	23.40
12	37.75	38.40	12.11	50.40	9.60	60.00	19.20
13	35.60	35.40	11.43	46.80	13.20	60.00	19.20
14	37.22	38.70	10.86	48.00	11.40	59.40	15.60
15	39.84	40.80	10.58	44.40	15.60	60.00	16.20
16	43.12	44.40	10.07	43.80	16.20	60.00	12.60
17	41.99	42.90	10.89	48.60	11.40	60.00	15.00
18	42.04	43.80	10.62	57.00	3.00	60.00	16.20
19	41.98	42.60	9.40	48.00	10.80	58.80	11.40
20	41.05	44.40	10.69	44.40	14.40	58.80	15.00
21	44.51	48.00	10.31	55.80	2.40	58.20	12.60
22	46.09	47.40	9.87	41.40	18.60	60.00	13.20
23	48.32	49.20	8.50	36.00	24.00	60.00	12.00
24	51.66	54.00	8.18	36.00	24.00	60.00	10.20

Appendix Z: Mean sedentary time according hour at Time 2

Hour	Mean sedentary time according to hour at T 2 (mins)	Median (mins)	SD (mins)	Range (mins)	Minimum (mins)	Maximum (mins)	Interquartile Range (mins)
1	55.30	57.00	4.79	23.40	36.60	60.00	5.40
2	56.83	58.80	5.06	31.20	28.80	60.00	4.20
3	57.91	60.00	5.66	33.00	27.00	60.00	1.20
4	56.89	60.00	7.28	39.00	21.00	60.00	1.80
5	56.23	60.00	7.79	44.40	15.60	60.00	3.00
6	53.22	57.60	10.27	54.60	5.40	60.00	9.60
7	50.74	52.20	9.10	45.00	15.00	60.00	13.20
8	47.62	49.80	10.37	44.40	15.60	60.00	19.20
9	45.18	47.40	11.20	38.40	21.60	60.00	20.40
10	42.22	44.40	12.57	48.60	11.40	60.00	21.60
11	36.60	37.20	13.11	50.40	9.00	59.40	23.40
12	35.07	35.40	10.26	45.00	13.20	58.20	15.00
13	33.49	33.00	10.13	50.40	9.60	60.00	15.00
14	36.78	37.20	9.98	46.20	13.80	60.00	14.40
15	39.35	40.20	10.30	48.60	11.40	60.00	13.20
16	45.20	46.80	8.56	48.00	12.00	60.00	9.00
17	43.66	46.20	8.94	37.80	22.20	60.00	12.60
18	42.89	43.80	8.91	38.40	20.40	58.80	13.20
19	42.91	43.80	8.58	40.80	15.60	56.40	10.80
20	43.72	45.00	8.54	40.20	17.40	57.60	10.20
21	44.52	45.60	8.21	43.20	16.20	59.40	9.60
22	45.52	46.80	7.59	36.00	24.00	60.00	9.60
23	48.08	49.20	6.34	30.00	30.00	60.00	8.40
24	52.33	53.40	5.90	31.80	28.20	60.00	6.60

Appendix AA: Dissemination Plan of Findings

The findings of the study will be disseminated to all involved departments, for example health policymakers such as hospital administrators, nurses' managers, medical staff and nurse educators to promote changes to nursing practice and nurse education to promote a secondary prevention strategy. One way to begin such strategic development is to ensure dissemination of the findings from this study widely, through presentations and peer-reviewed publications. Therefore, envisaging of the following plan to facilitate such a process:

- The researcher will publish two peer-reviewed papers. Presenting the findings of the study and raising awareness in Jordan of coronary risk factors. In addition, publishing the findings of this study in various international journals: firstly, publishing the CSEQ translation and cross-cultural adaptation chapter in the peer-reviewed journal and secondly, self-efficacy and PA will be a poster presentation in the fifth International Conference on Ambulatory Monitoring of physical activity and Movement (ICAMPAM) then published in peer-reviewed journal.
- Presentations of the findings on a local, national and international platform will be necessary to raise awareness for nurses, managers, educators and medical staff and to put the topic on the agenda of the nursing and medical professions and healthcare organisations.
- A working paper could be developed and presented to the Jordanian Nursing and Midwifery Council; this would be a discussion paper to suggest a review and adaptation of the code of nursing ethics to ensure that nurses have a structured, organised role in increasing AMI populations' awareness of PA and secondary prevention.
- The researcher will submit a translated report regarding study findings to concerned institutions such as MoH, JUH and the WHO office in Amman, Jordan.
- The findings will be available on the University of Salford website.

Presentations to date

- Abedalmajeed Shajrawi (2016). Measurement of PA Levels and Self-Efficacy during Early Recovery after Acute Myocardial Infarction, a Jordanian Cohort Study, University of Salford, PA group meeting, School of Health, July 20th

- Abedalmajeed Shajrawi (2016). Measurement of PA Levels and Self-Efficacy during Early Recovery after Acute Myocardial Infarction in Jordan, University of Salford, Postgraduate research day, School of Nursing; November 11st

- Abedalmajeed Shajrawi (2017). Measurement of PA Levels, Patterns and Self-Efficacy during Early Recovery after Acute Myocardial Infarction in Jordan, University of Salford, physical activity group meeting (PBM and RTBE joint meeting), School of Health, February14th

Appendix BB: Research Development

Exploring this critical topic was challenging and informing healthcare policymakers of the study results are vital. Given the prolonged data collection period of the study, I was concerned that a number of patients with AMI would not participate. Although some participants changed their mind and declined participation as the study progressed, the deeper underlying influences of Jordanian culture and the understanding of the issues regarding this topic became more apparent to me as a researcher and as a CCU nurse.

As a researcher living in Jordan, I believe now that starts activating an improved lifestyle and the importance of secondary prevention among the patient with AMI population. Patients with AMI have to demonstrate secondary prevention practices with regard to treating CHD, and cultural health misinterpretation needs to be rectified. It is necessary that researchers are made more aware that cardiac disease self-management programmes should be available, these programmes need to be visible and accessible to all patients with AMI, whatever their economic status or position in the community.

The PhD study journey and the invaluable support of my supervisors have improved my skills in problem solving, managing research, and communication. These skills are highly valuable for my future independent work in research in Jordan to produce high quality research and improve professional nursing education and practice in this country.

Research training offered by the University of Salford has also supported my efforts, and developed my knowledge and skills to carry out research. The training included short one or two-day seminars alongside longer modules that have improved my research and technical skills. These courses included sessions on a research methods training module, referencing, interview skills as well as qualitative and

quantitative data analysis. Shorter seminars of high value included: applying for ethics, preparing and delivering successful conference presentations. I think I will be having a vital role as an academic and a research to consolidate these skills within student seminars and conferences within the university and European conferences.