Understanding individual engagement in outpatient cardiac rehabilitation programs based on the Model of Therapeutic Engagement

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Statement of Originality

I hereby certify that I, Sepideh Jahandideh, conducted this research in the School of Human Services and Social Work at Griffith University. To the best of my knowledge, any material from other people’s work included in my thesis, published or otherwise, is fully acknowledged in accordance with the standard referencing practices. Also, if I have included copyrighted material, I declare that I have achieved written permission from the copyright owner to include it in my thesis and have attached a copy of the copyright clearance in the appendix. This research has not previously been submitted for a degree or diploma to any other University.

Sepideh Jahandideh

16th December, 2018
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A number of people influenced me and my research through my fascinating journey of doctoral candidature. I would like to express my sincere gratitude to my supervisors Professor Elizabeth Kendall, Associate Professor Samantha Low-Choy, Professor Kenneth Donald and Professor Rohan Jayasinghe. Their guidance helped me throughout my research to overcome obstacles I encountered during my PhD study.

Besides my supervisors, I would like to acknowledge the support of Griffith University in providing me with the scholarships and resources to complete my thesis. Also, I am using this opportunity to recognise the help and support I received from the Gold Coast University Hospital, the Robina Cardiac Rehabilitation Centre and the participants of this study who made my research possible.

This thesis is heartily dedicated to my beloved family for their generous support throughout my life. Special thanks go to my brother-in-law, Dr. Ebrahim Barzgari, for all his support. I hope to inspire others as you have inspired me! Last, but not least, I would like to thank my husband, thank you for your unconditional love.
Abstract
Facilitating individual engagement in the rehabilitation process is vital if our investment in interventions is to achieve the desired outcomes. Studies of engagement in the cardiac rehabilitation (CR) context are limited, in that they lack a comprehensive and detailed basis for understanding and monitoring the whole process of engagement. The Model of Therapeutic Engagement (MTE) (Lequerica & Kortte, 2010) is the most comprehensive theoretical framework yet proposed to explain CR engagement, however, in the ten years since its first proposal, no research has investigated this multi-layered model empirically to determine its utility in the context of CR. The MTE defines the process of engagement by theorising a series of sub-models that focus on: 1) individual intention to engage in CR programs; 2) initiation of CR (i.e. actual attendance); and 3) maintenance of participation in CR programs over time (i.e. completion). Although the MTE is likely to be useful in understanding engagement in CR, it has been derived from a psychological orientation. Consequently, it gives little consideration to the role of socio-environmental factors which are considered vital in the fields of rehabilitation and health promotion. The overall aim of this empirical study was to evaluate the way in which the components of the MTE contribute to engagement outcomes and interact with each other, and also to examine the role of socio-environmental barriers in the MTE. This empirical study aims to evaluate the theory underlying the MTE by implementing it empirically, and thus develop a better understanding of the process of CR engagement. Through this approach, useful predictors that may act as management ‘levers’ can be identified, which if manipulated, can lead to better engagement. In turn, this could inform planning and design of future programs.
The research began with a synthesis of the existing evidence for each of the proposed relationships among variables at each of the three stages of the MTE within a CR setting (see Chapter Three). A model-centric systematic review was used to explicitly structure the evidence, according to each stage of the MTE. This review identified eight studies which focused on aspects of stage one of the MTE, four additional studies which were relevant to stage two of the MTE, and six studies which considered aspects of stage three of the MTE. The results showed that the propositions of the first stage of the MTE have been well supported in the literature. However, there has been limited research investigating the proposed relationships among the variables that define the second and third stages of the MTE. Importantly, the literature review revealed that research to date has failed to provide a holistic approach to the understanding of individual engagement in CR programs. Hence, this literature review provided a strong basis for designing a substantial empirical study that aimed, for the first time, to comprehensively consider all stages of the MTE. However, due to its complexity, the analysis of the whole MTE was broken into several components, as explained below.

Implementing a complex multi-component model such as the MTE, in an empirical study, raises significant analytical challenges. The MTE reflects the process that individuals follow during CR as this process unfolds over time. As would be expected, some individuals drop out. Changes in the sample during investigation of each stage of the MTE reflect the construct of interest (i.e., engagement) and, therefore, cannot be ignored by treating this as missing data or attrition. For example, not all those who are referred to CR will wish to attend; not all those who intend to engage in the CR program will initiate contact; attendance will fluctuate during CR; not all those who remain in the program will sustain their engagement.
These attrition issues make it difficult for empirical modelling to make use of a single model to reflect the whole process of CR. For that reason, a modular approach to analysis was chosen, where each module focuses on a different key stage of the MTE process: 1) individual intention to engage in CR programs; 2) initiation of CR (i.e. actual attendance); and 3) maintenance of participation in CR programs over time. Due to the emphasis on modelling relationship ‘pathways’ amongst variables, and the limited amount of data available, structural equation modelling (SEM) was determined to be suitable to provide an explanation of engagement, and therefore was applied to each of the three stages of the MTE.

In the initial empirical study, the first stage of the MTE was evaluated in a sample of 217 participants at one hospital in metropolitan Australia who were referred to CR following a cardiac event that required hospitalisation. The results (Chapter Seven) revealed that perceived self-efficacy and perceived need for rehabilitation positively impacted on intention to engage in CR, with moderate to large effect sizes. Perceived need and outcome expectancies were also strongly and significantly associated with each other. Contrary to the MTE, there were no significant relationships detected between outcome expectancies and intention to engage in the CR program, and between perceived self-efficacy and outcome expectancies. However, more detailed inspection (by supplementing SEM with bootstrap resampling) revealed that willingness to consider treatment acted as a mediator of the relationship between perceived self-efficacy and intention to engage in the CR program, through a small indirect effect that was significant and negative. The inclusion of this mediator doubled the variance explained by the relationship pathways.

A prospective study was then conducted to test the entire MTE in the subset of 101 participants who enrolled in, and commenced, the CR program. The subsequent findings
(Chapter Eight) mirrored the effects found in the initial cross-sectional study (Chapter Seven). The effects remained the same in both direction and size in most cases. The main exception was the small significant negative relationship between perceived self-efficacy and outcome expectancies, which was much smaller and non-significant in the total sample. Another exception was the effect of perceived need on intention to engage which was found to be positive and significant in both studies, but larger in the cross-sectional analysis (Chapter Seven) compared to the prospective analysis (Chapter Eight). In this prospective study, the findings were consistent with all relationships proposed within the second and third stages of the MTE.

Finally, in Chapter Nine, the SEM was expanded to a multi-group analysis in order to examine the role of socio-environmental barriers. Despite being omitted from the original MTE, these barriers were found to be important in this first exploratory empirical analysis. The findings indicated that experiencing high-level socio-environmental barriers appeared to have a substantial moderating impact on the majority of the relationships proposed at the second and third stages of the MTE, with barriers tending to reduce engagement as would be expected. Significant differences were found between participants with high-level barriers and those with low-level barriers when comparing the effects, as shown by the beta estimate of the statistical model. Several relationships in the model were significantly weakened for participants with high levels of barriers compared to participants with low levels of barriers. Specifically, the strength of the relationship between intention to engage and actual involvement in preparation for the program was five times lower as was the relationship between their analysis of the CR experience and engagement. The strength of the relationship between CR initiation and engagement in the CR program was ten times lower and the
relationship between CR maintenance and engagement was three times lower. These findings suggest that people with high levels of barriers are less likely to translate their intention to engage into actual engagement or involvement in preparing for CR. Even for those who initiated CR, or maintained CR over time, this was less likely to translate into deep levels of engagement. Importantly, their engagement over time was less likely to be influenced by their experience of rehabilitation, presumably reflecting the greater influence of barriers on their engagement. Thus, overall, a high level of socio-environmental barriers substantially diluted the relationships between variables in subsequent phases of CR, with the relationships being three to ten times stronger for individuals who had a low level of barriers.

In summary, this study showed that perceived self-efficacy and perceived need for rehabilitation positively impacted on intention to engage in CR in the total population of eligible participants. Willingness to consider treatment was a strong mediator that doubled the likelihood of self-efficacy influencing intention to engage in CR. Perceived need was associated with outcome expectancies, however, these expectancies did not directly impact on intention to engage in CR program. Perceived need reduced in importance for people who did engage in CR, as might be expected. For those who did engage in CR, sustained engagement was associated with individual analysis of experience. Barriers in the social and physical environment reduced the strength of the MTE relationships, so must be included in future articulations of the model. Addressing barriers would significantly enhance engagement in CR.

This study has indicated that the MTE can improve our understanding of the process of engagement in CR programs. Further, a deeper acknowledgment and understanding of socio-environmental barriers can improve the utility of the MTE. Based on this more holistic
view of CR, as provided by the extended MTE, it is now possible to identify potential management levers that could be manipulated in order to enhance engagement. In particular, these results highlight that more attention is needed for raising the perceived need for CR and supporting the involvement of participants in preparation for their rehabilitation. These changes could significantly increase intention to engage in CR and actual initiation. Most importantly, the current study has confirmed the need to carefully review socio-environmental barriers that affect sustained engagement in CR. Prospective studies with larger samples than used in this first exploratory study, are required to determine whether these findings can be replicated, and are generally applicable to different populations of CR patients. Such a quantitative analysis could perhaps be supplemented by a qualitative study, to allow a deeper examination of the mechanisms underlying the apparent relationships among these variables. In addition, future studies must focus directly on exploring the role of other elements of engagement in order to provide a more comprehensive understanding of the engagement process. Specifically, greater consideration needs to be provided to CR barriers and facilitators, such as health professional-related factors (e.g. clinicians’ communicative and relational skills); factors associated with family caregivers of individuals; and mental distress factors to expand the MTE.

**Keywords:** Model of Therapeutic Engagement; Cardiac Rehabilitation; Intention to Engage; Initiation; Maintenance; Structural Equation Modelling.
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<tr>
<td>ANN</td>
<td>Artificial Neural Network</td>
</tr>
<tr>
<td>AMI</td>
<td>Acute Myocardial Infarction</td>
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<tr>
<td>AVE</td>
<td>Average Variance Extracted</td>
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<tr>
<td>BMI</td>
<td>Body Mass Index</td>
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<tr>
<td>CABG</td>
<td>Coronary Artery Bypass Grafting</td>
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<td>CFA</td>
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<td>CFI</td>
<td>Comparative Fit Index</td>
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<td>CHD</td>
<td>Coronary Heart Disease</td>
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<td>C-COGS</td>
<td>Client-Centredness Of Goal Setting</td>
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<td>CR</td>
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<td>CVD</td>
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<tr>
<td>GCUH</td>
<td>Gold Coast University Hospital</td>
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<tr>
<td>HAPA</td>
<td>Health Action Process Approach</td>
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<td>HBM</td>
<td>Health Belief Model</td>
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<tr>
<td>IFI</td>
<td>Incremental Fit Index</td>
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<tr>
<td>MARS</td>
<td>Multivariate Adaptive Regression Splines</td>
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<td>MI</td>
<td>Myocardial Infarction</td>
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<td>MTE</td>
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<td>MOT-Q</td>
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<td>NSTEMI</td>
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<td>PCFI</td>
<td>Parsimony Comparative Fit Index</td>
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<td>PCI</td>
<td>Percutaneous Coronary Intervention</td>
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<td>RRS</td>
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<td>SD</td>
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SE          Standard Error
SEM         Structural Equation Model(ing)
STEMI       ST-Segment Elevation Myocardial Infarction
QAT-OCCSS   Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies
RMSEA       Root Mean Square Error of Approximation
TAFE        Technical and Further Education
TLI         Tucker-Lewis Index
TMBC        Transtheoretical Model of Behaviour Change
VIF         Variance Inflation Factor
vs          Versus
WHO         World Health Organization
WLR         Weighted Linear Regressions
Z           Z-score (test statistic with Normal distribution)

List of Symbols

%           Percentage
<           Less than
>           Greater than
α           Cronbach's alpha
β           Standardised regression coefficients
B           Unstandardised regression coefficients
χ²          Chi-square
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Publications and Presentations in Support of this Thesis

The PhD candidate has produced five manuscripts from the outcomes of the research including: one systematic literature review (Chapter Three: Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018a); one literature review (Chapter Five: Jahandideh et al., 2018b); three original manuscripts reporting on the empirical analysis (Chapters Seven-Nine: Jahandideh et al., 2018c-e); and one letter to the editor (Chapter One: Jahandideh et al., 2018f). As the thesis is being submitted ‘by papers’ rather than ‘by dissertation’, each of these chapters is prepared and included as a manuscript. This necessitates a low level of repetition, of some aspects of study design and data collection.

In some cases, these manuscripts have been accepted for publication: two full papers have been published in the Journal of Behaviour Change; a conference paper was accepted for presentation at the IRES International Conference of Medical and Health Science and published in the International Journal of Advances in Science, Engineering and Technology; and a letter to the editor has been published which has been used to complete the first chapter of the current thesis. The remaining two manuscripts are currently under review for potential publication. The details of the prepared manuscripts included in this thesis are as follows:


Understanding individual intention to engage in outpatient cardiac rehabilitation programs based on the Model of Therapeutic Engagement. Submitted to *the Journal of Rehabilitation Counselling Bulletin*.

The process of individual engagement in cardiac rehabilitation programs. Accepted for publication in the journal *Behaviour Change*.

The impact of socio-environment barriers on the process of engagement in cardiac rehabilitation programs. Submitted to *the Western Journal of Nursing Research*.

Understanding individual engagement in outpatient cardiac rehabilitation programs through the model of therapeutic engagement. *Examines in Physical Medicine and Rehabilitation, I* (3).

Parts of this research have been presented at national and international conferences:

Accumulating evidence for dependencies in graphical statistical models: A model-centric approach to systematic literature review on factors affecting individual engagement in cardiac rehabilitation programs. Accepted for a poster presentation. BAYES 2018: Bayesian Biostatistics, Homerton College, Cambridge, UK.

Predicting individual engagement in outpatient cardiac rehabilitation programs using the Model of Therapeutic Engagement. Accepted for a poster presentation. Bold Ideas Better Solutions Symposium, Brisbane, Australia.


The candidate received one grant, three scholarships and one prize for poster presentation during her candidature. The details are listed below:

2015 International Postgraduate Research Scholarship (IPRS)
2015 Australian Postgraduate Award (APA)
2017 The Second Runner Up Prize for poster presentation at the 2017 Griffith Health HDR Research Day
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2018 Publication Assistance Scholarship (PAS)

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Chapter One
The Need for Cardiac Rehabilitation

This chapter provides an overview of the background to this study, the concept of engagement in rehabilitation, the process of engagement versus the state of engagement, the Model of Therapeutic Engagement (MTE), and rationale for the research. It introduces the research aim and objectives, and the significance of the research. A letter to the editor (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018f) has been published and provides some materials for this chapter. Also, some of this material summarises findings from the systematic review (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018a), reported in more detail in Chapter Three.

1.1 Background

Heart disease creates a significant burden on the health system, society and individuals (Azhar, Al Shammasi, & Higgi, 2016; Pandya, Gaziano, Weinstein, & Cutler, 2013; Roth et al., 2017). Diseases of the heart may result from damage to the heart itself caused by genetic or structural malformations, viruses, infections or inflammatory processes, or from cerebrovascular conditions (e.g. aneurysm, stroke, hypertension, narrowing or blockage of the arteries). These conditions can cause heart failure, angina and partial or complete loss of blood and oxygen supply to the heart resulting in acute myocardial infarction (AMI) or what is commonly known as a heart attack. Cardiovascular diseases (CVD), especially coronary vascular disease, account for the highest rate of mortality in Australia (Australian Bureau of Statistics, 2017). However, these statistics alone are not adequate to understand the real impact of heart disease, because many people live with heart disease for extended periods. In these cases, heart disease causes a significant adverse impact on individuals’ quality of life as well as on the people around them, and in this way accumulate to also impact on the
Cardiac rehabilitation (CR) is a multi-disciplinary intervention designed to stabilise, slow, or reverse CVD, restore health following a cardiac event and facilitate the prevention of further events (Balady et al., 2007). The overall goals of CR are to promote health and improve quality of life (WHO, 1993). Typically, CR includes core components of exercise and education combined with a multi-factorial approach to recovery and wellbeing based on psychological intervention, vocational rehabilitation, and/or pharmacological treatments (Cardiovascular & Rehabilitation, 2004).

In Australia, individuals have access to comprehensive multi-disciplinary outpatient CR programs. The normal duration of the programs is 6 to 12 weeks and consists of group-based therapies, including: education on heart disease risk factors (e.g. smoking cessation, physical activity, healthy eating, control of blood lipids, weight, blood pressure and diabetes); knowledge of anatomy and physiology of the heart; physiotherapy and exercise; medications and stress management (Gardiner et al., 2018). CR is offered to people who have experienced a myocardial infarction (ST-Segment Elevation Myocardial Infarction, Non-ST Segment Elevation Myocardial Infarction); re-vascularisation procedures to remove blockages; stable or unstable angina; controlled heart failure; and other vascular or heart diseases. Engaging with and meeting the diverse requirements of this broad population represents a major challenge. Researchers have shown significant reductions in mortality among those individuals who participated in CR programs (de Araújo Pio, Marzolini, Pakosh, & Grace, 2017; Goel, Lennon, Tilbury, Squires, & Thomas, 2011; Gomez et al., 2015; Pardaens et al., 2017). In terms of morbidity, benefits have been found for those who attend CR over those who do not (de Araújo Pio et al., 2017). For example, CR programs have been shown to improve exercise tolerance, functional capacity, lipid levels, blood pressure, symptoms of
angina and dyspnoea, weight loss, smoking reduction, stress levels and psychosocial functioning (Asbury et al., 2012; Campbell et al., 2012; Kerrigan et al., 2014; Koba et al., 2016; Parvand, Goosheh, & Sarmadi, 2016; Smith et al., 2017).

Despite the fact that all people hospitalised with acute coronary events or procedures are considered eligible for enrolment in CR programs (Scott, Lindsay, & Harden, 2003), access to CR remains low in Australia. Recent studies have demonstrated that only 46% of people who were hospitalised with acute coronary syndrome were referred to CR in Australia and New Zealand. Furthermore, only one-quarter of them had received the optimal recommended level of effective secondary prevention prior to discharge (Clark, Redfern, & Briffa, 2014; Redfern et al., 2014). Redfern and colleagues (2014) demonstrated that factors such as diagnosis, age and hospital type influenced the effectiveness of preventive care individuals received while they were in hospital. The study indicated that there was a significantly higher incidence of secondary prevention pharmacotherapy provided to individuals diagnosed with MI (Myocardial Infarction) as compared to other cardiac diagnoses. Those who were admitted to private hospitals, and older individuals, were less likely to receive optimal care. The result of another study conducted by Gardiner and colleagues (2018) on a sample of Australian people who were referred to participate in outpatient CR programs, showed that lack of knowledge about the benefits of CR programs was a major factor contributing to underutilisation.

Thus, over the years, a great deal of research has focused on the outcomes achieved by those who participate in rehabilitation. However with low levels of engagement, the likelihood of these benefits being realised for the majority of the population is severely curtailed. Little is known about factors that contribute to engagement in rehabilitation, and even less is known about the process of engagement specifically in CR. Whether a rehabilitation effort will succeed or fail partly depends on the ability of the clinical team to
engage successfully with individuals, to motivate them to attend, and to facilitate their full participation in CR (Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007; Medley & Powell, 2010). The questions of who engages in rehabilitation, and why they engage, remain largely unanswered.

Early in the history of research on formal medical rehabilitation, evidence showed that process variables were significant for understanding why some rehabilitation patients participated and benefitted whereas others did not. For example, an early examination of participant–staff rapport (for occupational therapy and physical therapy staff) in the rehabilitation process of individuals with chronic physical illness was conducted by Shontz and Fink (1957). They demonstrated the importance of communicative rapport to ensuring participation in intensive treatment. Additionally, Wright (1960) emphasised the need for involvement of participants in the decision-making and planning procedures to ensure their full engagement in the rehabilitation process.

All of this literature highlights that interest in these process variables has continued over time. A major purpose of these studies has been to confirm whether particular variables facilitate or hinder participation in CR. This approach has substantial implications in practice, as these variables could act as ‘management levers’ that could be adjusted in future treatment protocols in order to promote positive outcomes. Particular variables have been identified and investigated in diverse ways; sometimes in a unitary sense as sole factors affecting an outcome (e.g. individual intention to engage in CR programs, initiation of CR and maintenance of participation in CR programs), and sometimes in a multi-factor sense as a suite of factors, the effects of which accumulate to affect outcome. For instance, a large body of research has focused on self-efficacy and outcome expectancies as predictors of the degree to which people follow the guidelines provided by their healthcare professionals and how this adherence impacts on CR rehabilitation outcomes (Bennett, Mayfield, Norman, Lowe,
& Morgan, 1999; Blanchard, Arthur, & Gunn, 2015; Dohnke, Nowossadeck, & Müller-Fahrnow, 2010). Similarly, complex constructs such as motivation have received a great deal of attention as they that can partly explain participation in CR rehabilitation (Dechaine, Merighi, & O’Keefe, 2018; Horwood, Williams, & Mandic, 2015). Although these approaches, using sole factors or multiple factors, have revealed important findings on key constructs related to individual participation in rehabilitation, an overall understanding of the process of engagement has not evolved. Further, the findings that have emerged from the single factor approach have accounted for only a small proportion of variance in both participation and outcomes. This thesis addresses a clear need to study the complexities of the rehabilitation process more holistically to better understand and identify the active mechanisms that facilitate individual engagement in CR programs.

1.2 The Concept of Engagement in Rehabilitation

Individual engagement is a widely used term in the context of rehabilitation and the broader area of healthcare (Higgins, Larson, & Schnall, 2017; Horton, Howell, Humby, & Ross, 2011). Several researchers have suggested that rehabilitation may have limited benefits if people are not fully engaged in the process (Horton, Howell, Humby, & Ross, 2011; Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007; Medley & Powell, 2010). Indeed, the benefits of engagement have been demonstrated, both for individuals and for the healthcare system. Fewer hospital-acquired infections, reduced medical errors, reduced serious safety events, and increased individual satisfaction scores are some outcomes of implementing individual engagement strategies (Kim et al., 2018; Millenson, 2013). Individual engagement has also been associated with lower levels of depression and with higher levels of adherence, attendance, and effectiveness (Ivey, Shortell, Rodriguez, & Wang, 2018; Miró et al., 2018).
Engagement has been most frequently debated in the context of treatment retention (Godlaski, Butler, Heron, Debord, & Cauvin, 2009; Nobles, Perez, Skelton, Spence, & Ball, 2018; Padgett, Henwood, Abrams, & Davis, 2008) and participation in the treatment processes (Danzl, Etter, Andreatta, & Kitzman, 2012; Hitch, 2009; Lequerica et al., 2006; Roy, Gourde, & Couto, 2011). However, it has been proposed that to benefit from rehabilitation, individuals are required to do more than just participate (Lequerica et al., 2006; Roy et al., 2011).

Although the term ‘engagement’ is increasingly accepted and valued in clinical practice and research, the concept itself has led to considerable confusion among healthcare providers (Bright et al., 2015; Graffigna, Barello, & Triberti, 2016; Hitch, 2009; Higgins et al., 2017). Research on engagement appears to be under-developed with regard to the actual meaning of the terms, the factors that contribute to a perception that an individual chooses to engage or not, and how engagement occurs (Bright et al., 2015). The current research aimed to address such deficits in knowledge in this field, at least in the context of CR. The research, though, may contribute to the broader understanding of the factors underlying engagement in other forms of rehabilitation.

The term engagement is used inconsistently (Bright et al., 2015; Graffigna, Barello, & Triberti, 2016; Higgins et al., 2017), with uses ranging through the notion of accessing necessary services (Basta, Shacham, & Reece, 2008; Higgins et al., 2017); self-managing one’s own health conditions by undertaking daily tasks in collaboration of healthcare providers (Clark et al., 1991); seeking greater understanding or awareness about one’s condition (Hochhalter, Song, Rush, Sklar, & Stevens, 2010); or forming a therapeutic alliance with one’s healthcare providers (Tai-Seale, Foo, & Stults, 2013). Engagement also evokes a wide variety of closely related terms, such as shared decision making (Held Bradford, Finlayson, White Gorman, & Wagner, 2018; Macgowan, 2006; Tait, Birchwood, & Trower,
involvement and participation in the process of treatment (Danzl et al., 2012; Entwistle & Watt, 2006; Hitch, 2009; Kemppainen et al., 1999; Priebe, Watts, Chase, & Matanov, 2005; Tait et al., 2002). Furthermore, engagement has been used to refer to the development of relationships with other participants and their vigorous cooperation to address each other’s needs (Macgowan, 2006). However, in rehabilitation practice, the engaged individual is often used to describe the client who health providers experience as receptive and cooperative with rehabilitation processes (Bright, 2013). Thus, a large body of research considers engagement as an attribute or trait of an individual assigned by health providers.

Not surprisingly, indicators that have been used to measure engagement range from physical attendance at programs (O’Brien et al., 2009; Staudt et al., 2012; Tait et al., 2002) to compliance with treatment, usually defined as the extent to which an individual’s behaviour matches with health professionals’ expectations (Hayanes, 1979). However, this approach has been challenged by several researchers in that compliance can be manifested as a result of processes other than engagement (O’Brien et al., 2009). Similarly, attendance might be involuntary or arise through reluctant behaviour following mandatory requirements (Priebe, Watts, Chase, & Matanov, 2005). For instance, individuals with low health literacy may comply with treatment because they do not have the sufficient capacity to discuss their concerns with healthcare providers (Butcher & Selby, 2018; Chase et al., 2012). Other research has confirmed that attendance may demonstrate a pseudo-engagement rather than real investment in the process of change (Roy et al., 2011; Stadt, 2007). These conclusions demonstrate the need to recognize a range of levels of engagement. Considering attendance alone as a measure of engagement is a major limitation (Roy et al., 2011).

According to research conducted by Matthews and colleagues (2002), engagement can be regarded as a continuum ranging from apathy (low engagement) to enthusiasm and
interest (high engagement). These researchers showed that higher levels of engagement were associated with increased attendance, involvement and participation in rehabilitation activities. Therefore, it seems that cognitive and emotional factors may translate into behavioural factors such as energy, motivation, and concentration, that then create engagement (Matthews et al. 2002). Although the components chosen to measure engagement vary considerably from one study to another (Roy et al., 2011), the concept of engagement encapsulates multiple elements (Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007, p. 416). To date, no research has examined this level of complexity. Further, engagement is thought to be affected by both environmental factors (Godlaski et al., 2009; Lequerica & Kortte, 2010) and factors that are intrinsic to the individual, such as accepting the need for treatment, perceiving the benefits of treatment (Lequerica & Kortte, 2010; O’Brien, White, Fahmy, & Singh, 2009), and having a sense of self-efficacy (Chaudhary, Rangnekar, & Barua, 2013; Godlaski et al., 2009). Several behaviours have been recommended as signs of individual engagement, including: willingness to be involved (Park et al., 2002); contributions to the session (Macgowan, 2006); retention in care (Padgett et al., 2008); and mere attendance at therapy (Hall, 2001; Kortte et al., 2007; Macgowan, 2006; O’Brien et al., 2009; Tait et al., 2002). This complexity requires a multi-level approach to understanding engagement that moves beyond the notion of a static definition of engagement.

1.2.1 The Process of Engagement versus the State of Engagement

Health researchers have suggested that individual engagement is both a state and a process involving a series of behaviours (Bright et al., 2015; Simmons-Mackie & Kovarsky, 2009) which represents various levels of capacity, activity and interest that individuals have in balancing information or professional advice with their own needs in order to form their health outcomes (Ferrer, 2015; Fumagalli et al., 2014). Both the process and state of
engagement are likely to be shaped by the interactions between individuals and their healthcare providers (Bright et al., 2015; Simmons-Mackie & Kovarsky, 2009) and by the environment in which healthcare services are delivered (Higgins, Larson, & Schnall, 2017).

The process of CR engagement (meaning engaging ‘with’ CR) implicitly refers to individual-clinician and individual-service interactions, whereas the state of engagement (engaging ‘in’ CR) is regarded as an internal state experienced by the individual, which may be expressed via a number of recognisable behaviours (Bright et al., 2015).

The process of engagement has been represented as a dynamic, evolutionary (Graffigna & Barello, 2015) and highly individualistic process (Higgins et al., 2017). Graffigna and Barello (2015) suggested that the state of engagement is the final outcome of the engagement process, achieved through a series of emotional, cognitive, and behavioural components. Engagement as a state should, therefore, represent how successfully an individual has been in manoeuvring through the dynamic process of engagement.

Building reciprocal trust and respect (Addis & Gamble, 2004; Chase et al., 2012; Danzl et al., 2012; Priebe et al., 2005; Watkins et al., 1999) between the individuals and clinicians during the process of engagement is a critical component of fostering the state of engagement as an endpoint in the process of engagement (Chase et al., 2012; Gillespie, Smith, Meaden, Jones, & Wane, 2004; Priebe et al., 2005; Simmons-Mackie & Kovarsky, 2009) and of providing a safe and caring environment (Konrad, 2009). Clinicians can become effective in engaging individuals by understanding individuals’ experiences, priorities, and expectations (Addis & Gamble, 2004; Chase et al., 2012; Graffigna & Barello, 2015; Mallinson et al., 2007; Padgett et al., 2008; Priebe et al., 2005; Woolhouse et al., 2011; Wright et al., 2011) and moving from simply seeing individuals as a diagnosis to people who make decisions in relation to their treatment (Graffigna & Barello, 2015; Millenson, 2013; Chase et al., 2012). For example, a study conducted by Bright and colleagues (2017, p. 1397)
in a sample of people undertaking stroke rehabilitation demonstrated that engagement is a “co-constructed relational process” and the clinician’s engagement impacted on individual engagement.

With respect to engaging in rehabilitation, the key components include: what an individual is doing and their actual participation (Hitch, 2009); their internal state, revealed by commitment, enthusiasm, effort and endeavour (Chase et al., 2012; Danzl et al., 2012; Godlaski et al., 2009; Kortte et al., 2007; Lequerica & Kortte, 2010; Woolhouse et al., 2011); and apparent behaviours including attendance, participation, contribution, and persistence (Hitch, 2009; Kemppainen et al., 1999; Priebe et al., 2005; Zubialde, Eubank, & Fink, 2007).

The state of being engaged in rehabilitation results from the process of engaging with a rehabilitation provider or service (Hitch, 2009; Priebe et al., 2005). Engagement in rehabilitation appears, therefore, to be an internal state, with recognisable behaviours (Bright et al., 2015). Roy et al. (2011) noted that both engagement in (state), and engagement with (process) are necessary for engagement to occur.

Regardless of the importance of individual engagement in rehabilitation programs, little is known about how, in practice, healthcare providers understand and apply the concept of individual engagement in the process of providing care. In a study conducted by Fleming and colleagues (2017), many healthcare providers mentioned that it was difficult to predict which group of individuals would ultimately engage with treatment. Therefore, research would benefit from a theoretical model that incorporates multiple predictors in order to achieve a more organised, structured approach to conceptualising engagement, in this area and more broadly. This situation clearly identifies and justifies the underlying an aim of this research: to address this complexity, and develop a conceptual framework for understanding both the process and state of engagement in the context of CR programs. Importantly, this research will test and refine the conceptual framework empirically.
1.3 The Model of Therapeutic Engagement (MTE)

There have been few attempts to build a theory of engagement as both a process and a state, but one model has been proposed by Lequerica and Kortte (2010) based on their previous research in acquired brain injury rehabilitation (Kortte et al., 2007; Lequerica et al., 2006). In their theory, rehabilitation engagement is described as “a construct which involves multiple elements, including the individual’s attitude towards the therapy, level of acknowledging or understanding a need for treatment, level of active participation in the therapy programs, and level of attendance throughout the rehabilitation program” (Kortte et al., 2007, p. 878). Engagement, conceptualised in this broader sense, incorporates the interest, motivation, persistence and effort of the individual in the rehabilitation program. This conceptualisation aligns strongly with Bright’s definition of engagement: “engagement is a co-constructed process and state. It corporates a process of gradually connecting with each other and/or a therapeutic program, which enables the individual to become an active, committed and invested collaborator in healthcare” (Bright et al., 2015, p. 650). This thesis aims to develop an understanding of the complicated process and state of engagement by applying and empirically evaluating the Lequerica and Kortte (2010) Model of Therapeutic Engagement (MTE) to CR for the first time.

The MTE aims to elucidate how and why individuals engage in rehabilitation programs and incorporate both engagement as a process and a state into a single model. This model proposes that the state of full engagement results from a three-stage engagement process, and the success of the individual in this process depends on how individual progresses through the previous stages. The MTE has drawn heavily on the Health Action Process Approach (HAPA), a health behaviour change model that has been used extensively to predict individual changes in health-related behaviours such as quitting smoking or drinking and improving physical activity levels (Schwarzer, 2001). The HAPA emphasises
the environment and motivational stimuli that influence individual behavioural change (Schwarzer, 2001). The HAPA also represents the process of behaviour change in three stages including adoption, initiation and maintenance. Lequerica and Kortte (2010) used a similar basic framework for developing their Model of Therapeutic Engagement (MTE) in the field of rehabilitation.

Specifically, the MTE consists of a series of three stages that explain, firstly, the intention to engage in rehabilitation, then the initiation of rehabilitation, and finally maintenance of participation in rehabilitation programs (Figure 1.1, p. 13). This complex model can facilitate our understanding of the variables and processes that play a role in determining why and how people participate in, and benefits from, rehabilitation over time. No research has yet examined this multi-layered model in a way that can accommodate the dynamic process over time and the model has not yet been applied in the CR context. Its applicability to CR, thus, remains unknown. Nevertheless, the MTE offers the most comprehensive attempt to explain engagement in rehabilitation and may have applicability to CR since it recognises the fluid process of engagement in the CR program which may culminate in the state of an individual engaging in CR. The MTE can also clarify the different stages of engagement over time from discharge to CR program completion. The first stage of the MTE is formed when the individual is hospitalised after an acute cardiac event, and the second and third stages occur after discharge from hospital and commencing a CR program. Consequently, Lequerica and Kortte’s MTE provides a strong conceptual basis for the current study. This thesis provides an in-depth assessment of the MTE to determine its utility in the context of CR.
Figure 1.1 The conceptual framework of the Model of Therapeutic Engagement (Lequerica & Kortte, 2010)

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Figure 1.1 adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, *American Journal of Physical Medicine & Rehabilitation, 89*, 418. Copyright Year by “Wolters Kluwer”.

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1.4 **Rationale of the study**

The MTE of Lequerica and Kortte (2010) places active individual involvement at the centre of successful rehabilitation experiences. Cognitive, behavioural or emotional issues that interfere with individuals’ ability to become fully engaged in their recovery processes can increase the duration of hospitalisation and impede progress toward functional improvement. Transparency about how the process of CR engagement happens is crucial if engagement is a significant factor relevant to outcomes of rehabilitation (Bright et al., 2015). As established in Section 1.1, research conducted to date has focused on variables that are associated with the three stages of CR (motivation for, attendance at or participation in rehabilitation), but these variables have not been measured together, so research has not contributed to an overall understanding of the process. The MTE, although hitherto empirically untested in any form of rehabilitation program, was originally formulated in an attempt to articulate the complexity of the engagement process in the rehabilitation context.

The MTE can explain the process and state of individual engagement in CR programs thoroughly; however, the problem with this model is that it originates from a framework that privileges individual psychology rather than a broader public health approach. In addition to being person-centred and individualised, rehabilitation is now based on a strong social model that acknowledges the role of social and environmental determinants in producing good outcomes. The World Health Organisation has adopted a framework known as the International Classification of Functioning (Stucki, 2005) which includes specific reference to the social context in which people participate in rehabilitation. Similarly, in the area of cardiac disease and other chronic conditions, there has been a strong shift towards understanding the socio-environmental factors and their role in health. These are the factors in the immediate physical and family environment and the broader social context that influence the way in which the individual interacts with his or her rehabilitation.
Previous studies reported a variety of socio-environmental factors at various stages of the engagement process in CR programs (Banerjee, Grace, Thomas, & Faulkner, 2010; Rouleau et al., 2018). However, there has been a lack of prospective studies investigating the impact of socio-environmental factors on each stage of the process of engagement in CR. Given the established important role of socio-environmental factors, it is imperative that social and environmental contexts are incorporated into the MTE. This thesis, therefore, aims to examine the possible impact of socio-environmental factors which may negatively impact on the proposed relationships within each stage of the process of engagement.

Socio-environmental factors are important concepts that can alter intention, actual behaviour and outcomes for a range of health activities (Banerjee et al., 2010; Rouleau et al., 2018). Presumably, incorporating the role of socio-environmental factors will improve our understanding of how the process of engagement operates, and hence provide a better rationale for the MTE. Therefore, by studying a comprehensive MTE in rehabilitation and involving that model into broader social and environmental contexts, the current research will extend knowledge in the area and contribute to improved strategies for enhancing engagement in rehabilitation. The application of the MTE to CR is important given the low levels of engagement in this area and the potentially significant impact of cardiac ill-health in future.

1.5 Aim and objectives of the study

The overall aim of this thesis was to advance the understanding of individual engagement in outpatient CR programs by examining, evaluating and expanding the MTE (Lequerica & Kortte, 2010) in this context. The specific objectives of the study were to:
1. examine the three stages of the Lequerica-Kortte MTE (i.e. intention to engage in CR, initiation of CR (i.e. actual attendance), and maintenance of participation in CR programs in the context of CR (i.e. completion)).

2. measure and evaluate the way in which the components of the MTE interact with each other over time to understand individual engagement in CR.

3. Expand the MTE to investigate how socio-environmental factors may negatively impact on intention to engage in CR, initiation of CR, and maintenance of participation in CR programs.

1.6 Significance of this study

It is expected that the findings of the present study will develop the understanding of the relationships among a wide range of individual, social and environmental variables and their role in CR engagement (Objectives One to Three). Importantly, this study relies on a conceptual systems-based approach which involves both individuals and clinicians’ perspective in the research to make it more representative of the real process of individual engagement. This systematic approach is necessary, so that people with cardiac disease, as active participants, can improve their own health outcomes by building on their strengths and gaining self-confidence, as well as developing more efficient self-management skills and competency. This approach will raise clinicians’ awareness and knowledge about the impact of individual, social and environmental factors on rehabilitation engagement; deliver important baseline information which can be used in developing appropriate strategies for individual engagement in CR programs and more broadly for other rehabilitation or chronic disease settings; and support the individual throughout the whole rehabilitation journey. Specifically, the findings will drive new methods of engaging people in rehabilitation by highlighting those factors that require attention, and can potentially be influenced by
changing the system or through the interactions with individuals. More importantly, because the study is based on a set of theoretically derived propositions explicitly encapsulated in the MTE, it will represent a systematic examination of the engagement process instead of identifying single variables that facilitate or hinder rehabilitation engagement, as has been done in much of the previous literature. This approach will potentially lead to significant advances in understanding of how individual engagement occurs in CR programs.

1.7 Overview of studies in this thesis

The thesis structure is illustrated in Table 1.1. The thesis is submitted with publications. It consists of five manuscripts in various stages of publication (contained in Chapters Three, Five, Seven, Eight and Nine). Around those manuscripts, I have detailed further rationale for the study (Chapter One), a detailed overview of the theory (Chapter Two), the overall method (Chapter Four), the sample characteristics (Chapter Six) and the overall conclusions of the findings (Chapter Ten). Some of this information is, by necessity, repeated in the manuscripts, but in less detail depending on the requirements of the journal.

Manuscript One (Chapter Three) provides a systematic review of the conceptual framework (Manuscript One: Jahandideh et al., 2018a). This review synthesises existing empirical evidence for the components and relationships proposed within the MTE. Manuscript Two (Chapter Five) evaluates various statistical and machine learning methods, and their suitability for testing the MTE (Manuscript Two: Jahandideh et al., 2018b). This includes evaluating utility of four different statistical and machine learning modelling approaches, with varying strengths in explanation and prediction for testing the MTE. Chapters Seven, Eight and Nine contain manuscripts focused on, respectively: the findings from testing the first stage of the MTE (Manuscript Three: Jahandideh et al., 2018c); the findings from testing the entire MTE (Manuscript Four: Jahandideh et al., 2018d); and the
findings examining the impact of socio-environmental barriers on rehabilitation engagement in the outpatient CR program (Manuscript Five: Jahandideh et al., 2018e).

Appendix A (p. 328) provides the description of the data collection used to gain ethical clearance (Ethics No. HREC/16/QGC/329) from the Gold Coast Hospital and Health Service Human Research Ethics Committee. Appendices C and D (pages 338-355) contain the questionnaires used for data collection.
### Table 1.1 Thesis structure

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Section</th>
<th>Title of Manuscripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Introduction: Letter to the editor</td>
<td>Understanding individual engagement in outpatient cardiac rehabilitation programs through the Model of Therapeutic Engagement (Jahandideh et al., 2018f)</td>
</tr>
<tr>
<td>Two</td>
<td>Literature Review</td>
<td>NA</td>
</tr>
<tr>
<td>Three</td>
<td>Systematic Literature Review: Manuscript 1</td>
<td>The process of individual engagement in cardiac rehabilitation: A model-centric systematic review (Jahandideh et al., 2018a)</td>
</tr>
<tr>
<td>Four</td>
<td>Method</td>
<td>NA</td>
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<tr>
<td>Five</td>
<td>Results: Manuscript 2</td>
<td>Prediction models for individual engagement in cardiac rehabilitation programs (Jahandideh et al., 2018b)</td>
</tr>
<tr>
<td>Six</td>
<td>Descriptive Analysis</td>
<td>NA</td>
</tr>
<tr>
<td>Seven</td>
<td>Results: Manuscript 3</td>
<td>Understanding individual intention to engage in outpatient cardiac rehabilitation programs based on the Model of Therapeutic Engagement (Jahandideh et al., 2018c)</td>
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<tr>
<td>Eight</td>
<td>Results: Manuscript 4</td>
<td>The process of individual engagement in cardiac rehabilitation programs (Jahandideh et al., 2018d)</td>
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<tr>
<td>Nine</td>
<td>Results: Manuscript 5</td>
<td>How do socio-environmental barriers impact on the process of individual engagement in cardiac rehabilitation programs? (Jahandideh et al., 2018e)</td>
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<tr>
<td>Ten</td>
<td>Discussion and Conclusion</td>
<td>NA</td>
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</tbody>
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*Note. NA: Not Applicable*
1.8 References


and cardiovascular events after a percutaneous coronary intervention in patients with multivessel disease and incomplete revascularization, Oxford.


Chapter Two

Engagement in Rehabilitation

There is increasing evidence that people must be actively involved or engaged in the process to maximise rehabilitation benefits (Lequerica & Kortte, 2010). However, there is a need to evaluate the complexities of the rehabilitation process to better understand and identify the active mechanisms that facilitate such engagement. This chapter describes the Model of Therapeutic Engagement (MTE) (Lequerica & Kortte, 2010), which underpins this research, in order to operationalise its components in the context of cardiac rehabilitation (CR). By investigating this multi-layered model using advanced statistical models such as structural equation modelling (SEM), it will become possible to more fully understand the complex process of engagement.

2.1 The Model of Therapeutic Engagement in Rehabilitation

The MTE (Lequerica & Kortte, 2010) conceptualises the concept of engagement as both a process and as an individual state. Therefore, at the time, the MTE provided new insights into influential factors that lead to individual engagement over time. Lequerica and Kortte (2010) proposed a model of engagement that captured this complexity. Figure 2.1 depicts the components of the MTE in rehabilitation. The MTE conceptualises engagement as a complex multi-stage process influenced by interacting multiple factors at different points in time. The model also incorporates multiple dimensions of engagement, including interest, motivation, persistence, and effort. At each stage of the model, a set of predictors was proposed. The MTE suggested that perceived need, outcome experiences and perceived self-efficacy help to shape the willingness of a person to consider treatment (see Figure 2.1, Stage One). Consequently, this pre-intentional or motivational stage leads to the behavioural intention to either become engaged in treatment or not (Lequerica & Kortte, 2010).
The dynamic evolution of individual rehabilitation service begins with a process of preparation. A collaborative process may occur between the individual and care provider to establish goals and treatment planning at this stage (see Figure 2.1, Stage Two). Individual involvement in the preparation process has been shown to have a positive impact on their therapeutic engagement (Ozer & Kroll, 2002; Swann & Rosenbaum, 2018).

In this conceptualisation of the process of engagement, preparation is followed by a feedback loop where individuals assess the advantages and disadvantages of engagement and make decisions based on their experience, on whether to continue the activity or disengage. Individual expectations of the rehabilitation programs may or may not be met. The reassessment of previous attitudes, beliefs and expectations may support an individual to make a decision to continue with the program or not. This reassessment is an important regulatory step in the process of engagement (see Figure 2.1, Stage Three), since it ‘regulates’ the degree of engagement. At this point, the therapist and individual may need to control goals and/or adjust the treatment plan to take full advantage of the preferred individual outcomes. The whole Model of Therapeutic Engagement (MTE) as proposed by Lequerica and Kortte (2010) is shown in Figure 2.1. Then, each of the stages in the model, and their components, are further described below, together with evidence that supports each component.
Figure 2.1 The conceptual framework of the Model of Therapeutic Engagement (Lequerica & Kortte, 2010)²

² Figure 2.1 adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, American Journal of Physical Medicine & Rehabilitation, 89, 418. Copyright Year by “Wolters Kluwer”. 
Stage one: Intention to Engage in Cardiac Rehabilitation Programs

Intentions are self-instructions to accomplish particular behaviours or to acquire positive outcomes (Triandis, 1979) and are usually measured by endorsement of items such as ‘I intend to do X’! Forming a behavioural or goal intention signals the end of the deliberation about what one will do and defines how hard one is prepared to try, or how much energy one will exert, in order to achieve the stated desired outcomes (Ajzen, 2011; Gollwitzer, 1999; Webb & Sheeran, 2005). Intentions, thus, are expected to capture the motivational factors that impact on behaviour (Ajzen, 2011). Theories of attitude-behaviour relations, models of health behaviour, and goal theories all agree on the idea that intention is the key factor influencing behaviour (Abraham, Sheeran, & Johnston, 1998; Austin & Vancouver, 1996; Eagly & Chaiken, 1993).

Figure 2.2 Stage one of the Model of Therapeutic Engagement, intention to engage in cardiac rehabilitation programs³

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³ Figure 2.2 adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, American Journal of Physical Medicine & Rehabilitation, 89, 418. Copyright Year by “Wolters Kluwer”.
Predictors of Intention to Engage or not

Given that evidence suggests that intention is a significant predictor of behaviour, then this motivates the investment of resources, skills, opportunities, and cooperation in order to perform behaviours effectively (Liska, 1984). Intention is also an intermediate outcome in its own right, since it has its own predictors: individuals need to be motivated to change their habits.

In the MTE evaluated and extended in this thesis, three concepts are proposed to play a significant role in an individual’s intention to engage in the treatment or program: their (a) perceived need for treatment, (b) outcome expectancies, and (c) perceived self-efficacy (Schwarzer, 2001). This stage of the MTE (Figure 2.2) is derived from the Health Action Process Approach (HAPA) (Schwarzer, 2001) with the difference being that the MTE embeds perceived self-efficacy, perceived need, and outcome expectancies into both an individuals’ perception of self as well as individuals’ impression of the treatment environment, instead of focusing only on individuals’ perception of self, as is the case with the HAPA.

**Perceived Need for Treatment.** In the context of rehabilitation, the first precondition to create the intention to modify one's behaviour is the knowledge, or perception, that current behaviour may increase the risk of further cardiac events. The motivation to actually engage in a health program is generally formed by understanding that such treatment is necessary to achieve a positive health outcome (Schwarzer, 2001). Studies examining illness perception after Myocardial Infarction (MI) have found that an individual’s beliefs and perceptions about their illness are key determinants of recovery after MI (Petrie, Cameron, Ellis, Buick, & Weinman, 2002; Princip et al., 2018).

Although previous research has focused on the role of an individual’s perception of illness for measuring perceived need for treatment, the MTE embeds perceived needs into
both an individual’s perception of self and an individual’s impression of the treatment environment instead of focusing on only an individual’s perception of self. Lequerica and Kortte (2010) proposed that the individual’s perception of their disease couples with the perception of their treatment environment, which they called perceived treatment benefits. The individual’s perception of their disease, as focused on in previous research, does not completely represent the perceived need for treatment (Lequerica & Kortte, 2010). Therefore, perceived potential benefits of the treatment also act as a complementary component of perceived need. Consequently, the present research takes a new approach to integrating the concept of perceived need into the process of individual engagement in the CR programs.

Outcome Expectancies. Another significant motivator in changing one’s behaviour and potentially engaging in a treatment program are the expected outcomes arising from this behavioural change. Often these outcomes need to be considered in terms of advantages and disadvantages before one can make an effective behavioural change. In some circumstances, an individual may not consider that the outcomes are sufficiently significant to engage into action (Schwarzer, 2001). In a study undertaken by Blanchard et al. (2015) based on a sample of CR participants, the findings demonstrated that women with higher outcome expectations were more likely to be active in modifying their behaviour, whereas the opposite was true for women with lower outcome expectancies.

In the MTE, the concept of outcome expectancies is defined by two sub-components a) perceived likelihood of a successful outcome, and b) perceived value of outcome on quality of life. Indeed, the proposed MTE adds perceived value of outcomes on quality of life to the HAPA of Schwarzer (2001), based on the model of Atkinson (1964). Taking this one step further, Geelen and Soons (1996) presented an application of this addition for rehabilitation programs. The theoretical MTE suggests that treatment expectations which lead to a particular outcome may be insufficient to motivate an individual to engage in medical
rehabilitation if the individual does not value the predicted outcomes (Lequerica & Kortte, 2010). The current study progresses this idea further, by refining this concept of outcome expectancies in the process of individual engagement in the CR program, through consideration of both the expectation of a successful outcome as well as the perceived value of such an outcome.

**Perceived Self-efficacy.** Self-efficacy relates to an individual’s beliefs in their abilities to successfully complete a task (Bandura, 1991). For example, self-efficacy influences the quality and the nature of decisions related to ceasing cigarette smoking (Taniguchi et al., 2018), and in the adherence to medical recommendations (Shen & Maeda, 2018). Thus, the intention to alter a behaviour relies on an individual’s belief in his/her ability to succeed in the task (Schwarzer, 2001). A meta-analysis showed that self-efficacy is moderately associated with health-related quality of life among individuals with cardiovascular disease after surgery or during CR programs (Banik, Schwarzer, Knoll, Czekierda, & Luszczynska, 2018).

This element of the model has been described as an individual’s judgment of his/her ability to perform a course of action needed to obtain a particular goal (Smits & Zvolensky, 2006). Although self-efficacy overlaps with the construct of self-confidence, the latter tends to be a more general construct that could apply across many different tasks, while self-efficacy tends to be task-specific. In the literature on health behaviour change, perceived self-efficacy has been shown to be a stronger predictor of behavioural intention and performance of health-promoting activity than the perceived importance or risk appraisal (Gao, Xiang, Lee, & Harrison, 2008; Seydel, Taal, & Wiegman, 1990).

In the MTE, perceived self-efficacy can result from an individual’s belief about self in the context of their perception of the treatment environment. In other words, the MTE illustrates perceived self-efficacy to be an explicit belief in one’s ability to meet the demands
of treatment. Despite the fact that perceived self-efficacy is well-studied in the CR context, a novel approach is applied in the current study, which views the process of forming behavioural intention within both an individual’s belief about self (awareness of capabilities) and also in the context of the individual’s impression of their environment (perceived treatment demands).

**Stage Two: Cardiac Rehabilitation Initiation (i.e. attendance)**

![Diagram of Stage Two: Cardiac Rehabilitation Initiation](image)

**Figure 2.3** Stage two of the Model of Therapeutic Engagement, CR initiation

According to the MTE, behavioural intention is followed by preparation for engagement, which consists of the setting of rehabilitation goals and development of a treatment plan to obtain those goals (Lequerica & Kortte, 2010). This process of preparation is proposed as requiring a significant amount of energy from both individual and practitioner. The goal setting and treatment planning should be a collaborative endeavour between the individual and care provider (Maruish, 2002). Considering the individual in this preparation process has been revealed in several studies to have a positive effect on therapeutic engagement (Siegert & Taylor, 2004; Swann & Rosenbaum, 2018; Leach, Cornwell, Fleming, & Haines, 2010).

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4 *Figure 2.3* Adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, *American Journal of Physical Medicine & Rehabilitation, 89*, 418. Copyright Year by “Wolters Kluwer”.

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Goal setting in CR is a process that happens in both clear and hidden ways (Stone & King, 2007). Specifically, therapeutic goals are often not discussed with individuals in CR programs (Stone & King, 2007).

De Melo Ghisi and colleagues (2013) documented that the recommendation and endorsement by a physician is one of the important reasons identified by individuals for attending a CR program. In making a referral to CR, the referring physician is communicating the goal of improving their individuals’ cardiac outcomes. By approving these programs as beneficial, referring physicians increase the chance of individual attendance and adherence to recommended interventions. These physician goals are clear to those familiar with chronic disease care programs such as CR; however, seldom are they specifically communicated to individuals. Similarly, individuals sometimes fail to obviously categorise or articulate their own goals for CR (Gohlke et al., 2000).

The purpose of goal setting in CR is to promote the individual’s health, clinical, educational, and behavioural outcomes (Stone & King, 2007). Common individual goals for CR are: to improve their sense of wellbeing, lose weight, and cease smoking (Holtrop et al., 2006). Based on a first assessment, referring physicians’ goals for individuals typically include reducing cardiovascular disease risk factors and elevating participation rates in exercise programs (Gordon, 1997). CR programs, therefore, involve the collective goals of individuals and referring physicians delivered within a structured, multi-disciplinary clinical practice environment (Stone & King, 2007). According to Stone and King, the efficient delivery and utilisation of CR services necessitate the alignment of goals among the individual, the referring physician, and the CR program. This type of alignment is thought to contribute to the maintenance of the individuals’ motivation in CR programs (Hughes & Mutrie, 2006).
Diverse methods have been applied to set goals in the rehabilitation and behaviour modification programs. These include physician-directed (Farin, Frey, Glattacker, & Jäckel, 2007; Hurn, 2006), computer generated (Levetan et al., 2005; Levetan, Dawn, Robbins, & Ratner, 2002), individual formulated (Rosewilliam, 2011), and collaborative goal setting which involves both the individual and the healthcare practitioner (Bodenheimer & Handley, 2009). The studies cited before indicate that goals have mostly been set by the individual’s referring physician, prior to starting the CR program. These physician-directed goals have mainly concentrated on using pharmacotherapy to reduce clinical risk factors such as blood pressure (Okpechi et al., 2011; Weinberger, Glazer, Crikelair, & Chiang, 2010; Yokokawa et al., 2011) and cholesterol levels (Foger & Patsch, 2011; Friedman, Rajagopalan, Barnes, & Roseman, 2011; Olsson et al., 2011). Similar to physician-generated goals, computer-generated personalised goal setting has been reported to decrease the levels of glycated haemoglobin (HbA1c) among people with diabetes (Levetan et al., 2002) and achieve equivalence by using lipid-lowering agents used in managing cholesterol levels (Levetan et al., 2005) in people affected with cardiovascular disease. In general, these goals relating to clinical risk factor reduction increasingly stress the application of evidence-based clinical practice guidelines relevant to pharmacotherapy for secondary prevention (De Backer & Group, 2002).

In comparison with traditional clinician-directed goals, collaborative goal setting has been reported to increase individual participation in rehabilitation programs and also encourage healthy behaviours (Cameron et al., 2018; Leach et al., 2010; MacGregor et al., 2006). As a consequence, person-centred care is appearing as a progressively common approach in the health environment (Luxford, Safran, & Delbanco, 2011) and collaborative goal setting involving both the individual and a multi-disciplinary health group, is extensively recommended (Puczynski et al., 2005). The amount of energy devoted to
preparation for CR is likely to be specified by a collaborative and comprehensive goal setting effort that obviously outlines the individual’s goals and how they will be obtained. For all of these reasons, the MTE reflects the expectations that this type of goal setting will lead to improved engagement in CR.

**Individual perceptions regarding person-centeredness in goal setting and influencing factors**

Individuals commence rehabilitation programs with diverse values, beliefs, expectations and personalities (Baker, Marshak, Rice, & Zimmerman, 2001). Person-centred care is characterised as “respectful of, and responsive to, individual preferences, needs and values and ensuring that patient values guide all clinical decisions” (Institute of Medicine, 2001, P. 40). Promoting person-centred care can begin through shared goal setting (Ryan & Boss, 2018).

Studies have revealed the importance of an individual’s desire to have dynamic participation in goal setting in CR (Baker et al., 2001; Fernandez, Rajaratnam, Evans, & Speizer, 2012; Moore & Kramer, 1996). In addition, clinicians have suggested that individual participation in physical therapy goal-setting is an important part of sustainable high-quality care (Baker et al., 2001). However, individuals in CR programs often reported that their treatment goals were not satisfied and that they were passive participants (Moore & Kramer, 1996). Individuals often attributed their lack of active participation to: limitations that prevented them from participating in CR goal setting (e.g. due to ill health); inadequate access to information (Fernandez et al., 2012); and their failure to accept their state, especially in the early stages of CR (Pâquet, Bolduc, Xhignesse, & Vanasse, 2005). Individuals have also described specialists and the healthcare system as narrow-minded and strict regarding treatment goal setting (Cott, 2004; Young, Manmathan, & Ward, 2008).
Greater collaborative focus on goal achievement may allow rehabilitation workers to be more proactive, and so respond more flexibly to clients’ changing needs (Cott, 2004; Holliday, Ballinger, & Playford, 2007; Young et al., 2008).

**Stage Three: Maintenance of Participation in CR Programs**

![Diagram](image)

**Figure 2.4** Stage three of the Model of Therapeutic Engagement, maintenance of participation in cardiac rehabilitation programs

This active stage of engagement contains a feedback loop where the costs and benefits of engaging in rehabilitation are reassessed, and decisions are made as to whether to continue the activity or to disengage. The experience may, or may not, meet the individual’s expectations. Individuals may develop great satisfaction and believe that they are achieving the expected outcomes of the program. In this case, individuals are expected to participate in the program. Otherwise, those who feel that they are under-achieving in meeting expected outcomes may experience feelings of frustration and failure, and so are likely to disengage.

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5 *Figure 2.4* Adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, *American Journal of Physical Medicine & Rehabilitation*, 89, 418. Copyright Year by “Wolters Kluwer”.

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with the program. This reassessment of attitudes and beliefs in the face of indication from the subjective experience of engagement is an important regulatory step. Notably, it may need the therapist and individual to regulate goals and/or change the treatment plan to improve the desired outcome and to sustain motivation (Lequerica & Kortte, 2010).

**Predictors of Maintenance of Participation in CR Programs**

An individual’s experience of rehabilitation is heavily dependent on the way in which services are delivered. In this regard, person-centred care is increasingly being accepted as a priority of the health system. For person-centred care to be achieved, and to know the target of quality improvement, we require further insight into individuals’ experiences when encountering the healthcare (or rehabilitation) system (Abrahamsen Grøndahl, Hall-Lord, Karlsson, Appelgren, & Wilde-Larsson, 2013). Researchers are introducing methods of examining individuals’ experience of the healthcare system and its individual service delivery organisations (Bleich, Ozaltin, & Murray, 2009). The measurement of individual experience mainly addresses rehabilitation services, as coordination and continuity of care are often challenged by medical complexity and comorbidities, and the involvement of multiple healthcare professionals across care settings (McLeod, McMurray, Walker, Heckman, & Stolee, 2011; Toscan et al., 2012). Currently, there is a large and growing body of literature on methods for measuring the individual’s experience (Ahmed, Burt, & Roland, 2014; Beattie, Lauder, Atherton, & Murphy, 2014; Garratt, 2008).

The decision to preserve an adopted behaviour pattern is also believed to depend on a person’s satisfaction with the outcomes they have previously gained from that behaviour pattern (Rothman, 2000; Turk-Adawi, Oldridge, Tarima, Stason, & Shepard, 2013). A feeling of satisfaction tends to indicate the correctness of the initial decision to change the behaviour; furthermore, it promotes the critical effort people must put forth to control their behaviour.
and minimise vulnerability to relapse. People opt to preserve a behaviour in order to maintain a favourable situation and attempt to avoid an alternative, less favourable state. Therefore, the decision processes guiding behavioural maintenance can be conceptualised as a self-regulatory avoidance-based system where the progress is reflected by a continuous discrepancy between a current state and an undesired reference one (Carver & Scheier, 1990).

How do people ascertain if they are satisfied with the results afforded by a new pattern of behaviour? People can monitor the influence of their behavioural change on how they feel, what they can or cannot do, and the quality of their interactions with families and friends. However, how do they determine the value of these outcomes? For instance, although people may find it reinforcing to be praised about a loss of weight, they still may find it difficult to say if they have received enough compliments to justify their efforts. In such situations where ambiguity exists, people may tend to compare their achievements with an available standard (Festinger, 1954; Rothman, 2000). In addition, people often evaluate their obtained outcomes using their expectations as a standard (Bishop, Mintken, Bialosky, & Cleland, 2018; Gollwitzer, 1996).

A study conducted with CR and orthopaedic rehabilitation participants who maintained a change in their behaviour over an extended period of time revealed that successful participants reported a high level of satisfaction with how the change impacted their lives (Fleig, Lippke, Pomp, & Schwarzer, 2011). In a similar manner, Dalle Grave, Calugi and Marchesini (2014) found that satisfaction with results attained was associated with long-term weight loss maintenance. The success or failure of participants did not vary with their initial weight nor with the amount of weight they had lost during the treatment program, signifying that these factors did not impact on their judgments. Some research showed that decisions to adopt or initiate a behaviour may be motivated by different factors than decisions to sustain a behaviour (Kwasnicka, Dombrowski, White, & Sniehotta, 2016;
Sniehotta, Schwarzer, Scholz, & Schüz, 2005; Gollwitzer & Oettingen, 2015). For instance, initiation may be based on perceived expectations of the outcomes of the behaviours, whereas, maintenance may be based more on perceived satisfaction with the outcomes (Kwasnicka, Dombrowski, White, & Sniehotta, 2016). Further, some support has been found for the notion that long-term maintenance may be undermined by expectations that are overly optimistic, perhaps because actual outcomes may be deemed by individuals as not to be reasonable under these circumstances.

2.2 Socio-environmental barriers influencing Engaging in Cardiac Rehabilitation Programs

Socio-environmental factors may serve as either barriers or facilitators to the CR engagement program with facilitators of engagement inherent in the process of overcoming barriers. In the Model of Therapeutic Engagement, the role of socio-environmental barriers is remarkably absent. However, barriers have played a critical role in most other health behaviour models to date. For instance, barriers are central to the Health Belief Model (Becker, 1974; Janz, 1984), which is one of the more established theoretical models designed to explain and predict health behaviour. The evidence available about the role of perceived CR barriers (Resurrección, Motrico, Rubio-Valera, Mora-Pardo, & Moreno-Peral, 2018; Rogerson, Murphy, Bird, & Morris, 2012; Rouleau et al., 2016) suggests that they need to be included in the MTE as factors that contribute to the perceptions weakening the relationships between the proposed variables within the MTE. In carefully dissecting the literature, the barriers to engaging in CR programs may occur at the three stages of the MTE, with each stage having its specific barriers. For example, an individual’s decision to enrol in the programs may be influenced by: travel to exercise sessions; program fees; managing scheduling conflicts; healthcare provider recommendations; and family and peers’ opinion.
about CR programs (Resurrección, Motrico, Rubio-Valera, Mora-Pardo, & Moreno-Peral, 2018; Rogerson, Murphy, Bird, & Morris, 2012; Rouleau et al., 2016). Individual participation in CR programs may also be impacted by: physician referral; family support and encouragement; physician support and follow-up; caring and supportive staff; and experiencing positive health outcomes (Banerjee, Grace, Thomas, & Faulkner, 2010). There are no prospective studies investigating the impact of CR barriers on each stage of the process of engagement among people who experienced cardiac events. Given the importance of CR barriers in the process of engagement, the thesis expands the MTE to clarify the role of CR barriers in the process of engagement.

2.3 Conclusion

Engagement in the rehabilitation process is critical for individuals to fully benefit from rehabilitation interventions (Lequerica & Kortte, 2010). Understanding how and why individuals engage can form a firm basis for designing appropriate interventions to facilitate the attainment of goals to achieve the best possible outcomes. By basing the current study on evaluating the MTE and applying that model to a broader socio-environmental context, we move the field toward understanding the process of individual engagement in CR programs and how to make this process more effective.

The MTE conceptualises the process of engagement as beginning with the willingness of an individual to engage in treatment. It then describes how personal and environmental variables play a role in whether an individual engages in treatment or not (Lequerica & Kortte, 2010). Although Lequerica and Kortte (2010) have delineated the beginnings of a theoretical model for conceptualising the overall process of engagement, the model is yet to be implemented and evaluated empirically, to determine how well the concepts translate into practice. In the current series of studies, the theoretical MTE in
medical rehabilitation, as designed by Lequerica and Kortte (2010), will be examined in a specific population of CR participants. Thus, the research aims to provide a more comprehensive view of the concept of individual engagement as both a process and an individual state in CR programs, whilst acknowledging the role of socio-environmental barriers in different stages of this process. However, the MTE needs to be expanded in the future to lead to a clearer understanding of the role of both CR facilitators and barriers in the process of engagement.

The first stage of the model is formed when the individual is hospitalised after an acute cardiac event. During this stage, the individual’s willingness to engage in an outpatient CR program is shaped by their participation in the inpatient CR programs. This experience interacts with existing individual factors, such as self-efficacy and perceived need to form intention to engage. Stages two and three of the MTE occur after the individual has been discharged from hospital. Sustained engagement in CR in these stages is reliant on active participation in the design of the rehabilitation program and experiences during that program. In this study, the three stages of the MTE will be applied to demonstrate the process of engagement from hospital discharge to completion of the program.

This thesis primarily addresses the research question ‘Does the MTE adequately explain the engagement process in outpatient CR?’ Specifically, this research will evaluate the propositions made in the three stages of the MTE. It also proposes that individual, social, and environmental factors will act as barriers that moderate the relationships identified at each stage of the MTE. The role of broader individual, social, and environmental barriers at each stage of the MTE will be examined. The way in which these factors impact on participants will be explored through quantitative data using an advanced statistical model such as SEM. The series of propositions contained in this thesis are as follows.
Based on the original Model of Therapeutic Engagement (MTE) (Lequerica & Kortte, 2010) it is expected that:

1. Perceived need, outcome expectancies, and perceived self-efficacy will be associated with individual intention to engage in CR programs;
2. Individual intention to engage in CR programs will be associated with CR preparation (goal setting and treatment planning);
3. CR preparation (goal setting and treatment planning) will be associated with CR initiation;
4. CR initiation will be associated with individual engagement in CR programs;
5. Individual engagement in CR programs will be associated with individual analysis of experience;
6. Individual analysis of experience will be associated with CR program maintenance;
7. CR program maintenance will be associated with individual engagement in CR programs;

Based on other research in the area of engagement, it is expected that:

8. Socio-environmental barriers will moderate the proposed relationships within the MTE;
9. In particular, enumerating the number of socio-environmental barriers will affect individual engagement.
2.4 References


Calugi, S., Marchesini, G., El Ghoch, M., Gavasso, I., & Dalle Grave, R. (2018). The association between weight maintenance and session-by-session diet adherence,


Chapter Three

The Process of Patient Engagement in Cardiac Rehabilitation: A Model-Centric Systematic Review

Lequerica and Kortte (2010) have developed the most comprehensive Model of Therapeutic Engagement (MTE) in the context of brain injury rehabilitation. In this model, the construct of therapeutic engagement is explicitly defined by identifying a series of sub-models that explain the intention to engage in rehabilitation, initiation of rehabilitation and maintenance of participation in rehabilitation programs. No previous research has investigated this multi-layered model to determine its utility in the context of any rehabilitation settings. This chapter presents a model-centric systematic review of the process of individual engagement in cardiac rehabilitation. It includes a systematic review that compiles the current evidence on each stage of the MTE.

The information in this section has been published as a literature review paper in a peer-reviewed journal:


The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Performed data search, article selection against inclusion and exclusion criteria;
- Participated in critical appraisal of included articles;
o Participated in performing quality assessment;

o Wrote the manuscript;

o Prepared the manuscript and submitted to the journal.

Sepideh Jahandideh (16th December, 2018)

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3.1 Abstract

This study aimed to examine existing evidence about the proposed relationships among variables within the three stages of the Model of Therapeutic Engagement (MTE): individual intention to engage in cardiac rehabilitation (CR); CR initiation; and maintenance of participation in CR programs. This model has not yet been examined in any rehabilitation setting. Therefore, this systematic literature review is key to future research and application of the MTE to predict and enhance individual engagement in CR. A model-centric systematic literature review was conducted for each stage of the MTE. Studies were selected if they provided statistical evidence of the relationships between variables contained in the MTE. Few relevant studies met the selection criteria: 8 about variables contained in stage one of the MTE, four on stage two, and six on stage three. The tenets of the MTE were supported in the first stage, individual intention to engage in CR. However, there was less evidence quantifying the proposed relationships among variables that impact on CR initiation and maintenance of participation in CR programs. There is a scarcity of research examining rehabilitation engagement in depth to better understand the complicated process contributing to behavioural outcomes. No decision support models currently exist to alert individuals and healthcare provider to the factors that influence non-engagement.

**Keywords:** Cardiac rehabilitation; Model of Therapeutic Engagement; Intention; Initiation; Maintenance
3.2 Introduction

Cardiovascular and circulatory diseases account for the prominent causes of death in the world (Naghavi et al., 2015). However, death statistics alone are not adequate to describe the real impact of heart disease because many people live with heart disease for extended periods. In these cases, heart disease causes a significant negative impact on quality of life of individuals (Verberne, Moulaert, Verbunt, & van Heugten, 2018), as well as on people around them (van’t Wout Hofland, Moulaert, van Heugten, & Verbunt, 2018).

Cardiac Rehabilitation (CR) programs are multidisciplinary interventions which include individual assessment, nutritional counselling, risk factor management, psychosocial intervention, and physical activity and counselling complemented by exercise training, to stabilise, slow, or reverse cardiovascular disease and facilitate prevention of further cardiac events (Watchie, 2009). Over the years, a great deal of research has focused on the outcomes achieved by individuals who participate in rehabilitation, with participation often being defined as the number of sessions individuals attend (Dunlay, Pack, Thomas, Killian, & Roger, 2014; Gardiner et al., 2017; Lequerica & Kortte, 2010). However, knowledge is lacking about the factors that contribute to the process of individual engagement in rehabilitation (Smart, Aulakh, McDougall, Rigby, & King, 2017).

There have been several recent attempts to develop a more holistic conceptualisation of rehabilitation process participation (Blanchard, Arthur, & Gunn, 2015; Medley & Powell, 2010; Selzler, Rodgers, Berry, & Stickland, 2016). One of the more important constructs to emerge from this literature is engagement (Lequerica & Kortte, 2010). Rehabilitation engagement has been described as a multi-component construct, comprising elements such as treatment attitudes, understanding of treatment necessity, motivation, attendance, participation, and involvement in therapy activities (Medley & Powell, 2010). Positioning
engagement at the centre of the rehabilitation process enables a more thorough understanding of this complex process, and also prediction of the likely outcomes.

Interest in the engagement process has been persistent, but the main goal in previous research has been to identify single variables that facilitate or hinder rehabilitation engagement. Important variables have been disparately identified and studied. For instance, some researchers have focused on how an individual’s knowledge about rehabilitation and its goals has facilitated participation (Cox, Oliveria, Lahham, & Holland, 2017; Lequerica & Kortte, 2010). Although this piecemeal approach has revealed important findings about significant constructs related to each rehabilitation engagement stage, no overarching understanding of the engagement process has been provided. As such, the application of a theoretical model incorporating multiple CR stages and identifying the active mechanisms that inter-combine in complex ways may facilitate individual engagement. Lequerica and Kortte (2010) presented a theoretical Model of Therapeutic Engagement (MTE) aimed at clarifying how and why individuals engage in rehabilitation programs. Although evidence supports individual MTE components, the complete model is yet to be evaluated in any rehabilitation population. Thus, the applicability of the model to CR remains unknown.

The main aim of this review is to examine the evidence for the three stages proposed within the MTE (Figure 3.1, p. 67). Specifically, we will compile the evidence for each of the main relationships created in each of the three stages of the MTE. The main relationships embodied by each stage of the MTE are:

1. Intention to engage in CR is associated with higher levels of perceived need, positive outcome expectancies, and perceived self-efficacy.

2. Initiation of CR (i.e. attendance) is positively associated with greater investment in collaborative goal setting and treatment planning.
3. Maintenance of participation in CR programs (i.e. completion) is associated with positive evaluation of the experience, perceived progress and quality of engagement.

This study introduces a model-centric systematic literature review to examine the existing evidence for the MTE. Further empirical research can be guided by defining the relationships between the proposed-MTE variables that can be investigated by statistical models.

3.3 A New Method of Model-Centric, Systematic Literature Review

The MTE has been proposed based on theoretical principles derived from prior research. To evaluate how much the MTE can be explained in practice, a systematic review or a systematic review combined with a meta-analysis need to be conducted. A systematic review is a formal, systematic and structured approach to review all the relevant literature on a topic with different aims, methods, data collections, and analyses (Guitart, Pickering, & Byrne, 2012; Pickering & Byrne, 2013; Roy, Pickering, & Byrne, 2012). Thus, the flexibility of a systematic review makes it an appropriate method for Meta-analysis, which is a statistical method used to combine the numerical results from such studies, if it is possible to do so. Often studies produce results that are too different to combine using statistical techniques. As such, systematic reviews often include a meta-analysis, but not always. Therefore, conducting a meta-analysis is largely advantageous if the available data from systematic review studies makes doing so possible (Green & Higgins, 2005). As the number of studies in the systematic review was inadequate to examine each proposed relationship in the MTE, pooling such findings may lead to inaccurate outcomes. Therefore, in the present study, the Systematic Quantitative Literature Review methodology (Pickering, Grignon, Steven, Guitart, & Byrne, 2015) has been used to collate evidence about the relationships between
Figure 3.1 The conceptual framework of the Model of Therapeutic Engagement (Lequerica & Kortte, 2010), with arrows indicating how various inputs are related to intermediate outputs: intention to engage in CR programs (Stage One), CR initiation (Stage Two), and maintenance of participation in CR programs (Stage Three).

Note. This image was used for the copyright purpose of criticism and review.
MTE variables. However, a novel extension of this methodology is proposed by identifying and explicating literature relevant to each relationship proposed in the MTE (Figure 3.1, p. 67). This method enabled the synthesis of the current CR engagement research into the framework of MTE, with the final aim of evaluating what components of this model could be supported by evidence already available in the published literature.

3.3.1 Materials and Search Procedures

Three steps were undertaken in conducting this study. The first step was following up the MTE citations in order to make sure that the MTE had not been evaluated already in any rehabilitation setting (Lequerica & Kortte, 2010). The second step was identifying appropriate search terms related to the MTE concepts in CR settings. The constructs and proposed relationships at each MTE stage were formally represented as three distinct sub-models. Therefore, the dependent and predictor variables for each stage of the model were clarified, and relevant terms were selected for each variable. As the overall model was not yet well established or clearly defined, the terminology was diverse and broad (see Table 3.1). In the third step, once these terms were identified, three systematic searches were conducted of appropriate electronic databases (Cinahl, Cochrane, Embase, Proquest, Pubmed Central, ScienceDirect, Scopus and Web of Science) using the relevant search terms. Records identified through citations on the MTE were screened and separated, based on each stage of the MTE. The searches were conducted on 13 January 2017 with no time limitations. The initial search resulted in 67 papers identified through citations on the MTE, spread between 2010 and 2017; 548 papers for the first stage of the MTE; intention to engage in CR program; 466 papers for the second stage of the MTE, CR initiation; and 786 papers for the third stage of the MTE, maintenance of participation in CR programs.
Table 3.1 Key search terms used for each stage of the Model of Therapeutic Engagement

<table>
<thead>
<tr>
<th>Stages</th>
<th>Key search terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage one</td>
<td>“Cardiac rehabilitation” AND self-efficacy AND outcome expectancies AND “perceived need” AND (“risk awareness” OR “risk appraisal” OR “risk perception”) AND intention.</td>
</tr>
<tr>
<td>Stage two</td>
<td>(cardiac rehabilitation) AND (initiat* OR attend*) AND ((collaborative OR participatory OR shared OR person-centered OR individual*) AND (decision OR planning OR goal setting))</td>
</tr>
<tr>
<td>Stage three</td>
<td>Cardiac rehabilitation AND (participation or completion OR adherence OR compliance OR maintenance OR engagement) AND ((experience OR perceived OR subjective) AND (progress OR benefit OR improvement))</td>
</tr>
</tbody>
</table>

3.3.2 Inclusion Criteria, Exclusion Criteria, and Data Extraction

Exclusion criteria were non-English language, books, theses, conference abstracts, reviews of the literature, and qualitative studies. Studies were included if (a) they measured the MTE concepts in CR settings, regardless of the concept label, and (b) tested the relationships between concepts in the MTE using causal/predictive tests or statistical analysis, such as correlations, group difference analyses or regressions. The remaining studies were first screened for duplication. The process of selection is shown via a PRISMA study flow diagram for each stage (Figures 4.2, 4.3, and 4.4). Tables 4.2, 4.3, and 4.4 contain a summary of the selected studies relevant to each stage of the MTE. The key information included title, year, author, setting, sample size, study design, relevance of findings regarding the MTE, predictor variable names, data analysis method, and theory or model evaluated. Thus, this process makes visible the strength of evidence supporting each relationship, and permits an overall assessment of gaps and weaknesses in evidence across all studies relevant to the MTE.
hypotheses encapsulated in their conceptual framework for therapeutic engagement. Three reviewers were involved at all stages of data extraction where uncertainties were encountered.

**Figure 3.2** Search results for the first stage of the Model of Therapeutic Engagement: Intention to engage in cardiac rehabilitation programs
Figure 3.3 Search results for the second stage of the Model of Therapeutic Engagement:
Cardiac rehabilitation initiation
Records identified through database searches for stage 2 of the Model of Therapeutic Engagement (n = 786)
- Cinahl (n = 97)
- Cochrane (n = 183)
- Embase (n = 78)
- Proquest (n = 92)
- Pubmed Central (n = 13)
- Sciedirect (n = 29)
- Scopus (n = 131)
- Web of Science (n = 163)

Records identified through Citations to the Model of Therapeutic Engagement (n = 0)

Records After Duplicates Removed (n = 605)

Articles Excluded After Title/Abstract Review (n = 173)
- Non English language (n = 4)
- Books (n = 3)
- Theses (n = 64)
- Conference abstracts (n = 16)
- Editorial (n = 1)
- Reviews of the literature (n = 45)
- Qualitative studies (n = 40)

Relevent Full-text Screened (n = 432)

Articles Excluded After Full-text Reviewed (n = 426)
- No relationships between variables through data (n = 426)

Article Included (n = 6)

Figure 3.4 Search results for the third stage of the Model of Therapeutic Engagement: Maintenance of participation in cardiac rehabilitation programs
Table 3.2 Details of the studies included in the review regarding the first stage of the Model of Therapeutic Engagement: Intention to engage in cardiac rehabilitation is associated with perceived need, outcome expectancies, and perceived self-efficacy

<table>
<thead>
<tr>
<th>Study/Country</th>
<th>Setting/Sample size</th>
<th>Design</th>
<th>Relevance of findings regarding the Model of Therapeutic Engagement</th>
<th>Predictor variable names</th>
<th>Data analysis method</th>
<th>Theory/model evaluated</th>
<th>The quality Assessment (Percent Score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakker et al. (2015)/Netherland</td>
<td>Phase II CR program/ n = 149</td>
<td>Cross-sectional study</td>
<td>Only quitters show a positive relation between self-efficacy and intention to abstain from smoking. In the non-quitters, self-efficacy was not related to their intention to quit. Confirmed the impact of self-efficacy on intention to abstain from smoking in quitters.</td>
<td>Self-efficacy</td>
<td>Logistic regression</td>
<td>Attitude-Social Influence-Self-efficacy model (Vries &amp; Mudde, 1998)</td>
<td>100</td>
</tr>
<tr>
<td>de Melo Ghisi et al. (2015)/Canada</td>
<td>Phase II CR program/ n = 306</td>
<td>Quasi-experimental</td>
<td>Self-efficacy, risk awareness, and outcome expectancies were positively correlated to intention formation. However, intentions to engage in exercise were not directly related to behaviour, and so required action planning.</td>
<td>Risk awareness* (used as perceived need), self-efficacy and outcome expectancies</td>
<td>Structural equation model</td>
<td>The Health Action Process Approach (Schwarzer, 2001)</td>
<td>100</td>
</tr>
</tbody>
</table>

Note. *This term is used by the authors to refer to ‘Awareness of deficits’ in the MTE
Table 3.2 Continued

<table>
<thead>
<tr>
<th>Study/Country</th>
<th>Setting/Sample size</th>
<th>Design</th>
<th>Relevance of findings regarding the Model of Therapeutic Engagement</th>
<th>Predictor variable names</th>
<th>Data analysis method</th>
<th>Theory/model evaluated</th>
<th>The quality Assessment (Percent Score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dohnke et al. (2010) / Germany</td>
<td>Phase III CR program / n = 456</td>
<td>Longitudinal prospective design</td>
<td>More positive outcome expectancies and higher self-efficacy found among those who intended to participate in regular phase III CR program than those who did not intend to participate. Risk perception (perceived need) and negative outcome expectancies were not significantly different between intenders and non-intenders.</td>
<td>Self-efficacy and risk perception* (used as perceived need)</td>
<td>Logistic regression</td>
<td>The Health Action Process Approach (Schwarzer, 2001)</td>
<td>92</td>
</tr>
<tr>
<td>Sullivan et al. (2009)/ Australia</td>
<td>Adults with no previous personal history of stroke/ n = 129</td>
<td>Repeated measures design</td>
<td>Susceptibility, benefits, and self-efficacy predicted general intention to engage in exercise and also susceptibility predicted general intention to engage in weight loss.</td>
<td>perceived need (labelled as benefits and susceptibility*) and self-efficacy</td>
<td>Multiple hierarchical Regression</td>
<td>The Expanded Health Belief Model (Janz &amp; Becker, 1984)</td>
<td>86</td>
</tr>
<tr>
<td>Broadbent et al. (2009)/ New Zealand</td>
<td>Phase II CR program/ n = 103</td>
<td>Randomized control trial</td>
<td>Those who received an illness perception intervention reported higher levels of intention to attend rehabilitation classes than the control group.</td>
<td>illness perception* (considered as perceived need)</td>
<td>Statistical tests in SAS and SPSS</td>
<td>N/A</td>
<td>92</td>
</tr>
</tbody>
</table>

Note. * These terms are used by the authors to refer to ‘Awareness of deficits and perceived treatment benefits’ in the Model of Therapeutic Engagement
Table 3.2 Continued

<table>
<thead>
<tr>
<th>Study/Country</th>
<th>Setting/Sample size</th>
<th>Design</th>
<th>Relevance of findings regarding the Model of Therapeutic Engagement</th>
<th>Predictor variable names</th>
<th>Data analysis method</th>
<th>Theory/model evaluated</th>
<th>The quality Assessment (Percent Score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchard et al. (2009)/Canada</td>
<td>Phase II CR program (Home-based CR)/n = 76</td>
<td>Longitudinal prospective design</td>
<td>Self-efficacy did not predict exercise intention for either time interval in individuals receiving home-based CR. Only 3-month intention significantly predicted 6-month exercise behaviour</td>
<td>Self-efficacy</td>
<td>Statistical tests and path analyses in LISREL</td>
<td>Protection Motivation Theory (Rogers, 1983)</td>
<td>85</td>
</tr>
<tr>
<td>Sniehotta et al. (2005)/Germany</td>
<td>Phase II CR program/n = 307</td>
<td>Longitudinal prospective design</td>
<td>Outcome expectancies and risk awareness predicted intention to engage in physical activities. Outcome expectancies also predicted task self-efficacy and risk awareness predicted outcome expectancies and task self-efficacy.</td>
<td>Risk awareness* (considered as perceived need), outcome expectancies, and self-efficacy</td>
<td>Structural Equation Models to test the structural assumptions</td>
<td>The Health Action Process Approach (Schwarzer, 2001)</td>
<td>92</td>
</tr>
<tr>
<td>Bennett et al. (1999)/UK</td>
<td>Coronary Care Unit/n = 43</td>
<td>Longitudinal prospective design</td>
<td>Outcome expectancies predicted intention to engage in a healthy diet and regular exercise.</td>
<td>Outcome expectancies</td>
<td>Statistical tests</td>
<td>Social-cognitive theory (Bandura, 1986)</td>
<td>92</td>
</tr>
</tbody>
</table>

Note. *This term is used by the authors to refer to ‘Awareness of deficits’ in the MTE.
Table 3.3 Details of the studies included in the review regarding the second stage of the Model of Therapeutic Engagement: Initiation of rehabilitation is associated with the experience of collaborative goal setting and treatment planning

<table>
<thead>
<tr>
<th>Study/Country</th>
<th>Setting/Sample size</th>
<th>Design</th>
<th>Relevance of findings regarding the Model of Therapeutic Engagement</th>
<th>Predictor variable names</th>
<th>Data analysis method</th>
<th>Theory/model evaluated</th>
<th>The quality Assessment (Percent Score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hutchinson, Meyer, &amp; Marshall, 2015/ New Zealand</td>
<td>Phase II CR program/ n = 143</td>
<td>Cross-sectional study</td>
<td>Individual attendance at cardiac rehabilitation may increase with individualised care plans that consider cultural differences and improve discharge planning.</td>
<td>Individualised care plan</td>
<td>Statistical analysis in SPSS</td>
<td>N/A</td>
<td>75</td>
</tr>
<tr>
<td>Scane, Alter, Oh, &amp; Brooks (2012)/ Canada</td>
<td>Phase II CR program (home-based CR (n = 100) and center-based CR (n = 100))</td>
<td>Retrospective design</td>
<td>No significant differences in attendance between home-based (presumably more individualised) or centre-based cardiac rehabilitation programs.</td>
<td>Home-based or centre-based program</td>
<td>Statistical tests</td>
<td>N/A</td>
<td>85</td>
</tr>
</tbody>
</table>
Table 3.3 Continued

<table>
<thead>
<tr>
<th>Study/Country</th>
<th>Setting/Sample size</th>
<th>Design</th>
<th>Relevance of findings regarding the Model of Therapeutic Engagement</th>
<th>Predictor variable names</th>
<th>Data analysis method</th>
<th>Theory/model evaluated</th>
<th>The quality assessment (Percent Score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sniehotta, Gorski, &amp; Araújo-Soares, 2010/UK</td>
<td>Phase IV CR community-based program/ n = 103</td>
<td>Prospective cohort design</td>
<td>Action planning (precise plan about where and when individuals planned to attend a scheduled phase IV CR program) was an influential predictor of phase IV CR uptake.</td>
<td>Action planning</td>
<td>Binary logistic regression</td>
<td>Theory of Planned Behaviour (Ajzen, 1991)</td>
<td>85</td>
</tr>
<tr>
<td>Jolly et al., 2007/UK</td>
<td>Phase II CR program (home-based program (n=263) and centre-based program (n = 262))</td>
<td>Prospective study</td>
<td>No significant differences in attendance at physical activity if individuals participated in a home-based (presumably more individualised) or centre-based cardiac rehabilitation program.</td>
<td>Home-based or centre-based program</td>
<td>Logistic regression</td>
<td>N/A</td>
<td>92</td>
</tr>
</tbody>
</table>
Table 3.4 Details of the studies included in the review regarding the third stage of the Model of Therapeutic Engagement: Maintenance of participation in CR programs is associated with analysis and evaluation of the experience and progress

<table>
<thead>
<tr>
<th>Study/Country</th>
<th>Setting/Sample size</th>
<th>Design</th>
<th>Relevance of findings regarding the Model of Therapeutic Engagement</th>
<th>Predictor variable names</th>
<th>Data analysis method</th>
<th>Theory/model evaluated</th>
<th>The quality Assessment (Percent Score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gardiner et al. (2018)/Australia</td>
<td>Phase II CR program / n = 279</td>
<td>Retrospective design</td>
<td>Perception of benefits as a result of CR programs was related to ongoing attendance. Perceived benefits included positive changes to their lifestyle, well-being improvement, and quicker recovery.</td>
<td>Positive changes to lifestyle, well-being, improvement and quicker recovery</td>
<td>Statistical methods in SPSS</td>
<td>N/A</td>
<td>91</td>
</tr>
<tr>
<td>Marzolini, Mertens, Oh, &amp; Plyley (2010)/Canada</td>
<td>Phase II CR program (home-based resistance training (RT)) / n = 518</td>
<td>Retrospective design</td>
<td>Motivating factors to engage, barriers to participation, social influence, program factors and an injury while exercising impacted on individuals’ adherence to the program.</td>
<td>Motivating factors to engage, barriers to participation, social influence, program factors and an injury while exercising</td>
<td>Statistical test in SPSS</td>
<td>N/A</td>
<td>92</td>
</tr>
<tr>
<td>Araya-Ramirez et al. (2010)/USA</td>
<td>Phase II CR program / n = 425</td>
<td>Retrospective design</td>
<td>Attendance 25 or more sessions of CR programs are correlated with more weight reduction and better perception of physical health and function. Moreover, it is related to at least a 23% improving in walking distance.</td>
<td>Improvements in walking ability and perception of physical health and function</td>
<td>Statistical test in SPSS</td>
<td>N/A</td>
<td>83</td>
</tr>
<tr>
<td>Study/Country</td>
<td>Setting/Sample size</td>
<td>Design</td>
<td>Relevance of findings regarding the Model of Therapeutic Engagement</td>
<td>Predictor variable names</td>
<td>Data analysis method</td>
<td>Theory/model evaluated</td>
<td>The quality Assessment (Percent Score)</td>
</tr>
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</tr>
<tr>
<td>Alexander &amp; Wagner (2006)/USA</td>
<td>Phase II CR program / ( n = 153 )</td>
<td>Retrospective design</td>
<td>No relationship has been found between experience of improved individuals’ Health-Related Quality of Life (HRQL) and CR adherence.</td>
<td>Improvement in patients’ Health-Related Quality of Life (HRQL)</td>
<td>Statistical test in SPSS</td>
<td>N/A</td>
<td>86</td>
</tr>
<tr>
<td>Chan, Chau, &amp; Chang (2005)/China</td>
<td>Phase II CR program / ( n = 182 )</td>
<td>Prospective design</td>
<td>Perceived quality of life was not related to level of attendance at CR.</td>
<td>Improvement in patients’ quality of life</td>
<td>Statistical test in SPSS</td>
<td>N/A</td>
<td>85</td>
</tr>
<tr>
<td>Johnson &amp; Heller (1998)/Australia</td>
<td>Phase II CR program (Home-Based Exercise) / ( n = 459 )</td>
<td>Prospective longitudinal design</td>
<td>Individuals perception of their enjoyment was predictors of adherence to regular home exercise.</td>
<td>Self-reported enjoyment</td>
<td>Multivariate logistic regression analysis</td>
<td>N/A</td>
<td>92</td>
</tr>
</tbody>
</table>
3.3.3 Quality Assessment

The Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (QAT-OCCSS; National Institutes of Health, 2014) was applied to appraise the quality of studies. The QAT-OCCSS includes 14 criteria that assess the quality of studies, based on some methodological and reporting factors. These factors included the clarity of the study research objectives, any potential sources of bias (e.g. sample selection, attrition), consideration of confounding variables, study power, the description of the measurement tools, and the robustness of the measurement tools, as well as other common factors related to internal validity. Two reviewers completed this tool for each study (the first and second authors).

3.4 Results: Applying Model-centric Systematic Literature Review to the Model of Therapeutic Engagement

After the selection process, 18 articles were eligible for consideration in this review: 8 for the first stage, intention to engage in CR; 4 for the second stage, CR initiation; and 6 for the third stage, maintenance of participation in CR. A summary of the findings and the characteristics for each of the included studies can be found in Supplemental Table 1 (p. 356). Total quality percent scores ranged from 83% to 100%. The results of the quality assessment also showed that 77% of included studies did not justify sample size, nor a power analysis. In addition, 77% of studies did not measure the impact of confounding variables on the relationships between dependent and predictor variables. Other factors were strongly described in more than 90% of the included studies (see Supplemental Table 1, p. 356). The following section provides a deeper explanation of included articles in this review.
3.4.1 Stage One: Intention to engage in cardiac rehabilitation will be associated with perceived need, outcome expectancies, and perceived self-efficacy

The search criteria and records identified through citations of the MTE returned 548 articles. Of those, 112 were duplicates, 141 articles met the exclusion criteria, and 276 did not specifically examine predictive or potentially causal relationships among the variables in the model. These steps identified 8 relevant articles (see Figure 3.2 and Table 3.2).

Four studies contained a test of the relationship between perceived need and intention formation. All four found that health beliefs and perceptions were significant predictors of intention formation (Broadbent, Ellis, Thomas, Gamble, & Petrie, 2009; de Melo Ghisi, Grace, Thomas, & Oh, 2015; Sniehotta, Scholz, & Schwarzer, 2005; Sullivan, White, Young, & Scott, 2009). The study by Sniehotta, Scholz and Schwarzer (2005) on CVD patients indicated that risk awareness was a significant predictor of intentions ($\beta = 0.11, p = 0.04, n = 307$). Broadbent et al. (2009) focused on individuals admitted with acute myocardial infarction. The intervention group received standard care plus three half-hour individual sessions and one half-hour individual-and-spouse session in hospital with a health psychologist. Findings reported higher intentions to attend outpatient CR programs upon discharge from hospital, in comparison with the control group [Mean = 7.69 (SD = 2.52, n = 52) versus Mean = 5.89 (SD = 3.77, n = 51), t (78) = 2.70, $p < 0.01$]. Other study findings on a sample of at-risk individuals concluded that general intention to exercise was predicted by benefits ($\beta = 0.579, p < 0.05$) and susceptibility ($\beta = 0.143, p < 0.05$) in the Health Belief Model (n = 124), as well as benefits ($\beta = 0.408, p < 0.05$) and self-efficacy ($\beta = 0.257, p < 0.05$) in the Expanded Health Belief Model (n = 124). In addition, susceptibility ($\beta = 0.304, p < 0.05$) predicted general intention for weight loss in the Health Belief Model (n = 61) (Sullivan et al., 2009). In a study of CR participants with heart disease or multiple
cardiovascular risk factors (de Melo Ghisi et al., 2015), findings were that risk awareness was positively related to intention \( r = 0.20, p < 0.05, n = 306 \).

Four of the eight relevant studies demonstrated that outcome expectancies had a positive effect on intention formation (Bennett, Mayfield, Norman, Lowe, & Morgan, 1999; de Melo Ghisi et al., 2015; Dohnke et al., 2010; Sniehotta et al., 2005). The study by de Melo Ghisi et al. (2015) revealed that psychological outcome expectancies were positively correlated with intention \( r = 0.22, p < 0.01, n = 81 \). Sniehotta et al. (2005) showed that outcome expectancies were the significant predictors of intentions \( \beta = 0.25, p < 0.01, n = 307 \) when accounting for the relationships between motivational factors (risk awareness, outcome expectancies, and task self-efficacy) and behavioural intentions.

Dohnke et al. (2010) studied phase III CR participants and found significantly more positive outcome expectancies among actors in a regular phase III CR program (non-intender: Mean = 2.81, SD = 0.72, n = 257; intender: Mean = 3.25, SD = 0.58, n = 60; actor: Mean = 3.60, SD = 0.46, n = 139, \( p < 0.01 \)). In addition, negative outcome expectancies were significantly different between intenders and actors (intender: Mean = 2.00, SD = 0.82, n = 60; actor: Mean = 1.41, SD = 0.57, n = 139, \( p < 0.01 \)). The study by Benneth et al. (1999) involved individuals hospitalised in a coronary care unit (CCU) with a diagnosis of first myocardial infarction. The results showed that outcome expectancies were significantly associated with intention to engage in a healthy diet \( r = 0.35, p < 0.05, n = 43 \) and regular exercise \( r = 0.38, p < 0.05, n = 43 \).

A relationship between perceived self-efficacy and intention formation was confirmed in four studies (Bakker, Nijkamp, Sloot, Berndt, & Bolman, 2015; de Melo Ghisi et al., 2015; Dohnke et al., 2010; Sullivan et al., 2009). Bakker et al. (2015) found that for CR participants, intention to abstain from smoking was significantly lower in smokers (Mean
and also that self-efficacy was lower in smokers (Mean = 0.28, SD = 1.33, n = 46) than quitters (Mean = 0.99, SD = 0.99, n = 103). They found that there was a significant positive relationship between self-efficacy and intention to abstain from smoking in quitters (β = 1.245, p < 0.001, n = 103). However, there was no relationship between self-efficacy and intention in smokers (β = 0.886, p = 0.233, n = 46). de Melo Ghisi et al. (2015) indicated that task self-efficacy was positively related to intention to engage in exercise (r = 0.27, p < 0.01, n = 81). Dohnke et al. (2010) showed that individuals who participated in CR reported higher self-efficacy than those who only intended to participate: maintenance self-efficacy for intenders (Mean = 2.64, SD = 0.79, n = 60) versus actors (Mean = 2.83, SD = 0.93, n = 139); and recovery self-efficacy for intenders (Mean = 3.00, SD = 0.82, n = 60) and actors (Mean=3.31, SD=0.86, n=139). Sullivan et al. (2009) reported that self-efficacy predicted general intention to exercise (β = 0.257, p < 0.05, n = 124) in the Expanded Health Belief Model. Therefore, studies consistently found a strong relationship between self-efficacy and intention. In contrast, another study found no relationship (β = 0.01, p > 0.05, n = 76) between self-efficacy and intention to engage in physical activity at the baseline assessment (Blanchard et al., 2009). This discrepancy may be explained by the small sample size or different study context. One study estimated that a total of 69% of variance in intentions was explained by motivational factors, comprising task self-efficacy, outcome expectancies, and risk awareness (n = 307), based on the theoretical assumptions of the Health Action Process Approach (Sniehotta et al., 2005).

Based on these reviewed studies, significant relationships were found between all three predictors (perceived need, outcome expectancies, and perceived self-efficacy) and intention formation (Table 3.2). Overall, these relationships were consistent across all but
one study and in the expected direction. Thus, the tenets of the MTE were well supported in the first stage.

3.4.2 Stage Two: Initiation of cardiac rehabilitation will be associated with the experience of collaborative goal setting and treatment planning

The search returned 466 articles, of which 100 were duplicates. Another 65 articles were excluded according to the inclusion and exclusion criteria. After reviewing the full text of the remaining articles, another 297 were excluded because they did not test the relationships between variables. Thus, only the 4 remaining articles investigated collaborative goal-setting and treatment planning, and their relationship to initiation of a CR program. Study characteristics are detailed in Table 3.3.

Two of the 4 selected articles investigated home-based or centre-based CR program attendance differences. These were included because a home-based service provision offers participants more flexibility and choice in designing and delivering the program in comparison with hospital-based service (Dalal, Doherty, & Taylor, 2015). Presumably, when services were delivered in individuals’ homes, they were involved in the design, location and/or timing of those services. Scane, Alter, Oh and Brooks (2012) found no significant differences between the mean attendance rate at prescheduled telephone consultations in the home program and prescheduled visits in the traditional program (Home program: 61.1% ± 36.3% (mean ± SD), 95% CI 53.9-68.4, n = 100; Traditional program: 55.6% ± 3.5% (mean ± SD), 95% CI 43.4-54.7, n = 100; p = 0.21); also, no significant difference existed between home and traditional programs regarding program completion (Home program:72/100, traditional program: 64/100; p = 0.22). Jolly et al. (2007) reported no significant differences in undertaking three episodes of minimum 15-minute duration physical activity in a home-
based or center-based CR program at 12 weeks (90.1% (n = 263) versus 93.4% (n = 262), \( p = 0.3 \)).

The two other articles focused on CR individualised planning and attendance. CR attendance may increase when discharge planning for hospital inpatients focuses on responding to specific cultural issues (Hutchinson, Meyer, & Marshall, 2015). Similarly, action planning (precise planning about where and when individuals planned to attend a scheduled phase IV CR program) increased uptake of phase IV CR [\( \beta = 1.22, p < 0.05, n = 103 \)] (Sniehotta, Gorski, & Araújo-Soares, 2010). Thus, the two articles on patient involvement in CR planning and preparation found significant relationships in the expected direction. Specifically, deliberate planning about attendance and attention to any cultural or contextual issues facilitated the translation of intention into action. The finding that home versus centre-based programs were not different in attendance rate, indicated that home-based programs (Scane, 2012) could be a worthy option for patients who would otherwise not initially engage.

3.4.3 Stage Three: Positive analysis and evaluation of the experience and progress will result in maintenance of participation in CR programs

The search returned 786 articles, excluding 181 duplicates and another 173 based on exclusion criteria (as presented in Figure 4.7); 426 did not quantitatively test the relationships between variables. Only 6 articles were identified that investigated the relationship between subjective evaluations of rehabilitation experiences and CR adherence or sustained engagement (see Figure 3.4, Table 3.4).

Of the six selected articles, two measured changes in perceived quality of life in CR patients, which is a common benefit individuals may expect to achieve (Oldridge, 1997).
However, neither showed any relationship with adherence to a program (Alexander & Wagner, 2006; Chan, Chau, & Chang, 2005).

The remaining four articles identified several patient experience factors that were associated with adherence. For example, Johnson and Heller (1998) found that high perceived enjoyment barriers were predictive of adherence (Odds ratio = 12.1, CI: 3.03 - 48.6, n = 216). Marzolini, Mertens, Oh, and Plyley (2010) showed that motivator factors (such as improving appearance, maintaining body weight, enhancing self-image and confidence and so on) had been ranked differently by people who comply and people who drop out while 40% of those indicated that ‘improve appearance’ was one factor that motivated them to participate in resistance training (n = 358). In addition, the compliers also reported a greater level of family or friends support ($p < 0.005$, n = 345) and family physician or cardiologist support ($p < 0.0005$, n = 345) in comparison to the dropouts. They also identified negative impact of injuries sustained during exercise, which may have been perceived as the opposite of progress or benefit. In a prospective study (n = 279), Gardiner et al. (2018) identified the importance of perceived benefits and progress, such as the ability to make positive lifestyle changes (96.8% changed their lifestyle, 2.5% not changed, and 0.7% without any answer; $p < 0.01$), improvements in well-being (96% received benefits from attending the CR program and 3.9% no responses; $p < 0.001$) and quicker recovery, for adherence to CR programs. Finally, Araya-Ramírez et al. (2010) found that those who achieved the greatest gains in CR were those who had attended the most sessions. Participants who attended 25 or more sessions showed better 6-minute walk test results ($20 \pm 18$ vs $18 \pm 14$, $p = 0.012$, n = 425). Participants who attended more sessions were also those who reported the highest level of disability, suggesting that higher attendance may simply reflect
higher level of need and, therefore, greater gains. Nevertheless, there was clearly a relationship between perceived benefit or progress and attendance at CR sessions.

3.5 Discussion

Individual engagement in rehabilitation is vital to the successful management of cardiac disease and its consequences. Unsurprisingly, many variables exist at the individual and environmental interface, potentially influencing engagement (Lequerica & Kortte, 2010). This complexity has been captured and articulated in the MTE developed for use in brain injury rehabilitation (Lequerica & Kortte, 2010), but yet to be evaluated in any rehabilitation setting.

This review examined the extent to which existing evidence supported the relationships proposed in the MTE. The majority of existing research focused on the initial MTE stage, prediction of intention to engage in CR programs (Broadbent, Ellis, Thomas, Gamble, & Petrie, 2009; de Melo Ghisi, Grace, Thomas, & Oh, 2015; Sniehotta, Scholz, & Schwarzer, 2005; Sullivan, White, Young, & Scott, 2009). In this regard, the MTE was consistently supported, with all studies confirming the proposed relationships between perceptions of need, self-efficacy and outcome expectations and intention to engage in rehabilitation.

Much less is known about the process of translating intention into action and then sustaining that engagement over time. The current review provided some limited support for the notion that individualised care planning, collaborative processes that involved the person in rehabilitation decisions, and actively addressing personal contexts may enhance the likelihood of attendance. A relationship emerged between positive rehabilitation experiences or perceived progress and sustained rehabilitation commitment, but without any certainty.
about the direction of that effect. As expected, some evidence suggested that negative rehabilitation experiences, such as injury, reduced engagement (Rogerson, Murphy, Bird, & Morris, 2012). However, more research is needed to determine the nature and intensity of this impact.

At present, no strong evidence exists to alert healthcare practitioners to the risk of non-engagement or disengagement that would then allow them to improve health system responses. It is not surprising to find that individual cognitive, behavioural or emotional issues interfere with ability to fully engage in rehabilitation. However, more in-depth evidence about how the engagement process occurs and is sustained over time is crucial if this challenge is to be addressed (Bright, Kayes, Worrall, & McPherson, 2015). Research to date has failed to provide an overarching approach to engagement. The MTE attempts to broaden this perspective and acknowledge the complexity of engagement.

This review has confirmed that there is insufficient research that quantifies the variables involved in CR engagement, or establishes the direction of the relationships among these variables. Further research is needed to facilitate understanding of how to maximise the likelihood that people who have sustained a cardiac event will engage in a CR program, thus improving their outcomes.

### 3.5.1 Study Limitations

This model-centric way of structuring a systematic quantitative literature review is novel and provides several advantages: (a) more explicit, less subject to bias and more easily reproducible; and (b) able to clearly identify the strength of evidence and gaps within a well-defined group of studies (Pickering & Byrne, 2014). Quantitative systematic literature reviews are often focused on distilling information on a particular intervention (Tovar,
Walker, & Rew, 2018); or the quality of the studies (Petit Francis, Spaulding, Turkson-Ocran, & Allen, 2017) whereas this approach directly targets the proposed relationships in the model. Despite its promising findings, some limitations can be mentioned. First, it is difficult to compare studies as there was little homogeneity with respect to study designs, measures and population characteristics. Second, due to the paucity of studies focused on the MTE in CR, studies were included if they examined the relationships between MTE variables in terms of various components of CR (e.g., diet or exercise which are essential components of CR). No studies focused on CR as an entire intervention. Third, most studies were conducted at one site only, each with a specific type of patient and all the samples were male dominant. Nevertheless, the method has provided a clear understanding of the relationships within the MTE where there is strong support, limited research or confusing results.

3.5.2 Future Directions

This new approach to model-centric systematic literature review has enabled explicit confirmation that comprehensive multivariate research on the topic of engagement is still in early development and will need to progress, to inform practice and policy. Further research is needed to help broaden understanding about the complex multi-stage processes underlying therapeutic engagement, and hence identify potential points of influence to improve engagement. Indeed, there is clearly a need to understand how individuals assess and evaluate the rehabilitation experience, and consequently adjust their engagement in a CR program.
3.6 References


Chapter Four

Research Method

The previous chapter provided the background on the process of individual engagement in the CR program based on the Model of Therapeutic Engagement (MTE). In this chapter, the research methodology employed to measure and evaluate the way in which the components of the MTE interact with each other is described. The research design, sampling and recruitment, data collection for each stage of the MTE, procedures, and data analysis techniques are explained thoroughly. This provides a more comprehensive review of options for quantitative analysis, and the details of the quantitative methods, compared to the brief summaries contained in the articles that have been prepared for publication (Chapter Five to Nine). Furthermore, ethical considerations and approval are presented.

4.1 Research Design

A prospective study was designed, aiming to examine, evaluate and expand the MTE in the context of cardiac rehabilitation (CR). The first stage of the MTE occurs in the hospital and the latter stages occur in the community after discharge from hospital. For this study, the researcher had access to individuals receiving services from the Gold Coast University Hospital (GCUH) and the Robina Cardiac Rehabilitation Centre. These individuals were sampled on two occasions: at their discharge from hospital; and at the end of the outpatient CR program.

The quantitative study was explicitly aimed to evaluate each of the relationships involving multiple variables and their impact on individual engagement, as proposed within the MTE. The MTE is a complex conceptual model that contains three temporal stages: intention to engage in CR programs; CR initiation; and maintenance of participation in CR
programs. Its complexity posed points to consider for analysis. First, the multi-stage nature of the model with embedded dependent variables resulted in difficulty establishing an overarching statistical analysis that can accommodate such complexity. On the other hand, this multi-stage structure provided the opportunity to separate the model into three distinct components that could be evaluated separately.

Given that the MTE focuses on a dynamic concept of engagement, which can fluctuate over time, some participants dropped out during the study. This attrition was an important and inherently inextricable aspect of the study that cannot be ignored or observed simplistically. Participants may re-engage or engage in different ways during the period of the study. Accordingly, the analysis must be able to accommodate a changing sample without compromising the study. Due to the complexity of the analysis, a major risk for this study was erroneous conclusions made on the basis of faulty analyses or ones where major assumptions have been violated. To accommodate these challenges, a multi-stage analytical design was used in which a series of statistical models were fitted empirically to different subsets of the collected data. These empirical sub-models correspond to the three stages in the conceptual model that structures the analysis.

In all, three datasets were utilised as the basis for the quantitative studies comprising this thesis. The first dataset contained data for individuals who consented to participate in the study (217 participants, including those who commenced and those who did not commence the CR program); the second dataset contained only the data of consenting individuals who commenced the CR program (101 participants); and the third contained consenting individuals who did not commence the program (106 participants). Structural equation modelling (SEM) provides a broad ‘umbrella’ of statistical methodologies that are flexibly able to analyse all three datasets.
4.2 Participants

Sampling and Recruitment

Individuals eligible for CR services are automatically referred to the Robina Cardiac Rehabilitation Centre at discharge from the Cardiology Ward of the Gold Coast University Hospital (GCUH). The CR coordinator contacts individuals to organise an initial assessment session. The length and content of the CR program vary based on individual needs. Generally, individuals attend the program one or two times a week for supervised exercise, each session lasting one hour, as well as education sessions that are delivered by a multidisciplinary team.

In this study, data were collected between April, 2017 and February, 2018. Due to the need for participants to consent, a consecutive convenience sample was compiled. All individuals who were eligible to receive CR services at the time of data collection were approached to participate. In order to be referred to CR, individuals suffered from either myocardial infarction (ST elevation MI, non-ST elevation MI), re-vascularisation procedures, stable or unstable angina, controlled heart failure, and other vascular or heart diseases. Exclusion criteria were also applied to individuals who were: considered too ill, based on the complexity of various medical issues, to complete the survey at the time the individual was approached by the nurse; unwilling to volunteer in the study; unable to read and speak English; diagnosed with any visual, cognitive or psychiatric conditions, such as schizophrenia, depression, and anxiety disorders, that would prevent them from completing the survey; previous attendance at CR; or not referred to the Robina Cardiac Rehabilitation Centre. Study participants met the eligibility criteria and consented to participate in prospective self-report data collections over two-time intervals. Participants were recruited when they were inpatients of the Cardiology Ward at the GCUH and followed as outpatients of the Robina Cardiac Rehabilitation Centre.
Subjectivity bias is inherent in convenient and iterative sampling processes (Parahoo, 2014). However, the bias can be ameliorated through careful specification and implementation of a recruitment protocol (Stone, Shiffman, Atienza, & Nebeling, 2007). In particular, the researcher ensured that the enlistment of individuals was not related to systematic factors, such as the enlistment techniques of particular hospital staff, or to any factors specific to potential participants (e.g. perceived ability to benefit from or engage in rehabilitation). Hospital staff provided the same enlistment information and materials (supplied by the researchers), in the same way, and consistently to all potential participants. Potential participants were all approached irrespective of: the severity of their cardiac incident (except if illness prevented participation, and the participation was not recommended by the attending clinicians); demographic factors such as gender and socio-economic status; and personality factors such as approachability or level of distress (also as indicated by attending clinicians). All potential participants were addressed by the researcher so that the study was not represented differently to individuals by different therapeutic teams. The researcher trained the conducting nurse about the enlistment process to ensure that the nurse understood the importance of subjectivity that is inherent in such protocols if procedures were not strictly controlled.

As reported by Kline (2011) and Jackson (2003), there is considerable debate among researchers regarding a priori sample size determination for SEM. Since Maximum Likelihood Estimation (MLE) is a common estimation procedure used in SEM software, Loehlin (2004) and Ding, Velicer and Harlow (1995) suggested a minimum size of 100 would be sufficient to use MLE appropriately. For this study, the minimum required sample sizes for model structure were calculated, using an online statistical sample size calculator (Soper, 2018), which adopts rules of thumb proposed by Cohen (1988) and Westland (2010). This
calculator computed the required sample size based on specification of the number of observed and latent variables in the MTE, the anticipated effect size, the desired probability and statistical power levels.

Statistical modelling could be compartmentalised to address each stage of the conceptual MTE separately, because empirical data was available on the inputs as well as the outputs at every stage. This approach contrasts with a more difficult statistical modelling situation, where the outputs of each stage would be latent rather than measured variables. By dividing the model in this way, it is also possible to consider sample size of each stage separately.

A minimum sample size of 72 for evaluating the first stage of the MTE (Manuscripts Three and Five) and 85 for evaluating the entire MTE (Manuscripts Four and Five) would provide power of 80% to detect a standardised effect size of 0.4 (if in fact present) against a significance level of 5%. This situation gives a one-in-twenty chance of erroneously concluding an effect size is significantly different from zero when it is in fact equal to zero. It is not possible, mathematically, to simultaneously optimise power levels to be as high as possible and significance to be as low as possible. This balance between the power and significance level is relatively standard in this field of behavioural science (Cohen, 1988).

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provides an acceptable practical tradeoff between: Type I error as reflected by the significance level, that is, mistakenly concluding an effect is significantly different from zero when it is actually zero, and Type II error or one minus power, that is, mistakenly concluding an effect is non-significantly different from zero, when it is actually larger than the specified effect size (here 0.3).

These sample sizes were met by all three datasets, thus enabling SEM analyses of the first stage of the MTE as well as of the entire MTE, including confirmatory factor analysis for all latent constructs. The following table (Table 4.1) shows the minimal sample size required to detect the effects for these specifications.

<table>
<thead>
<tr>
<th></th>
<th>The first stage of the MTE</th>
<th>The entire MTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipated effect size</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Desired statistical power level</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Number of latent variables</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Number of observed variables</td>
<td>56</td>
<td>100</td>
</tr>
<tr>
<td>Desired probability level</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Minimum sample size to detect effect in a confirmatory factor analysis for all latent constructs</td>
<td>72</td>
<td>85</td>
</tr>
</tbody>
</table>

The minimal sample size for each study was calculated again for the next stage of a pathway analysis, involving estimation of effect sizes in all relationships of the MTE. A sample size of 88 for the first stage of the MTE and 89 for the entire MTE would have power of 80% to detect an effect of 0.3 with a significance level of 5% (Table 4.2). In the current study, these minimal sample sizes were satisfied for all three datasets: the total sample size
of 217 participants in Manuscript Three (Chapter Seven) was used to confirm latent constructs, and then evaluate relationships in the first stage of the MTE; 101 participants in Manuscript Four (Chapter Eight) were used to confirm latent constructs, and then evaluate relationships in the entire MTE; and finally 101 and 106 participants respectively were used in Manuscript Five (Chapter Nine) to examined the role of socio-environmental factors in the extended MTE.

Table 4.2 The required sample size for each stage of the Model of Therapeutic Engagement after performing confirmatory factor analysis, in a pathway analysis of all specified relationships between engagement outcomes and predictor variables

<table>
<thead>
<tr>
<th></th>
<th>The first stage of the MTE</th>
<th>The entire MTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipated effect size</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Desired statistical power level</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Number of latent variables</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Number of observed variables</td>
<td>22</td>
<td>42</td>
</tr>
<tr>
<td>Desired probability level</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Minimum sample size to detect effects in a pathway analysis</td>
<td>88</td>
<td>89</td>
</tr>
</tbody>
</table>

4.3 Data Collection

Quantitative research in the social sciences is generally characterised by the use of standardised measures, which classically employ a deductive approach (when the null hypotheses are true, then the statistical properties of the data follow a known distribution), with highly structured data collection for testing research hypotheses and the corresponding statistical hypotheses (Creswell & Plano Clark, 2007). To this end, three questionnaires were constructed, corresponding to the three stages within the MTE. This strategy for data collection allowed the different stages of patient engagement to be examined separately, as
depicted in the MTE, in addition to allowing an overall analysis to be conducted to examine the MTE in its entirety.

A composite questionnaire was used to collect data at each stage of participation. The variables (drawn from the MTE) can be considered in four themes. The first theme comprised demographic variables, such as age, gender, marital status, religion, and ethnicity; potential resources, such as work status, education, and annual combined household income; and individual medical profile, such as discharge diagnosis. The second thematic grouping of variables comprised the main outcomes of engagement, that became the dependent variables in statistical analysis, at each stage of the MTE: intention to engage in CR programs, CR initiation, and maintenance of participation in CR programs. The third thematic grouping of variables comprised factors (which may also be considered as predictor variables) that have been hypothesised to be associated with stages of engagement at each stage of the MTE. These were numerous, and are described in Chapters One, Two and Four. For instance, they include predictors such as perceived self-efficacy, outcome expectancies and perceived need for individual intention to engage in CR programs. The last thematic set of variables comprised socio-environmental factors, here those variables which may act as barriers and hence moderate the relationships between the proposed predictors and outcomes, in each of the three stages of the MTE.

**Questionnaires**

Data related to the participants’ engagement with outpatient CR programs were obtained from a series of standard, self-reported questionnaires, as well as engagement ratings by a nurse regarding the level of participant engagement. A clinical nurse completed the engagement rating questionnaire for each participant at the last session of the outpatient CR
program. Participants completed two questionnaires with assistance from the researcher in case they needed more clarification about the questions. The first questionnaire, conducted at discharge time, measured participant behavioural intention to engage in CR, together with the associated factors, as well as demographic variables, potential resources, and individual medical profile as outlined in the first stage of the model. Barriers to engagement were also measured at this stage. The second questionnaire was conducted at the last session of outpatient CR program and measured variables related to the initiation of CR, and maintenance of participation in CR programs. As in the previous stage, socio-environmental barriers were measured again at this stage. The structure of questionnaires is outlined in Appendices A, B, and C. More details about the measures for each stage of the MTE are explained below.

4.4 Measures

Questionnaire 1 covered the first stage, intention to engage in CR programs (Appendix C, p. 338). The second questionnaire addressed the second and third stages of the MTE: CR initiation and maintenance of participation in CR programs (Appendix C, p. 349). Prior to undertaking any analysis, the measures of both questionnaires were re-validated in the relevant study. This ensured that the relevant constructs remained adequate in each particular setting: cardiac rehabilitation participants being initially treated at the Gold Coast University Hospital, followed by outpatients rehabilitated at the Robina Cardiac Centre. All constructs had been previously validated in other rehabilitation related contexts, as reported here, providing some a priori confidence that they would be suitable in this context.
Validation of Scales

Cronbach’s alpha was adopted as a standard approach to validate scales, and measures the internal consistency of multiple items within a scale, and is therefore indicative of whether these items can reliably be summed as a measure of the conceptual construct. This thesis applies Cronbach’s (1960) guidelines, which recommended that a scale is acceptable when Cronbach’s alpha exceeds 0.6. Their original thresholds were based on their experience working in a similar field of behavioural research.

Stage One Questionnaire

The MTE constructs were measured by psychometrically validated scales. The survey comprised of 76 items. Of these, 67 items sought responses using a five-point Likert scale, and 9 items sought responses provided on semantic differential scales. This questionnaire measured the constructs related to the first stage of the MTE (Figure 4.1) and socio-demographic and medical variables.

**Figure 4.1** Stage one of the Model of Therapeutic Engagement, intention to engage in cardiac rehabilitation programs

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Demographic and Medical Variables

The demographic questionnaire contains 9 items that sought responses, using categorical scales on the participant’s: age, gender, marital status, religion, ethnicity, work status, highest level of education, annual combined household income, and medical diagnosis. The categories used were consistent with previous surveys utilised in an Australian context, such as Gardiner et al. (2018) and Worcester, Murphy, Mee, Roberts and Goble (2004).

Dependent Variable Stage One: Intention to Engage in Cardiac Rehabilitation

Intention refers to personal goals, imposed by self or others (Fishbein & Ajzen, 1975). This was measured with the Short Version of Recovery Intention Questionnaire (6 items) (Blasche & Marktl, 2011) which was adapted to a rehabilitation setting through a slight change of question-wording (Appendix C, p. 347). Responses were on a five-point-type scale ranging from strongly disagree to strongly agree. The original scale was validated on 380 Australian employees (Blasche & Marktl, 2011). This scale had good reliability (0.87). A sample item of the scale was “I provide myself with sufficient opportunities for recovery”. A full list of items on this scale is provided in Appendix C (p. 347).

Predictor Variables Stage One: Intention to Engage in Cardiac Rehabilitation

Perceived Need for Rehabilitation. Two sub-scales were used to measure perceived need for rehabilitation. These were awareness of deficits and perceived general benefits of rehabilitation. To measure awareness of deficits, a subscale of the Motivation for Traumatic Brain Injury Rehabilitation Questionnaire (MOT-Q): Lack of Denial (8 items) was utilised (Chervinsky, Ommaya, Spector, Schwab, & Salazar, 1998). Responses were sought using a five-point Likert-type scale ranging from strongly disagree to strongly agree. A sample item
of the scale was “I’m better now than I ever was, so I don’t need rehabilitation”. A full list of items on this scale is provided in Appendix C (p. 344).

Also, one subscale from the MOT-Q: Lack of Anger (5 items) was used to measure perceived general benefits of rehabilitation. Responses were sought using a five-point Likert-type scale ranging from strongly disagree to strongly agree. A sample item of the scale was “I’m very interested in rehabilitation, but it’s not for me”. A full list of items on this scale is provided in Appendix C (p. 345).

Boosman, van Heugten, Winkens, Smeets and Visser-Meily (2016) used Cronbach’s alpha to validate both sub-scales on 122 inpatients and 92 outpatients in a brain injury rehabilitation program in the Netherlands. Internal consistency of the sub-scale Lack of Denial was acceptable in the inpatient group (α = 0.63) and good in the outpatient group (α = 0.84). Regarding Lack of Anger, internal consistency was acceptable (α = 0.68) in the outpatient group and good (α = 0.80) in the inpatient group (Boosman et al., 2016).

**Outcome Expectancies.** Outcome expectancies refer to beliefs about the positive and negative outcomes of alternative behaviours. Two constructs were used to assess outcome expectancies: a) perceived success and b) value of outcomes. Perceived success was assessed using a subscale of Rehabilitation Representations Scale, Treatment Outcome Beliefs (6 items) (Bains, Powell, & Lorenc, 2007), while the value of outcomes was measured using the Outcome Expectancies Questionnaire (5 items) (Sniehotta, Scholz, & Schwarzer, 2005). Responses were sought on a five-point Likert-type scale ranging from strongly disagree to strongly agree. Validation of the Rehabilitation Representations Scale was conducted by Bains et al. (2007) on a population of 40 acquired brain injury rehabilitation participants in the United Kingdom. The scale showed acceptable internal consistency (α = 0.70). A sample item is “Rehabilitation will help me to come to terms with my disease”. The
Outcome Expectancies Questionnaire had been validated on 307 CR participants in the United Kingdom (Sniehotta et al., 2005). Cronbach’s alpha showed the questionnaire to have good reliability ($\alpha = 0.80$). A sample item of the scale was “Rehabilitation will help me learn new ways of doing things”. The full list of items on this scale is provided in Appendix C (p. 342-343).

**Perceived Self-efficacy.** A measure of perceived self-efficacy was derived from two sub-group constructs: a) awareness of capabilities and b) perceived demands. Awareness of capabilities utilised 6 items of the *Control Cognition subscale from the Rehabilitation Representations Scale (RRS)*. A sample item of the scale was “I have the confidence that I can cope with doing rehabilitation”. The construct perceived demands was measured using 7 items from the *Perceived Barriers subscale of the RRS* (Bains et al., 2007). A sample item of the scale was ‘I have more important things to get on with than doing rehabilitation’. The original scales (but not the subsets of items chosen) were validated on a population of 40 acquired brain injury rehabilitation participants in the United Kingdom (Bains et al., 2007). The internal consistencies for the Control Cognition subscale from the RRS and the Perceived Barriers subclass of the RRS were 0.83 and 0.89, respectively, as measured using Cronbach’s alpha. This confirmed that the validity of these scales was adequate, for the original population, and potentially for this study too. The full list of items on this scale is provided in Appendix C (p. 340-341).

**Willingness to Consider Treatment.** Lequerica & Kortte (2010) suggested an individual’s willingness to consider treatment to be a mediating variable in the MTE. To measure this, the construct *Willingness to Follow Treatment Recommendations* (6 items) (Chervinsky et al., 1998) was utilised. This had been validated on 122 inpatients and 93 outpatients in a brain injury rehabilitation program in the Netherlands (Boosman, van
Heugten, Winkens, Smeets, & Visser-Meily, 2016). Internal consistency of the subscale was acceptable for both the inpatient and outpatient groups ($\alpha = 0.70$, $\alpha = 0.73$, respectively). A sample item of the scale was “Doctors know what I need and I’ll do what they say”. The full list of items on this scale is provided in Appendix C (p. 346).

Stages Two and Three Questionnaire

The second questionnaire, which covered the initiation of rehabilitation (15 items) and maintenance of participation in CR programs (40 items) stages, considered several measures. This questionnaire measured the constructs related to the second (Figures 4.2) and third stages of the MTE (Figure 4.3).

![Figure 4.2](image)

**Figure 4.2** Stage two of the Model of Therapeutic Engagement, cardiac rehabilitation initiation

**Dependent Variable Stage Two: CR Initiation**

In order to be categorised as initiating the CR program, it was necessary for a participant to:

(i) initiate a formal CR program and (ii) attend a minimum of four out of the first six exercise sessions (Shanks, Moore, & Zeller, 2007). The latter was assessed by a nurse in their report of patient attendance.

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10 Figure 4.2 adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, *American Journal of Physical Medicine & Rehabilitation, 89*, 418. Copyright Year by “Wolters Kluwer”.
Predictor Variables Stage Two: CR Initiation

Two constructs, goal setting and treatment planning, were used to measure preparation for Rehabilitation.

**Goal Setting.** Goal engagement and goal satisfaction were measured using a single questionnaire which consisted of 1 item with a Likert scale ranging from excellent to none (Turner-Strokes et al., 2015). For the original study, responses ranged across the full range: excellent, very good, moderate, poor, and none. The questionnaire accounted for a number of factors: how well goals matched participant priorities for rehabilitation; the extent to which participants agreed with the goals; the extent of choices available regarding goals; and the extent to which participants felt involved with/in charge of the goal-setting process (Appendix C, p. 350).

**Treatment Planning.** *The Client-Centeredness of Goal Setting construct [C–COGS]* (Doig, Prescott, Fleming, Cornwell, & Kuipers, 2015) was used to measure treatment planning. This construct is comprised of three subscales which evaluate goal alignment, goal planning participation, and client-centeredness of goals. C–COGS can be used to evaluate the goal planning from the individual’s perspective, and consists of 13 items using a five-point Likert-type scale from strongly disagree to strongly agree. This scale had been validated on a collection of 42 Australian participants in a brain injury rehabilitation program. An average of 67% agreement occurred across all items (Doig et al., 2015), indicating a fair degree of reliability. A sample item of the scale was “My rehabilitation goals were what I want to work on”. The full list of items on this scale is provided in Appendix C (p. 351).
Figure 4.3 Stage three of the Model of Therapeutic Engagement, maintenance of participation in cardiac rehabilitation programs\footnote{Figure 4.3 Adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, \textit{American Journal of Physical Medicine & Rehabilitation}, 89, 418. Copyright Year by “Wolters Kluwer”.

Dependent Variable Stage Three: Maintenance of Participation in CR Programs

\textit{Maintenance}

Attendance at 90\% of scheduled CR sessions was required for a participant to be classified as maintaining attendance and was based on a nurse report.

Predictor Variables Stage Three: Maintenance of Participation in CR Programs

\textit{Analysis of Experience}

Two variables, perceived quality of service and perceived achievements, were used to measure analysis of experience.

\textbf{Perceived Quality of Service.} McMurray et al.’s (2015) questionnaire, with 10 items assessed via a Likert type scale from never to always, was used to measure an outpatients’ perceptions of the quality of services. This questionnaire was found to have good reliability,
with inter-item Pearson correlations ranging from 0.13 to 0.74, and an internal consistency measured via Cronbach’s alpha of 0.88 (McMurry et al., 2015). A sample item of the scale was “I was always treated with courtesy in rehabilitation”. The full list of items on this scale is provided in Appendix C (p. 352).

**Perceived Achievements.** The **COPM (Canadian Model of Occupational Performance)** questionnaire is based on a client-centered approach to establishing treatment goals and assessing changes in perceived performance and satisfaction with occupational performance over time (Law et al., 2014). The COPM questionnaire consisted of 13 items which demonstrated acceptable test-retest measured using the Spearman’s rho correlation coefficient and inter-rater reliability measured via intra-class correlation coefficient, as well as acceptable content, criterion, and construct validity (Cup, Scholte op Reimer, Thijssen, & van Kuyk-Minis, 2003). A sample item of the scale was “Did you reach the expected result of your treatments?”. The full list of items on this scale is provided in Appendix C (p. 353).

**Quality of Engagement**

In order to quantify information from a rehabilitation nurse regarding participants’ levels of engagement in rehabilitation, the **Hopkins Rehabilitation Engagement Rating Scale (HRERS)** (Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007) was used. The HRERS contains 5 items with a Likert scale from never to always, and was completed by a clinician to quantify the degree to which a participant engaged in their rehabilitation. A population of 206 subjects (with spinal cord injury, ischemic or hemorrhagic stroke, amputation, or hip or knee replacement) from inpatient rehabilitation programs in the United States was used to initially validate the HRERS (Kortte et al, 2007). A good internal consistency (Cronbach’s alpha, 0.91) and interrater reliability (intra-class correlation coefficient, 0.73) was reported by the
developers of the scale, indicating that it is useful for use as a unidimensional construct (Kortte et al., 2007). A sample item of the scale was “The patient acknowledged a need for rehabilitation services and the benefit of therapy exercise or rehabilitation activities”. The full list of items on this scale is provided in Appendix D (p. 355).

**Moderating variable**

*Socio-environmental Barriers*

In order to determine whether the proposed relationships within the MTE are invariant to the presence of barriers posed by the individual’s social and physical environment, various socio-environmental barriers were enumerated for consideration as a moderating variable. Socio-environmental barriers were measured using the *Cardiac Rehabilitation Enrolment Obstacles (CREO) Scale* (Fernandez, Salamonson, Juergens, Griffiths, & Davidson, 2008). The CREO scale assesses an individual’s perceptions of the degree to which barriers posed by the individual, provider, and health system were perceived to affect their enrolment and participation in CR. Scale revisions developed by Fernandez et al. (2008) have resulted in the current 15-item version. However, four personal factors (personally I thought it was unnecessary; did not have time; lack of motivation; and fear of sickness) were removed from the CREO scale, for the purposes of this study, as the MTE already addressed these individual-level factors in components of three stages of the MTE.

Only items pertaining to socio-environmental barriers were included. Based on previous studies which identified socio-environmental factors that negatively impacted on the outcome of each stage of the MTE (Banerjee, Grace, Thomas, & Faulkner, 2010; Resurrección, Motrico, Rubio-Valera, Mora-Pardo, & Moreno-Peral, 2018; Rogerson, Murphy, Bird, & Morris, 2012), the CREO scale can be generalised to all stages of the MTE.
The impact of socio-environmental barriers on all the three stages of the MTE were examined at the same time.

Participants were requested to rate their level of agreement with each of the statements in the CREO scale to examine barriers related to their intention to engage in the CR program, regardless of whether or not they had commenced CR. Statements were rated on a five-point response format from strongly disagree to strongly agree. Higher scores indicated greater barriers to individual commencement and participation in a CR program. Convergent validity and test-retest reliability were reported by Fernandez and colleagues (2008) to be acceptable on the initial validation population of CR patients in Australia (intra-class correlation coefficient = 0.64) (Fernandez et al., 2008). A sample item of the scale was “Long waiting lists for rehabilitation”. The full list of items on the CREO scale is contained in Appendix C (p. 348).

Summary

All the variables explained above, including socio-demographic and individual medical profile variables, dependent variables, predictor variables, moderating variables, and mediating variables, are summarised in Table 4.3 as below.
Table 4.3 Description of variables and scales within the Model of Therapeutic Engagement

<table>
<thead>
<tr>
<th>Socio-demographic and individual medical variables</th>
<th>Scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Number</td>
</tr>
<tr>
<td>Gender</td>
<td>Male, female</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Married, divorced, de-facto, single</td>
</tr>
<tr>
<td>Religion</td>
<td>Catholic, Islam, Protestant, other, prefer not to say/no religion</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Caucasian, Aboriginal/Torres Strait Islander, Asian, Middle Eastern, other</td>
</tr>
<tr>
<td>Work status</td>
<td>Unemployed/disability, part-time, full time, retired</td>
</tr>
<tr>
<td>Education</td>
<td>Junior/ Intermediate certificate (year 10) or before, senior/Leaving certificate (year 11-12), TAFE (Technical and Further Education) certificate or equivalent, undergraduate degree, postgraduate degree</td>
</tr>
<tr>
<td>Gross annual income</td>
<td>≤$19,999, $20,000-$39,999, $40,000-$59,000, $60,000-$79,999, ≥80,000, prefer not to say</td>
</tr>
<tr>
<td>Discharge diagnosis</td>
<td>Coronary artery disease (CAD), heart attack, abnormal heart rhythms or arrhythmias, heart failure (HF), heart valve disease, congenital heart disease, heart muscle disease, pericardial disease, aorta disease and Marfan syndrome, vascular disease, other</td>
</tr>
</tbody>
</table>
**Stage one:** Intention to engage in CR programs

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to engage in CR programs</td>
<td>The Short Version of Recovery Intention Questionnaire [6 items] (Blasche &amp; Marktl, 2011)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mediating variable</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness to consider the treatment</td>
<td>The Willingness to Follow Treatment Recommendations scale [6 items] (Chervinsky et al., 1998)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Predictor variables</th>
<th>Scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived need</td>
<td>Awareness of Deficits</td>
</tr>
<tr>
<td>Perceived Benefits of rehabilitation</td>
<td>Perceived Benefits of Rehabilitation will be measured using two subscales: the MOT-Q, Interest in Rehabilitation [7 items] and Lack of Anger [5 items] (Chervinsky et al., 1998)</td>
</tr>
<tr>
<td>Outcome expectancies</td>
<td>Perceived Success</td>
</tr>
<tr>
<td></td>
<td>Value of Outcomes</td>
</tr>
<tr>
<td>Perceived self-efficacy</td>
<td>Awareness of Capabilities</td>
</tr>
<tr>
<td></td>
<td>Perceived Treatment Demands</td>
</tr>
<tr>
<td>Moderatoring variable</td>
<td>Scale</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Socio-environmental Factors</td>
<td>Cardiac Rehabilitation Enrolment Obstacles Scale [11 items] (Fernandez et al., 2008)</td>
</tr>
</tbody>
</table>

**Questionnaire 2**

**Stage two: CR Initiation**

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR Initiation</td>
<td>Yes / No (attendance at a minimum of four out of the first six exercise sessions)</td>
</tr>
</tbody>
</table>

**Predictor variables**

<table>
<thead>
<tr>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal Setting</td>
</tr>
<tr>
<td>Treatment Planning</td>
</tr>
</tbody>
</table>

**Stage three: Maintenance of Participation in CR Programs**

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of the CR Program</td>
<td>Yes / No (attendance at 90% of scheduled CR sessions)</td>
</tr>
</tbody>
</table>

**Predictor variables**

<table>
<thead>
<tr>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Quality of Service</td>
</tr>
<tr>
<td>Perceived Achievements</td>
</tr>
<tr>
<td>Quality of Engagement</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td><strong>Moderating variable</strong></td>
</tr>
<tr>
<td>Socio-environmental Factors</td>
</tr>
</tbody>
</table>
4.5 Protocol

Participants provided consent to the researcher while they were still inpatients of the Cardiology Ward at the GCUH. The first questionnaire was given to participants by the researcher at their discharge time. The last questionnaire was posted to the individuals’ home address with a stamped self-addressed envelope for its return. For participant’s convenience, both questionnaires were available in either paper format or online through the SoGo Survey website (https://www.sogosurvey.com/). Individuals who met the eligibility criteria were approached consecutively until the required sample size was achieved. The Quadrant software program was applied to manage the prospective data collection process, and to keep track of participant details for follow-up (http://www.quadrant.edu.au/).

A pilot study was conducted to test the functionality of research tools and to determine how to modify the questions in the two questionnaires, as well as to test the proposed data analyses before conducting the main study. This pilot study ensured that questions which were ambiguous were identified, then rectified or discarded, which led to the refinement of the resulting research tools (Peat, Mellis, & Williams, 2002). Another important function of the pilot study was to record the time taken to complete the questionnaires in order to provide insights for the researcher about implementation, in practice, and later to assess whether this was reasonable (Peat et al. 2002).

It was important that at least some participants in the pilot study be similar to the intended research participants, in order to highlight design issues that the researchers may have overlooked (van Teijlingen & Hundley, 2002). In the current study, the pilot study revealed questions for the researcher that were confusing, were not understood or were not answered appropriately. By conducting the pilot study on 10 colleagues, I was able to identify gross oversights, and then another pilot was conducted with 10 individuals, who participated in the CR program in the Robina Cardiac Rehabilitation Centre. The
participants of the pilot study were not included in the final study, and the researcher made appropriate changes to the data collection instruments based on feedback from the pilot study.

4.6 Data Analysis
Analyses were performed using SPSS (Version 21.0 for Windows; IBM SPSS Statistics, Armonk, NY, USA) and SPSS Amos (Version 21.0; Arbuckle, 2012). The collected data were analysed using structural equation models (SEM) in Amos:

- Measurement model: to confirm that the constructs provided an adequate measure of their associated latent variables;
- Pathway analysis: to estimate the effects of predictors on the various individual engagement outcomes, as stipulated by the relationships in the MTE; and
- Multi-group analysis: to test whether the proposed relationships within the MTE were significantly different across two groups of participants with low- or high-level socio-environmental barriers.

Preliminary Analyses
The data were cleaned by checking for missing data, duplicates, outliers and invalid responses before any analysis was conducted. Preliminary data analysis helped with quality control and preparation of the data for subsequent analyses (Blischke, Karim, & Murthy, 2011), and included overall descriptions of the data via descriptive summary statistics. The use of SEM may sometimes encounter problems, when multi-collinearity and outliers exist in the data, so these issues should be checked at the outset via exploratory data analysis (Grewal, Cote, & Baumgartner, 2004). The problem of multi-collinearity manifests as high correlations among the predictor constructs (Baumgartner & Homburg, 1996). The Variance Inflation Factor (VIF), provided in the output from the
collinearity diagnostics function in SPSS, was used to assess multi-collinearity. In addition, correlations among the variables proposed initially by Lequerica and Kortte (2010) were checked for excessive multi-collinearity (Teck & Lai, 2011). Similarly, overly large values of Cronbach’s alpha in any of the constructs (values over 0.90) can be symptomatic of multi-collinearity. Lastly, Mahalanobis distances were evaluated to identify obvious outliers (Hair, Black, Babin, Anderson, & Tatham, 2006). These preliminary analyses ensured that the quantitative data had been appropriately scrutinised before applying the data to each stage of the engagement process, and then across stages of the engagement process.

The Measurement Model

The next step before fitting the SEM was to test the measurement model by conducting a Confirmatory Factor Analysis (CFA). The resulting coefficients quantify the contribution of each indicator to each latent construct (like components of a score) and therefore help assess the reliability and validity of each construct (Kline, 2011). In the simplest case, the coefficients of all items are equal to one. Any item with negative weights should be investigated to check whether they were intentionally reverse coded.

Convergent validity estimates the degree to which the indicators within each construct should be related to each other in order to arrive at the same results if some are missing (Hair, Black, Babin, & Anderson, 2010). Discriminant validity ensures that a construct and its indicators are unique compared to other constructs and their indicators. Furthermore, internal consistency reliability of constructs was checked using Cronbach’s alpha.
After the measurement model was validated, SEM with maximum likelihood estimation was employed to analyse the relationships proposed within the MTE and permit testing of the direct effect of the proposed variables at each stage of the MTE. A bootstrap procedure, based on 2000 bootstrap samples and a 95% bias-corrected two-tailed confidence interval, were used to estimate the standard error in the test for the mediator (Efron, 1987). This way, SEM enables evaluation of the general compatibility (i.e. the goodness of fit) of the model with the data, as well as the estimated extent (through regression coefficients) and strength (through p-values) of relationships among constructs.

Goodness-of-fit for the measurement and structural equation models was judged using six indices, which should be considered together to evaluate a model. As noted recently (e.g. Wasserstein & Lazar, 2016; Greenland et al., 2016) in the debate about inappropriate use of p-values, it is poor statistical practice to rely solely on p-values or simply applying thresholds (like $p < 0.05$) to judge the significance of an effect, without also reporting the effect size. The same debate emphasizes that instead of thresholding p-values, it can be more instructive to consider their values on the continuum, and carefully choose benchmarks (for similar data, and population) for comparison. Thus in this study, the benchmarks for each summary statistic is chosen from relevant fields, as documented here.

A ratio of the chi-squared statistic to its corresponding degrees of freedom provides a key goodness-of-fit index used to assess whether predictions from the proposed model were aligned with the data (Norušis, 2012). These values need to be viewed with caution, since a chi-squared test, like all null hypothesis tests, has a high tendency to indicate significance with increasing sample size (Hair et al., 2010; Wasserstein & Lazar, 2016).
Meyers, Gamst, and Guarino (2016) recommended some fit measures in addition to the chi-squared test. Five other indices of model fit were used: PCFI (the Parsimony Comparative Fit Index); CFI (Comparative Fit Index); IFI (Incremental Fit Index); TLI (Tucker-Lewis Index); and RMSEA (Root Mean Square Error of Approximation) with standard thresholds. These indices assess how much the estimated model fits with the collected data.

The Comparative Fit Index (CFI) was developed by Bentler (1990) and analyses differences between the collected data and the theoretical model. The CFI performs well even when the sample size is small (Tabachnick & Fidell, 2007). A result greater than 0.90 and close to 1.0 indicates a good model fit (Byrne, 2001). The CFI is one of the most popular indices in SEM as it is the least affected index by sample size (Fan, Thompson, & Wang, 1999) and is computed as follows:

$$ CFI = 1 - \frac{\max (\hat{C} - d, 0)}{\max (\hat{C}_b - d_b, 0)} = 1 - \frac{NCP}{NCP_b} $$

where $\hat{C}$, $d$, and NCP are the discrepancy, the degrees of freedom and the non-centrality parameter estimate for the model being evaluated, respectively, and $\hat{C}_b$, $d_b$ and NCP$_b$ are the discrepancy, the degrees of freedom and the non-centrality parameter estimate for the baseline model, respectively.

The PCFI (based on the CFI mentioned above), is one of the parsimonious fit indices which compares the models with different degrees of freedom, and balances goodness-of-fit with model complexity. Values higher than 0.5 indicate a parsimonious model fit (Safarnia, Akbari, & Abbasi, 2011). The PCFI formula is:

$$ PCFI = (CFI)(PRATIO) = CFI \frac{d}{d_b} $$

where $d$ is the degrees of freedom for the model being evaluated, and $d_b$ is the degrees of freedom for the baseline model.
The Incremental Fit Index (IFI) is one of the relative fit indices that do not use the chi-squared test statistic in its raw form, but compares the chi-squared value to a baseline model. For these models, the null hypothesis is that all variables are uncorrelated (McDonald & Ho, 2002). A value above 0.90 indicates a good fit (Arbuckle & Wothke, 1999). The formula is:

$$IFI = \Delta_2 = \frac{\hat{C}_b - \hat{C}}{\hat{C}_b - d}$$

where $\hat{C}$ and $d$ are, respectively, the discrepancy and the degrees of freedom for the model being evaluated, and $\hat{C}_b$ and $d_b$ are, respectively, the discrepancy and the degrees of freedom for the baseline model.

The Tucker-Lewis Index (TLI) is another incremental fit index criterion for assessing the goodness-of-fit. The cut-off of 0.90 or above is recommended for this indicator (Arbuckle & Wothke, 1999). TLI is computed as below:

$$TLI = p_2 = \frac{\hat{C}_b - \hat{C}}{d_b - 1}$$

where $\hat{C}$ and $d$ are the discrepancy and the degrees of freedom for the model being evaluated, respectively, and $\hat{C}_b$ and $d_b$ are the discrepancy and the degrees of freedom for the baseline model, respectively.

The RMSEA is one of the noncentrality-based indices accepted as “one of the most informative criteria in covariance structure modelling” (Byrne, 2001, p. 84). The RMSEA assesses approximation error between the observed covariance and the covariance of the hypothesised model (Meyers et al., 2016). The RMSEA is influenced by sample size. When the sample size is small, use of this statistic is inclined to reject acceptable models (Byrne, 2001). Smaller RMSEA values show a better fitting model.
Values between 0.08 and 0.10 indicate mediocre fits while those above 0.10 indicate poor fits (Byrne, 2001; Hair et al., 1998). The RMSEA computational formula is:

\[
Population \ RMSEA = \sqrt{\frac{F_0}{d}}
\]

\[
Estimated \ RMSEA = \sqrt{\frac{\hat{F}_0}{d}}
\]

The model complexity evaluates the cost of every additional parameter (measured by d) on the variation explained (measured by F0). In comparing two nested models, F0 will never favour the simpler model. Steiger and Lind (1980) suggested compensating for the effect of model complexity by dividing \( F_0 \) by the number of degrees of freedom (d) for testing the model.

**The Multi-group Analysis**

The multi-group or between-group analysis is based on predefined data groups and determines if there are significant differences in their group-specific parameter estimates (Hayduk, 1987). By appropriately identifying the presence or absence of multi-group differences, the accuracy of the model estimate can be improved (Matthews, 2017). Before implementing the multiple group analysis in Amos, the hypothesised models were drawn from data to assure that models were identified well and no issues appeared during the process of fitting models. Structural models were then fit separately in each of two groups (participants with low- or high-level socio-environmental barriers to engaging in the CR program), and then the differences in parameter estimates were examined (via Z-scores) to test if there were any substantive differences in structural relationships within the MTE. The median points of socio-environmental barriers were calculated to categorise individuals as having lower (than median) or higher (than median) number of barriers.
4.7 Ethical Consideration and Approval

Research collaboration agreement between the Gold Coast Hospital Service and Griffith University was obtained before study commencement, based on a description and design of the proposed research, as a summary of that outlined here. The National Ethics Application Form (NEAF) was approved by the Gold Coast Hospital Service District Human Research Ethics Committee (HREC) in February, 2017 (HREC Reference Number: HREC/16/QGC329) (Appendix A, p. 328). The committee also approved the online versions of the two questionnaires.

The major ethical issues of concern in this study included: informed consent, privacy and confidentiality, anonymity and the researcher’s responsibilities. In this study, the researcher informed the participants of the purpose of the research, and informed consent was sought from the participants. Confidentiality was assured to all study participants in relation to the information they provided. All paper forms were kept locked in a secure cabinet in the investigator’s office, and all computer files were password protected. No names were used in the analyses, subsequent reports, and manuscripts resulting from this work. All participants remained anonymous, and were always referred to by their code. The study participants were free to withdraw from this study at any point during the research process. The researcher also shared the final study report with participants who requested a copy of the study findings, as this study posed no significant risk to any participant due to their anonymity.

4.8 Conclusion

This chapter has clarified the method applied in this research. In the beginning, the study design, the process of sampling, and methods of recruitment were explained. The data collection and data analysis methods were then described. The following six chapters (Chapters Four to Nine) present findings from each study. Five chapters (Chapters Three,
Five, Seven to Nine) contain manuscripts that have been written according to specific journal style requirements, including the referencing style and spelling. Chapter Six contains descriptive analyses of the sample involved in the MTE-based process of engagement in CR.
4.9 References


Chapter Five

Prediction Models for Patient Engagement in Cardiac Rehabilitation Programs

This section explores the suitability of various linear and non-linear statistical methods for evaluating the conceptual framework proposed by the Model of Therapeutic Engagement (MTE). Three methods proposed to be appropriate for assessing this complex model included: multivariate adaptive regression splines (MARS); artificial neural network modelling (ANN); and structural equation modelling (SEM). However, in the current study, we determined that the best method for evaluating the MTE is SEM for several reasons. The first practical constraint is that the sample collected is too small to support machine learning algorithms such as MARS or ANN. The second, and most relevant, issue is that SEM is a model-based approach that enables direct evaluation of the relationships proposed in the conceptual framework of the MTE. In contrast machine learning techniques focus more on the predictive ability of the inputs, and do not provide an easily interpretable mathematical representation of underlying relationships.

The information in this section has been published as a literature review paper in proceedings of a conference:


The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Performed literature review;
- Wrote the document;
- Prepared the manuscript for submission to the conference.

Sepideh Jahandideh (16\textsuperscript{th} December, 2018)

Principal supervisor: Elizabeth Kendall (16\textsuperscript{th} December, 2018)

Corresponding author: Sepideh Jahandideh
5.1 Abstract

Individual engagement in the cardiac rehabilitation (CR) process is increasingly viewed as an essential factor in achieving desired clinical outcomes. Engagement is a construct that can inform our understanding of intention, initiation (i.e. attendance), and maintenance of participation in CR programs. Despite the extended research into individual engagement in psychotherapy and mental health context, research directly exploring this topic within the context of CR has only recently emerged. There is an absence of a coherent approach to understanding and monitoring individual engagement in CR. The most comprehensive theoretical model of therapeutic engagement was developed by Lequerica and Kortte (2010) with reference to acquired brain injury. However, research is yet required to evaluate this multi-layered model thoroughly. The application of such a model could help predict individual engagement in CR, thus providing a useful framework for program planning. We also expect that the lack of application to date is associated with the complexity of multi-layered models, mainly when non-linearity is created by the complex parameters that affect human behaviour after an illness. We propose the use of non-linear statistical or machine learning methods to evaluate this complex model, in conjunction with more standard approaches such as variance-weighted linear regressions.

Keywords: individual engagement, Model of Therapeutic Engagement, multivariate adaptive regression splines, artificial neural network modelling, structural equation modelling
5.2 Introduction

To the present, research has focused on the results achieved by individuals who undertake CR programs. However, little research is known about factors that contribute to individual engagement in such a program (Cannistra, Balady, O'Malley, Weiner, & Ryan, 1992; Izawa et al., 2004; Lequerica & Kortte, 2010; Linden, 2000; Pasquali, Alexander, Coombs, Lytle, & Peterson, 2003; Sundararajan, Bunker, Begg, Marshall, & McBurney, 2004). The ability to engage successfully with individuals, to actuate them to attend, and to facilitate their full participation in the program determines the success or failure of a rehabilitation procedure (Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007; Medley & Powell, 2010). Questions about who engages and why they engage in rehabilitation programs remain largely unanswered.

There have been several recent efforts to develop a more holistic conceptualisation of participation in the rehabilitation process. One of the more outstanding constructs to emerge from this work is engagement (Blanchard, Arthur, & Gunn, 2015; Medley & Powell, 2010; Selzler, Rodgers, Berry, & Stickland, 2016). Rehabilitation engagement has been described as “a construct that captures multiple elements, including an individual’s attitude toward the therapy, his/her level of understanding or acknowledgment of a need for treatment, the need for verbal or physical prompts to participate, the level of active participation in therapy activities, and the level of attendance throughout the rehabilitation program” (Kortte et al., 2007, p. 881). In their recent concept analysis, Bright and colleagues (2015, p. 650) proposed a practical definition of engagement as “a co-constructed process and state”. By positioning engagement at the center of the rehabilitation encounter, as both a process and a state, a more thorough understanding of this complicated concept can be gained.

Interest in the engagement process has existed for some time, but the primary goal has been identifying unitary factors that facilitate or hinder individual participation in
rehabilitation. Important variables have been identified and studied in a disparate manner, such as research into the influence of individualised care plans on individual participation in rehabilitation (Hutchinson, Meyer, & Marshall, 2015; Reunanen, Järvikoski, Talvitie, Pyöriä, & Härkäpää, 2016). Other research has focused on self-efficacy and outcome expectancies as predictors of the degree to which individuals follow the guidelines of their healthcare providers and how these predictors finally impact rehabilitation outcomes (Blanchard et al., 2015; Selzler et al., 2016). Individual motivation has received a great deal of attention as an important construct that can partly explain individual participation in rehabilitation (Dohnke, Nowossadeck, & Müller-Fahrnow, 2010; Horwood, Williams, & Mandic, 2015; Siegmund, Ahmed, Crawford, & Bena, 2017).

Although this piecemeal approach has revealed informative findings about important constructs related to engagement in rehabilitation, it has not provided any overarching understanding of the process of engagement. This approach has also resulted in multiple findings that account for only a small proportion of the variance in both participation and outcomes. As such, there is a need to work on the complexities of the rehabilitation process more holistically to better understand and identify the active ingredients that combine with each other in complex ways to facilitate individual engagement.

Research in this area could benefit from the application of a theoretical model that incorporates multiple predictors, thus facilitating a more organised, structured approach to research. Given the complexity of engagement, the development of a multivariate model is an important, yet challenging endeavour. Lequerica and Kortte (2010) presented a theoretical Model of Therapeutic Engagement (MTE) which aimed to clarify how and why individuals engage in medical rehabilitation (Figure 5.1, p. 141). Although there is evidence in support of individual components of this theoretical engagement model, the
whole model has not yet been evaluated in any rehabilitation population. Thus, the model’s applicability to cardiac rehabilitation (CR) outcomes remains unknown.

Developing prediction models can improve accuracy by generating empirical, quantitative estimates of the likelihood of outcomes at each stage of the MTE. The MTE enables us to have the model structure for applying in the context of CR programs and testing the significance of proposed links. Otherwise, this study would require a large dataset to deliver the best model structure.

5.3 Hypothesis

We hypothesized that by studying a comprehensive psychological model of therapeutic engagement and considering the impact of broader socio-environmental barriers on the model, we will extend knowledge in the area and thereby contribute to improved strategies for enhancing engagement.

At each stage of the model, a set of predictors is proposed. The model suggests that perceived needs, outcome experiences, and perceived self-efficacy collectively help to shape the willingness of a person to commence treatment (see Figure 5.1, Stage One). The consequence of this stage, which is called the pre-intentional or motivational stage, is the behavioural intention to become engaged in rehabilitation or not (Lequerica & Kortte, 2010).

In the second stage of the MTE, the dynamic interactions with a rehabilitation service begin to influence the process of preparation. A collaborative process may occur between the person and the rehabilitation provider that influences the way in which goals are established, and treatment is planned (see Figure 5.1, Stage Two). Deliberate involvement of the individual in the preparation process has been shown to have a positive impact on therapeutic engagement (Laine & Davidoff, 1996; Ozer & Kroll, 2002).
Figure 5.1 The conceptual framework of the Model of Therapeutic Engagement (Lequerica & Kortte, 2010), with arrows indicating how various inputs are related to intermediate outputs: intention to engage in CR programs (Stage One), CR initiation (Stage Two), and maintenance of participation in CR programs (Stage Three)\textsuperscript{12}.

\textsuperscript{12} Figure 5.1 adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, American Journal of Physical Medicine & Rehabilitation, 89, 418. Copyright Year by “Wolters Kluwer”.

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The process of engagement then shifts into a feedback loop where individuals assess the advantages and disadvantages of engagement and make decisions, based on their experience, about whether to continue the activity or disengage. Individual expectations of the rehabilitation programs may or may not be met, which will influence the future behaviour (Sweet, Tulloch, Fortier, Pipe, & Reid, 2011). Reassessment of previous attitudes and beliefs about rehabilitation is an essential regulatory step in the process of engagement (See Figure 5.1, Stage Three). As such, the therapist and individual may need to adjust treatment plans to take full advantage of the reassessment process. However, little is known about how individuals evaluate rehabilitation experiences.

Lequerica and Kortte (2010) alluded to the possibility that individual-level engagement in rehabilitation was likely to be influenced by social and physical environment. However, the MTE focused on engagement as an individual experience without articulating the role of the socio-environmental context within which it occurred beyond the therapeutic relationship. Given our understanding of socio-environmental influences on health, it is necessary to place the MTE within a broader framework by taking into consideration the context in which rehabilitation clients live and the broad upstream factors that influence their outcomes. Socio-environmental barriers have played a critical role in some health behaviour models, but are notably absent from the MTE. The role of socio-environmental barriers in the engagement process during rehabilitation is likely to differ across different stages, but there is no evidence to understand this impact. Although the role of specific barriers has been studied disparately in the context of CR (de Melo Ghisi, Oh, Benetti, & Grace, 2013; Harrison & Wardle, 2005; Sutton, Rolfe, Landry, Sternberg, & Price, 2012), the extent to which these contribute to intention to engage in CR, CR initiation and maintenance of participation in CR remains under-explored. Therefore, further studies are required to enrich our understanding of the role
of barriers at each stage of individual engagement in outpatient CR programs, and the complexity of the processes presented in the MTE.

The primary aim of this study is to test the Model of Therapeutic Engagement in the context of CR. Specifically, the current study aims to examine the propositions made in the three stages of the MTE and the role of socio-environmental barriers at each stage of the model. The propositions generated from the MTE are:

1. Intention to engage in rehabilitation will be associated with perceived need, outcome expectancies, and perceived self-efficacy.
2. Initiation of rehabilitation will be associated with energy and the experience of collaborative goal setting and treatment planning.
3. Maintenance of participation in rehabilitation will be associated with analysis and evaluation of the experience and progress.
4. Socio-environmental barriers will moderate the relationships at each stage of the MTE.
5. Non-linear statistical or machine learning models can predict the likelihood of outcomes at each stage of MTE with high accuracy.

5.4 Statistical challenges in evaluating the model
The MTE contains three temporal stages (i.e. intention to engage in CR programs; CR initiation; and maintenance of participation in CR programs), each consisting of multivariate processes. This complexity poses a number of challenges for analysis. Specifically, the multi-stage nature of the MTE with embedded dependent variables makes it difficult to establish an overarching statistical analysis that can accommodate such complexity. The multi-stage structure provides the opportunity to separate the MTE into three distinct components that can be evaluated individually, using weighted linear regression (WLR). WLR is the most widely used of all statistical techniques and enables
the study of linear, additive relationships between variables. It is also used to understand which predictor variables are related to the dependent variable, and to explore the comparative strength of these relationships. However, this segmental approach will increase the rate of error and will deliver a partial result that does not provide a coherent test of all the proposed relationships. Although more manageable than more complicated techniques, this approach will fail to provide an understanding of the full engagement process over time. Given the complexity of the analysis, a major risk will be erroneous conclusions made by a faulty analysis, or one where major assumptions have been violated.

To evaluate a multi-layered model such as that proposed here, a modular analytical approach is required, involving optimisation of variance-weighted linear regressions for each MTE stage. A more coherent approach to model analysis is structural equation modelling (SEM). The aim of SEM is to evaluate the role of multiple exploratory variables on a response variable, and typically also considers the role of latent (unmeasured) variables. This defines a complex network of sub-models, and traditional estimation methods for SEM presume a linear relationship among variables within each sub-model. However, relationships within sub-models may also manifest as nonlinear relationships.

A further complication is that for many statistical models, data needs to be tabulated in such a way that all variables are measured on all individuals. This means that all sub-models are fitted at the same time to one large dataset. In testing engagement, we are equally interested in the findings associated with those who drop out of the study at different stages over time. As the MTE focuses on a dynamic concept (i.e. engagement), which can fluctuate over time, it is highly likely that participants will drop out during the course of the study. This attrition will be an important and inherently inextricable aspect of the study that cannot be ignored or simply observed. Participants may re-engage or
engage in different ways during the course of the study, so analysis must be able to accommodate a changing sample without losing power. However, the software for fitting SEMs does not permit the fitting of these sub-models using separate datasets, theoretically this is feasible due to the mathematical properties of the multivariate normal distribution that underlies inference for SEMs. A Bayesian SEM could achieve this modular approach; however, it requires high-level programming skills in WinBUGS and R (Muthén & Asparouhov, 2012). A feasible option is to use a sequence of regressions, where the parameter estimates and uncertainty are propagated, using weights, between sub-models. This can be applied to most forms of regression, including a series of variance-weighted linear regressions.

To successfully evaluate the MTE, more complex statistical approaches will be required. We propose multivariate adaptive regression splines (MARS) and artificial neural network modelling (ANN). MARS is a form of regression analysis. This is a non-parametric regression technique and can be seen as an extension of linear models that builds a flexible model which accommodates non-linearities and interactions between variables. MARS models can make predictions rapidly (Friedman, 1991). Therefore, MARS satisfies the requirement of both the explanatory performance and prediction performance and also one requirement of non-linearity. In addition, ANNs are a class of non-linear mathematical models that are characterised by a complex structure of interconnected computational elements. These computational elements aggregate a series of inputs (such as parameters that influence the level of patient engagement) by using a summation operation and producing an output. In this case, ANN satisfies the requirement of predictive performance. Research is required to determine the utility of these methods and the role of theoretical models in driving CR programming in the future.
5.5 Discussion

Engagement in rehabilitation is vital if we are to successfully manage the consequences of cardiac disease. Indicators of engagement can be observed at the individual and environmental interface (Lequerica & Kortte, 2010). However, minimal investigation of the individual engagement process exists which deeply reveals the contributive influences on the various stages of individual engagement. In addition, no decision support models currently exist to alert individuals and/or healthcare providers, to the factors that influence non-engagement.

Detailed examination of the relevant factors impacting the individual engagement process within outpatient CR programs can be achieved through the application of the MTE. This work investigated the utility of four different statistical and machine learning modelling approaches, with varying strengths in explanation and prediction, including: WLR, SEM, MARS and ANN. Each modelling approach can be applied to examine and describe the complex relationships between inputs and outputs, and underlying patterns in data related to individual engagement. Two types of outputs may result from the hypothesised comprehensive framework for representing individual engagement through a set of known variables. First, the explanatory findings are those which could support healthcare providers to identify modifiable management strategies that can be reformed to improve individual engagement levels. Second, the predictive findings allow the formulation of personalised care management plans that take into account the predicted likelihood of individual engagement with outpatient CR programs. Statistical models (such as SEM) and machine learning models (such as MARS and ANN) can assist in evaluating the MTE in order to achieve prediction and explanation benefits.

Evaluating the MTE raises some analytical challenges in that the samples will change slightly as each sub-model within the model is examined (e.g. not all those who were referred to CR will wish to attend; not all those who intend to attend will initiate
contact; attendance will fluctuate during CR; not all those who remain in the program will sustain their engagement after discharge, and so forth). At each point of analysis, the sample may be different, meaning that global models of analysis can be subjected to too much missing data, leading to excessive use of estimation or imputation or limited power. Hence, a series of variance-weighted linear regressions can be applied for each stage of the MTE. WLR use precludes overall explanation of the individual engagement process and renders error more likely, but will separately provide an understanding of contributing variables which impact on each stage of the MTE. Therefore, the most apt representation of individual engagement can be achieved by applying several alternative methods: 1) ANN, 2) MARS and 3) SEM.

The SEM approach could result in good explanatory performance; the ANN gives a good predictive performance; and the MARS approach may result in both explanatory and predictive performance. Due to the capacity of these models to address non-linear relationships between input and output features, which basic linear regression cannot, these models have been chosen for testing of the other hypotheses. Non-linearity postulated, due to the type of influential factors on individual decision-making behaviour in relation to CR engagement. In addition, in comparison with SEM, MARS and ANN require a big dataset aiming for perfect predictive power; however, these two models can overfit the training data and hence be less generalizable to the new data. Therefore, a three-model comparison is required to evaluate their performance in the CR setting and to discover the ideal method for understanding and predicting individual engagement in CR.
5.6 References


Chapter Six

Descriptive Analysis

The previous chapter proposed suitable statistical methodologies to be used for empirically evaluating the Model of Therapeutic Engagement (MTE), applicable for analysing the data collected in Chapters Seven, Eight and Nine. This chapter describes the sample and its characteristics at the various stages of the prospective study.

6.1 Analysis of the sample involved in the Model of Therapeutic Engagement-based process of engagement in CR

A request was delivered to 310 participants to volunteer for the current study. As shown in Figure 6.1 below, 217 of the 310 participants consented to participate in the study and complete the first and second questionnaires. The main reasons provided by 93 participants for not accepting to participate in the study included: feeling too unwell to complete the survey; and participating in other studies during hospitalisation.

The level of individual intention to engage in the CR program was measured with the Short Version of Recovery Intention Questionnaire (Blasche & Marktl, 2011) [Appendix C, p. 347]. Each item on the questionnaire was answered on a five-point Likert scale ranging from strongly disagree to strongly agree. This questionnaire was completed by individuals who were referred to the CR program at the time of hospital discharge. After validating the scale (see Chapter Seven, p. 158), individuals were divided into two groups based on whether they fell above or below the average score of the validated intention scale (mean = 10): that is, individuals with a high level of intention to engage in the CR program and those with a low level of intention to engage in the CR program. Consequently, 217 participants agreed to participate in the research. Of the 217 consenting to participate, 87 indicated a low level of intention to engage in the CR program and 130 indicated a high level of intention.
A small portion of participants were lost to follow up after discharge from the hospital for several reasons: 5 participants enrolled in the CR program but did not reply to the researcher after discharge; 4 participants were referred to another CR centre but only 2 of them enrolled in the program; and one enrolled in the program but withdrew from the study. Of the remaining 207 participants, a total of 101 participants enrolled in the CR program while 106 declined to enrol. In the next stage of the MTE (CR initiation), 63 participants of those who chose to enrol (101) initiated the program and 38 did not initiate the program. Initiation was defined as attending at least four sessions, because attending a single session was not considered sufficient to represent the level of engagement required for this study.

As can be seen in Figure 6.1 (p. 155), 45 participants with a high level of intention to engage in the program and 18 participants with a low level of intention to engage in the program actually initiated the program. In contrast, 20 participants with a low level of intention and 18 participants with a high level of intention to engage in the program did not initiate the program. In terms of maintenance of the program (i.e. completion of all sessions), 53 participants (of 130) with a high level of intention to engage in the program and 26 participants (of 87) with a low level of intention to engage in the program maintained the program. In contrast, 12 participants with a low level of intention to engage in the CR and 10 participants with a high level of intention to engage in the program did not maintain the program to completion. These patterns suggest that factors other than intention may have influenced attendance and completion in this study.

Based on Spearman, there was a significant, yet weak, relationship between intention to engage in the CR program and both initiation ($r_s = 0.29$, $n = 101$, $p < 0.01$), and maintenance ($r_s = 0.27$, $n = 101$, $p < 0.05$). However, there was no significant relationship between intention to engage in CR and depth of engagement ($r_s = 0.19$, $n = 101$, $p < 0.12$), as rated by rehabilitation nurses who used the Hopkins Rehabilitation
Engagement Rating Scale (HRERS) to measure individuals’ levels of engagement in therapy at the end of the CR program (Kortte et al., 2007). The HRERS scale has been validated in Chapter Eight (p. 205). Therefore, intention to engage in CR while in hospital may marginally improve the likelihood of initiation and maintenance, but does not guarantee a quality level of engagement.

6.2 Sample Characteristics

Table 6.1 (p. 156) illustrates the respondents’ demographic and medical profile. The sample of 217 individuals comprised 74% males and 26% females. The mean age of the participants was 63 years (SD = 11.35) with a range from 30 to 91 years. Approximately, 36% reported receiving a junior or intermediate certificate (year 10) level of education or less; 21% completed a senior or leaving certificate (years 11-12); 29% completed a TAFE (Technical and Further Education) certificate or equivalent; 10% completed an undergraduate degree; and 4% held postgraduate degrees. In addition, almost 29% of patients were diagnosed with coronary artery disease; 29% with non-ST-segment elevation myocardial infarction (NSTEMI); 28% with ST-segment elevation myocardial infarction (STEMI); 6% with valvular heart disease; 3% with cardiovascular risk factors; and 5% with arrhythmia.

Participants who did not enrol in the CR program consisted of 81% male and 19% female, whereas the participants who enrolled consisted of 63% male and 37% female. The average age for participants who did not enrol versus those who enrolled in the program was similar for the two groups (who did not enrol, mean age = 64 years, SD = 11; enrolled, mean age = 65 years, SD = 12). Willingness to consider treatment was also similar for both groups (did not enrol, mean = 14, SD = 1.80; enrolled, mean = 13.38, SD = 2.63).
Barriers to engaging in the CR program were measured using the Cardiac Rehabilitation Enrolment Obstacles (CREO) Scale (Fernandez et al., 2008). The CREO scale assesses each individual’s perception of barriers which affects their enrolment and participation in CR. Before validating the scale, barriers to engaging in the CR program at the first stage of the MTE were not substantially different between the two groups of participants (did not enrol, mean number of barriers = 26.50, SD = 8.50; enrolled, mean = 25.60, SD = 7.90). Among participants who commenced the program, the average number of barriers was 16.40 (SD = 6.30), which indicates that barriers to engagement in the CR program decreased after the program commencement.
Figure 6.1 Descriptive analysis of the sample who participated in the study and enrolled, initiated or maintained the cardiac rehabilitation program.
Table 6.1 Participants’ demographic and medical profile (n = 217)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sample Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>57 (26)</td>
</tr>
<tr>
<td>Male</td>
<td>160 (74)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>30-45 years old</td>
<td>14 (6)</td>
</tr>
<tr>
<td>46-61 years old</td>
<td>69 (35)</td>
</tr>
<tr>
<td>62-77 years old</td>
<td>98 (48)</td>
</tr>
<tr>
<td>78-93 years old</td>
<td>35 (11)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
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<tr>
<td>Married/De-facto</td>
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<tr>
<td>Divorced/Widowed</td>
<td>39 (18)</td>
</tr>
<tr>
<td>Single</td>
<td>29 (13)</td>
</tr>
<tr>
<td><strong>Religion</strong></td>
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<tr>
<td>Catholic</td>
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<tr>
<td>Protestant</td>
<td>47 (22)</td>
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<tr>
<td>Islam</td>
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<tr>
<td>Other</td>
<td>47 (22)</td>
</tr>
<tr>
<td>No religion</td>
<td>62 (29)</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>16 (7)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
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<tr>
<td>Hispanic</td>
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<tr>
<td>Asian</td>
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<td>Middle East</td>
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<td>Caucasian/European</td>
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<td>New Zealand</td>
<td>16 (7)</td>
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<tr>
<td>Other</td>
<td>16 (7)</td>
</tr>
<tr>
<td><strong>Work status</strong></td>
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<tr>
<td>Pension</td>
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<tr>
<td>Self-funded</td>
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<tr>
<td>Retiree</td>
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</tr>
<tr>
<td>Employed part-time</td>
<td>18 (8)</td>
</tr>
<tr>
<td>Employed full-time</td>
<td>52 (24)</td>
</tr>
<tr>
<td>Pension and employed part-time</td>
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<td>Pension and retiree</td>
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<tr>
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<td>Pension, retiree and employed part-time</td>
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<tr>
<td>Other</td>
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Table 6.1 Continued

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<th>Variables</th>
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</thead>
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<tr>
<td>Highest level of education</td>
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<tr>
<td>Junior/Intermediate certificate (year 10) or before</td>
<td>78 (36)</td>
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<tr>
<td>Senior/Leaving certificate (years 11-12)</td>
<td>45 (21)</td>
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<tr>
<td>TAFE certificate or equivalent</td>
<td>64 (29)</td>
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<tr>
<td>Undergraduate degree</td>
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<tr>
<td>Postgraduate degree</td>
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<td>Annual combined household income</td>
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<tr>
<td>Less than $19,999</td>
<td>26 (12)</td>
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<tr>
<td>$20,000-$39,000</td>
<td>57 (26)</td>
</tr>
<tr>
<td>$40,000-$59,000</td>
<td>24 (11)</td>
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<tr>
<td>$60,000-$79,000</td>
<td>35 (16)</td>
</tr>
<tr>
<td>More than $80,000</td>
<td>29 (13)</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>46 (21)</td>
</tr>
<tr>
<td>Medical diagnosis</td>
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<tr>
<td>Coronary Artery Disease (CAD)</td>
<td>63 (29)</td>
</tr>
<tr>
<td>Non-ST-segment elevation myocardial infarction (NSTEMI)</td>
<td>64 (29)</td>
</tr>
<tr>
<td>ST-segment elevation myocardial infarction (STEMI)</td>
<td>60 (28)</td>
</tr>
<tr>
<td>Valvular heart disease</td>
<td>14 (6)</td>
</tr>
<tr>
<td>Cardiovascular risk factors</td>
<td>6 (3)</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>10 (5)</td>
</tr>
</tbody>
</table>
Chapter Seven

Understanding Individual Intention to Engage in Outpatient Cardiac Rehabilitation Programs Based on the Model of Therapeutic Engagement

The Model of Therapeutic Engagement (MTE) proposed that individual intention to engage in outpatient cardiac rehabilitation (CR) programs (the first stage of the MTE) is impacted by: perceived self-efficacy (awareness of capabilities and perceived demands), outcome expectancies (perceived success and value of outcomes), and perceived need (awareness of deficits and perceived general benefits of rehabilitation). Furthermore, the individual’s willingness to consider treatment mediates the relationships between all of these constructs of perceived self-efficacy, outcome expectancies, perceived need, and intention to engage in the CR program (Lequerica & Kortte, 2010). In this chapter, the main focus was to empirically evaluate the first stage of the MTE (in Figure 7.1) using a sample of 217 individuals, specifically enlisted for this purpose, who consented to participate in the study.

Figure 7.1 The first stage of the conceptual Model of Therapeutic Engagement (Lequerica & Kortte, 2010)\textsuperscript{13}

\textsuperscript{13} Figure 7.1 adapted from “Therapeutic engagement: a proposed model of engagement in medical rehabilitation” by Lequerica, A. H., & Kortte, K., 2010, American Journal of Physical Medicine & Rehabilitation, 89, 418. Copyright Year by “Wolters Kluwer”.

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The information in this chapter has been submitted to a peer-reviewed journal as an original paper:


The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Completed and obtained the required human research ethics approval;
- Developed the survey questionnaire;
- Collected data;
- Performed data analysis and interpreted the findings;
- Prepared the manuscript and submitted to the journal.

Sepideh Jahandideh (16th December, 2018)

Principal supervisor: Elizabeth Kendall (16th December, 2018)

Corresponding author: Sepideh Jahandideh
7.1 Abstract

This study aimed to evaluate the first stage of the theoretical Model of Therapeutic Engagement (MTE) for outpatient cardiac rehabilitation programs. The MTE has not previously been evaluated empirically in any rehabilitation settings before this study on 217 individuals, invited to receive cardiac rehabilitation after surgery in an Australian hospital. Structural equation modelling provided a mechanism for representing and empirically evaluating the conceptual model structure embodied by the MTE. The first stage of the MTE is derived from the Health Action Process Approach (HAPA). The difference is that the MTE integrates perceived self-efficacy, perceived need, and outcome expectancies into both individuals’ perception of self and individuals’ impression of the treatment environment, instead of focusing only on individuals’ perception of self, as is the case with the HAPA approach. Also, an individual’s willingness to consider treatment was added as a mediator in the MTE. The results revealed evidence supporting that perceived self-efficacy (awareness of capabilities, and perceived treatment demands) and perceived need for rehabilitation (awareness of deficits, and the general benefits of treatment) both positively impacted on individual intention to engage in the program. The individual’s willingness to consider the treatment was confirmed to act as a mediator of the relationship between perceived self-efficacy and intention to engage in CR. The relationships between perceived self-efficacy and outcome expectancies, and also outcome expectancies and intention to engage in the cardiac rehabilitation program were not evident in this initial study. Our findings confirm that the MTE translates well from theory into practice in that it provides a useful mechanism by which the individual’s intention to engage can be described, and hence planned for.
Keywords: Model of Therapeutic Engagement, perceived self-efficacy, outcome expectancies, perceived need, willingness to consider the treatment, structural equation modelling
7.2 Introduction

Cardiovascular diseases are associated with the highest rate of mortality in Australia (Australian Bureau of Statistics, 2017). For people with cardiovascular disease (CVD), cardiac rehabilitation (CR) is a secondary prevention program and delivered by a multidisciplinary team. The key components of CR programs should be to manage identified modifiable risk factors, promote healthy behaviors in individuals, reduce cardiovascular disability, and encourage an active lifestyle (American Association of Cardiovascular and Pulmonary, 1999). Researchers have shown significant reductions in mortality for individuals who have participated in CR programs (de Araújo Pio, Marzolini, Pakosh, & Grace, 2017; Pardaens et al., 2017). Despite the fact that all people hospitalised with acute coronary events or procedures are considered eligible for enrolment in CR programs, only 11% of eligible individuals across Australia were referred to CR at hospital discharge after a CVD event (Walters et al., 2008). Furthermore, fewer than 20% of all eligible individuals completed a CR program in Queensland (Scott, Lindsay, & Harden, 2003).

The underutilization of CR programs may be attributed to a variety of CR participants, health care provider and community variables (Jolly et al., 2007). A recent study conducted by Gardiner and colleagues (2018) on a sample of Australia people who were eligible to receive outpatient CR programs demonstrated that poor utilization of CR programs was primarily associated with lack of knowledge about health-related benefits of CR programs (Gardiner et al., 2018). Therefore, increasing individuals' knowledge about the benefits of CR programs while they are in hospital is essential to enhance engagement in outpatient CR programs. Motivating individuals to initiate CR while they are in hospital may be a critical action to enhance individual engagement in outpatient CR programs. In this paper, we consider the role of individual intention to engage in CR programs while they are in hospital. This is one of the potential key factors in the process
of individual engagement in CR programs, and developing understanding about this factor, could substantially help healthcare providers design interventions to optimize CR outcomes.

As noted by Seel, Steyerberg, Malec, Sherer, and Macciocchi (2012, p.144), a strong theoretical basis is an important phase of developing quantitative models, whether they be explanatory or predictive. Several health behavior models have been developed to reflect an understanding of why, and how, patients engage in healthy behaviors and avoid dangerous habits. Four known models in the context of rehabilitation are the Health Action Process Approach (HAPA) (Schwarzer, 2001), the Trans-theoretical Model of Behaviour (Prochaska & Velicer, 1997), the Health Belief Model (Hochbaum, Rosenstock, & Kegels, 1952) and Protection Motivation Theory (Rogers, 1983). In all four theoretical models, behavioral intention is considered to be a pivotal element in determining change of health behavior. An intention is defined as a desire to achieve certain behaviors or to attain positive outcomes (Triandis, 1980). The individual’s intention of what they will do defines the degree of effort the person is prepared to provide. Intentions, thus, incorporate the motivational factors that impact on a behaviour (Ajzen, 1991).

More recently, the Model of Therapeutic Engagement (MTE) was proposed by Lequerica and Kortte (2010) and is centered on the role of intention in determining engagement in rehabilitation. The MTE describes the process of individual engagement in rehabilitation following traumatic injury (Lequerica & Kortte, 2010, p. 418), and has not yet been quantitatively evaluated in any rehabilitation setting.

The MTE comprises three previously untested stages: (1) intention to engage in CR; (2) CR initiation; and (3) maintenance of participation in CR. The first stage of intention in the MTE includes three main components: perceived self-efficacy which is related to individuals’ beliefs in their abilities to successfully complete a task (Bandura,
perceived need which refers to the knowledge, or perception, that current behaviour has potentially risky health outcomes (Schwarzer, 2001); and outcome expectancies which is the expectancies of the outcome arising from this behavioural change (Schwarzer, 2001). The first stage of the MTE (Figure 1) on intention to engage is derived from the Health Action Process Approach (HAPA), with the difference being that the MTE tends to view the process of behavioral intention as a complex stage composed of both individuals’ perception of self and individuals’ impression of the treatment environment, instead of focusing only on individuals’ perception of self. For example, perceived risk of developing health problems is a factor associated with perceived need for health behavior change in the HAPA model. However, Lequerica and Kortte (2010) suggested that perceived risk of deficits (as termed in HAPA model) does not entirely explain the perceived need for treatment. Perceived benefit of treatment is also an important component of the perceived need for treatment. This new approach couples the individuals’ perception of self with the perception of an aspect of their environment. In addition, the role of willingness to consider the treatment has been proposed in the MTE as a factor which influences the individual’s intention to engage in rehabilitation. Previous studies on the prototype willingness model indicated that willingness to consider the treatment impacts on individuals’ intention to change their health behavior (Hukkelberg & Dykstra, 2009; Matterne, Diepgen, & Weisshaar, 2011).

The first stage of the MTE explains how individual intention to engage in rehabilitation is formed prior to discharge from hospital. In this motivation stage, an individual’s behavioural intention is driven by attitudes and beliefs, and is a necessary predictor of actual engagement. The nine propositions (P1-P9) of the first stage of the MTE provide a strong theoretical foundation for this empirical study, which is specifically designed to evaluate them empirically.
The MTE proposed that perceived self-efficacy and perceived need impact on outcome expectancies (P1 & P2). In addition, three major variables are considered to play an important role in the process of forming an intention to engage (Lequerica & Kortte, 2010), namely: (P3) perceived need for treatment, defined by two sub-components, a) awareness of deficits, and b) understandings about the general benefits of treatment; (P4) outcome expectancies, with sub-components a) perceived likelihood of a successful outcome, and b) perceived value of outcome on quality of life; and (P5) perceived self-efficacy, defined by a) awareness of capabilities, and b) perceived treatment demands. Previous research reported that higher levels of individual intention to engage in health behavior change are associated with higher the levels of perceived need (Broadbent, Ellis, Thomas, Gamble, & Petrie, 2009; de Melo Ghisi, Grace, Thomas, & Oh, 2015), outcome expectancies (Bennett, Mayfield, Norman, Lowe, & Morgan, 1999; Sniehotta, Scholz, & Schwarzer, 2005) and perceived self-efficacy (Bakker, Nijkamp, Sloot, Berndt, & Bolman, 2015; Dohnke, Nowossadeck, & Müller-Fahrnow, 2010). However, these studies only focused on individuals’ perception of self in these components and did not consider the individual’s impression of the treatment environment, as is the case with these components of the MTE.

The MTE proposed that intention to engage in CR is a result of the awareness that: a deficit exists, and that it requires treatment, together with a belief that actively participating in such treatment will decrease that deficit, and finally, the fact that this outcome is valued. There must also be a belief that one has the ability to participate in that treatment given the context of one’s environment, despite any difficulties associated with participation. The culmination of these beliefs, when combined, is a willingness to consider the treatment to reach outcome goals (P6), which in turn influences the intention to engage in CR programs (Lequerica & Kortte, 2010). Individuals’ willingness to consider the
treatment is defined as the most important cognitive factor in actual behavioral performance (Ajzen, 1991; Fisher & Fisher, 1992).

In addition, previous research has supported that age and gender can act as moderators since they affect the strength of the relationship between social-cognitive variables and physical activity behavior. Specifically, Renner, Spivak, Kwon and Schwarzer (2007) examined whether the HAPA model can be generalized to different age groups to predict the physical activity. Their results showed age differences in the interplay of social-cognitive variables. Another study found gender was important, reporting that for women, 28% of the variability in intention was accounted for by objective risks, outcome expectancies, and perceived self-efficacy, whereas these predictors were not found useful for predicting dietary behaviors for men (Renner et al., 2008). Therefore, this study considers the importance of MTE components in the first stage explaining intention to engage in CR programs, whilst simultaneously considering the role of age and gender (P7-P9).

The hitherto untested MTE also proposes that there is an interplay between patients’ perception of self, and patients’ impression of the treatment environment in forming patient intention to engage in CR programs. This study adapts that new perspective in order to broaden our understanding of the complex process of individual intention to engage in CR. Therefore, the specific objectives of this study were to: a) explore, measure and validate the components of the first stage of the MTE in rehabilitation; b) examine the way in which the MTE components interact with each other, and in particular work together to explain intention to engage in CR; and c) analyze the contribution of age and gender in these relationships.
7.3 Methods

Study Design

This study focuses on the initial stage of the MTE, and sits within a larger study aiming to examine all three stages of the MTE. Given that the MTE focuses on a dynamic concept of engagement which may fluctuate over time, participants tend to drop out as rehabilitation progresses. Conversely, there is no way for new participants to join, unless they start at the beginning of the MTE process. Thus, there can be attrition, which is not balanced by additions. This progressive attrition affects the sample size available for analysis at each stage. Our initial focus in this paper is on the first stage of the MTE, with the highest sample size: the intention to engage in CR programs. Therefore, a cross-sectional design focused on the contemporaneous relationships (i.e. occurring at a particular stage of engagement) among variables to develop a predictive model for engagement at this first stage of the process of CR, as described by the theoretical model. Using previously validated survey instruments, we compiled a new composite of questionnaires for data collection.

Participants

Individuals were referred to Phase II CR if they had established myocardial infarctions, percutaneous coronary intervention, coronary artery bypass grafting, angina pectoris, and other forms of chronic and acute heart disease (Williams et al., 2006). Individuals were informed about this study on CR while they were in hospital. Consenting individuals were invited to complete a self-administered survey in either paper or online format through SoGo Survey (http://www.sogosurvey.com/). Exclusion criteria applied to patients who were: too ill or unwilling to volunteer in the study; unable to read and speak English; diagnosed with any visual, cognitive or psychiatric conditions that would prevent them from completing the survey; or had participated in CR programs before.
Data Collection

Individuals were recruited for an eight-month period (April to November 2017) at the Gold Coast University Hospital (GCUH), Australia. The sample comprised of 217 individuals who had experienced cardiac events and also had never participated in CR. The sample can be described as a convenience sample as, due to ethical requirements, it was necessary that participants self-nominated. As negotiated with the GCUH, the hospital cardiac rehabilitation nurse gave eligible patients an information letter on the day of discharge. If individuals agreed to participate in the study, they were approached by the principal researcher, given more details about the study and asked to sign the consent form. They were informed about the process of the study and anonymous data processing. A total of 310 eligible individuals were invited to volunteer for the study. Of these, 217 individuals consented and returned the survey, providing a relatively high response rate of 70%. This response rate of 70% is appropriate in studies that aim to explain knowledge or behavior (Mundy, 2002). The main reasons provided for not participating included feeling too unwell to complete the survey and participating in other studies during hospitalization.

A minimum required sample size for statistical analysis via Structural Equation Models was calculated using an online statistical sample size calculator (Soper, 2018), which implemented the method that balances significance and power (Cohen, 1988; Westland, 2010). This approach computes the required sample size based on the number of observed and latent variables in the proposed model structure, the standardised effect size that needs to be detected, and the desired significance and statistical power levels (Soper, 2018). For performing confirmatory factor analysis, a minimum sample size of 150 is estimated in general to have a power 80% to detect a standardised effect size of 0.3 with a significance level of 5% (5 latent variables; 56 observed variables). A minimum
sample size of 88 is estimated sufficient for conducting a pathway analysis of the model structure (5 latent variables; 22 observed variables).

Research ethics approval was obtained from the Gold Coast Hospital and Health Service Human Research Ethics Committee (Reference number HREC/16/QGC/329).

**Measures**

The constructs from the MTE were assessed using psychometrically-validated scales, as described below. The survey was composed of 65 items, with 56 using a five-point Likert scale and 9 using a semantic differential scale.

**Demographic and Medical Variables**

The demographic questions assessed the participant’s age, gender, marital status, religion, ethnicity, work status, the highest level of education, annual combined household income, and medical diagnosis.

**Dependent Variable**

**Intention to Engage in CR.** Intention refers to personal goals, either self-imposed or other-imposed (Fishbein & Ajzen, 1975). *The Short Version of Recovery Intention Questionnaire* (6 items) was used here with a slight change of wording of items to suit a rehabilitation setting. Three of these items initially belonged to the “recovery management” scale, two to the “recovery neglect” scale, and one to the “recovery organization” scale (Blasche & Marktl, 2011). Responses were on a five-point Likert-type scale ranging from strongly disagree to strongly agree. That study validated this scale.

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14 The material contained in this section is a duplication of that from the methods described in Chapter Four of this thesis. It is repeated here for completeness as it forms part of the submitted/published manuscript.
on a population of 380 Australian employees, which is therefore relevant to Australian CR patients. This scale had a good scale reliability (Cronbach’s alpha = 0.87). A sample from the full list of items is “I provide myself with sufficient opportunities for recovery”.

**Perceived Need for Rehabilitation.** The perceived need for rehabilitation was assessed by two variables: awareness of deficits and perceived general benefits of rehabilitation. Awareness of deficits was measured using a subscale of the *Motivation for Traumatic Brain Injury Rehabilitation Questionnaire (MOT-Q): Lack of Denial* (8 items), a sample from the full list of items is “I’m better now than I ever was” (Chervinsky, Ommaya, Spector, Schwab, & Salazar, 1998). The construct Perceived general benefits of rehabilitation was measured using two sub-scales from the MOT-Q: 

*a)* *Interest in Rehabilitation* (7 items), with a sample item “I’m very excited about getting treatment as soon as possible” ; and b) *Lack of Anger* (5 items), with a sample item “therapists would waste my time”. Responses were on a five-point Likert-type scale ranging from strongly disagree to strongly agree. The scales were validated on a population of 122 inpatients and 92 outpatients in the brain injury rehabilitation setting in the Netherlands by Boosman, van Heugten, Winkens, Smeets and Visser-Meily (2016). Internal consistency of the subscales, Interest in Rehabilitation and Lack of Denial, was acceptable in the inpatient group ($\alpha = 0.66, \alpha = 0.63$, respectively) and good in the outpatient group ($\alpha = 0.83, \alpha = 0.84$, respectively). Regarding Lack of Anger, internal consistency was acceptable in the outpatient group ($\alpha = 0.68$) and good in the inpatient group ($\alpha = 0.80$) (Boosman et al., 2016).

**Outcome Expectancies.** Referring to beliefs about the positive and negative outcomes of alternative behaviors, outcome expectancies were measured by two variables: a) perceived success and b) value of outcomes. The *Rehabilitation Representations Scale, Treatment Outcome Beliefs* (Bains, Powell, & Lorenc, 2007), was used to assess perceived success (6 items). Responses were on a five-point Likert-type
scale ranging from strongly disagree to strongly agree. This scale was validated on a population of 40 acquired brain injury rehabilitation participants in the United Kingdom. *The Outcome Expectancies Questionnaire* (Sniehotta, Scholz, & Schwarzer, 2005) was used to measure the value of outcomes (5 items), and validated on a population of 307 CR participants in the United Kingdom. A sample from the full list of items is “Rehabilitation will help me learn new ways of doing things”. The internal consistency presented by the developers for this subscale was good (0.70).

**Perceived Self-efficacy.** Perceived self-efficacy was measured by two variables: a) awareness of capabilities, and b) perceived demands. Awareness of capabilities was measured using 6 items of the *Control Cognition subclass from the Rehabilitation Representations Scale (RRS)* (Bains et al., 2007). A sample from the full list of items is “I have the confidence that I can cope with doing rehabilitation”. In that study the internal consistency for this subscale was 0.83. The construct perceived demands was measured by 7 items from the *Perceived Barriers subclass of the Rehabilitation Representations Scale (RRS)* (Bains et al., 2007). In that study, the internal consistency for this subscale was 0.89. The original scales (but not the subsets of items chosen) were validated on a population of 40 acquired brain injury rehabilitation participants in the United Kingdom (Bains et al., 2007). A sample from the full list of items is “I have more important things to get on with than doing rehabilitation”.

**Mediator and Moderator Variables.** Willingness to consider treatment has been proposed for inclusion in the model as a mediator variable (Lequerica & Kortte, 2010). The construct *Willingness to Follow Treatment Recommendations* [6 items] (Boosman, van Heugten, Winkens, Smeets, & Visser-Meily, 2016) was used, which had been validated on a population of 122 inpatients and 92 outpatients in the brain injury rehabilitation setting in the Netherlands (Boosman et al., 2016). Internal consistency of the subscale was acceptable for both the inpatient and outpatient groups (α = 0.70, α =
0.73, respectively). A sample item is “Doctors know what I need and I’ll do what they say”.

It was proposed that the relationships in the model for initiation of engagement were moderated by (i.e. differed across) gender (male or female) and age (young or old). Multiple-group analyses (Hayduk, 1987) were conducted to determine whether the causal relationships in the model were invariant across age or gender groups or not.

**Methods of Analysis**

The collected data were analyzed to: firstly, undertake an exploratory data analysis to characterize the sample’s demographics; secondly, to conduct a confirmatory factor analysis (CFA) establish that it was appropriate to sum items comprising the latent variables (measurement model); as well as thirdly, conduct a pathway analysis to estimate the complex effects of latent and observed variables on initiation of engagement (and test the model structure proposed by the MTE). A structural equation model (SEM) was used to achieve the factor and pathway analyses. To avoid issues, multi-collinearity of constructs and outliers were checked before any analyses. We completed analyses with SPSS (Version 21.0 for Windows; IBM SPSS Statistics, Armonk, NY, USA) and SPSS Amos (Version 21.0; Arbuckle, 2012).

The use of SEM may encounter various problems, such as multi-collinearity and outliers, which should be checked at the outset of SEM analysis via exploratory data analysis (Grewal, Cote, & Baumgartner, 2004). The problem of multi-collinearity manifests as high correlations among the predictor constructs and/or observed variables (Baumgartner & Homburg, 1996). The variance inflation factor (VIF), provided in the output from the collinearity diagnostics function in SPSS (Mansfield & Helms, 1982), was used to test multicollinearity. Recommendations are that VIFs of all model variables should fall under 10 to indicate that no significant multicollinearity exists (Hair,
Anderson, Babin, & Black, 2010). In addition, correlations were inspected among outcome expectancies, perceived self-efficacy, perceived need, willingness to consider the treatment, and intention to engage in the CR programs. Recommendations are that correlations among variables should fall below 0.80, to avoid excessive multi-collinearity (Teck & Lai, 2011). Lastly, the Mahalanobis distance was used to detect outliers, as recommended by Hair, Black, Babin, Anderson, and Tatham (2006).

Before testing the structural model and hypotheses encompassed by the MTE, the measurement model was applied for each individual construct, to examine whether the items within the constructs are sufficiently consistent, yet provide slightly different information, allowing them to be aggregated (Kline, 2005). Three sets of fit indices were considered for model fit: relative fit indices; absolute indices; and parsimonious fit indices. Model fit was evaluated by comparing seven indices to thresholds recommended in previous studies. The Incremental Fit Index describes how much a path (between two variables) adds to the model (IFI ≥ 0.90) (Arbuckle and Wothke, 1999); and the Tucker-Lewis Index compares the proposed model with a so-called ‘null’ model, which simply comprises a mean (TLI ≥ 0.90) (Arbuckle and Wothke, 1999). The null hypothesis that the modelled and observed values of the outcome (here individual intention to engage in CR) are not at all aligned, can be tested via a chi-square test of independence. The Root Mean Square Error is another measures of the calibration error in how closely the predictions match the observed values in the data (RMSE ≤ 0.08) (Browne and Cudeck, 1993), and the ratio of the Chi-Squared test statistic to the degrees of freedom assesses the magnitude of discrepancy between the observed sample and the MTE structure and its implied variance-covariance matrices (≤ 3.0) (Norušis, 2012). Both the RMSE and Chi-Squared test statistic provide overall measures of goodness-of-fit, but do not apply a penalty for model complexity. The Parsimonious Comparative Fit Index compares modifications of the model structure consistent with the MTE, having different number
of variables and hence varying degrees of freedom (PCFI > 0.5) (Safarnia, Akbari, & Abbasi, 2011). The PCFI, was used to measure parsimony, to balance goodness-of-fit with model complexity. In this study, modifications were made by eliminating observed variables that were not found significant or with standardized factor loadings of less than 0.50 (Hair, 2010). Different covariance models were also considered for error terms and modified to improve model fit.

Low reliability and validity of scales may result in relationships seeming non-significant, despite whether the links exist or not (Shook et al., 2004). Therefore, validity and reliability assessments were considered as the first steps in this research. Both convergent and discriminant validity indices were applied for measuring validity of questionnaires. Convergent validity evaluates to what extent different measures of a construct should be related to each other to lead to the same results (Hair et al., 2010). Convergent validity is deemed sufficient if average variance extracted (AVE) equals or exceeds 0.5, and all standardized factor loadings are significant in a factor analysis (José Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014). Discriminant validity indicates to what extent a latent variable and its indicators vary from another latent variable and its indicators, and hence contributes the potential to discriminate between individuals. If the AVE of each scale is more than its corresponding squared correlations or shared variance, then discriminant validity of that construct is considered adequate (Hair et al., 2010). Furthermore, the AVE needs to exceed its corresponding correlation, or maximum shared variance (MSV). AVE and both convergent and discriminant validity of the measurements were calculated using the "Validitymaster" function in the Stats Tool Package (Gaskin, 2016). Finally, Cronbach’s alpha was used to measure internal consistency of the scales (Gaskin, 2016). An alpha coefficient below 0.5 is considered unacceptable, according to George and Mallery (2003).
The proposed MTE was evaluated using structural equation modelling (SEM) to conduct a path analysis involving multiple latent variables. The method is being increasingly used in rehabilitation research to evaluate complex model structures (Chan, Lee, Lee, Kubota, & Allen, 2007), and is well suited to test the complex inter-relationships among constructs, and multiple hypotheses, as proposed by the MTE. SEM provides an umbrella for both: confirmatory factor analysis, needed here to confirm the factor structure of multiple psychological instruments; and also for testing theoretical models via pathway analysis (Schumacker & Lomax, 2012). The latter pathway analysis can assess linear relationships amongst constructs (latent variables) and other observed variables. Since pathway analysis flexibly allows a hierarchy of relationships, non-linear relationships can be induced by the hierarchies. Pathways were used to indicate when an outcome (known as a predictor) variable (such as intention to engage in CR programs) depended on another (known as a dependent variable or predictor), and enabled direct testing of the sign and magnitude of the effects of predictors on outcomes by estimating the corresponding path coefficients (Schumacker & Lomax, 2012, p. 33).

Another advantage of using SEM is the ability to intuitively analyze the role of mediators and moderators. A mediator is defined as a variable that affects the direction or strength of pathways relating outcomes and predictors (Baron & Kenny, 1986). Here, SEM was used to assess the direct effects of perceived self-efficacy, perceived need, and outcome expectancies on intention to engage in CR, with or without the indirect effects of the mediator willingness to consider the treatment. Multi-group analyses (Gaskin, 2012) were used to address the role of the moderators, age and gender, to determine if they influenced the direction or strength of the relationships between all other predictors and the dependent variable (intention to engagement in CR programs).

The SEM was implemented to obtain estimates of effect sizes that make the data most likely via maximum likelihood estimation (Arbuckle, 2012). Given the complexity
of the model, bootstrapping, as a resampling method (MacKinnon, Fairchild, & Fritz, 2007), was helpful for estimating the standard errors of these parameter estimates (Bollen & Stine, 1992). Both direct and indirect effects involving latent variables were based on a 95% bias-corrected two-tailed confidence interval with bootstrapping (Cheung & Lau, 2008). In this study, 2000 bootstrap samples were found to be adequate.

Goodness-of-fit indices and standardized factor loadings were examined for each model (Schumacker & Lomax, 2012), particularly the percentage of variance explained, based on the R-squared values.

### 7.4 Results

**Descriptive Statistics**

Table 7.1 illustrates the participants’ demographic and medical profile. The sample of 217 individuals comprises 74% males and 26% females. The mean age of the participants was 63 (SD = 11.35) with a range from 30 to 91 years. Approximately 36% reported receiving a junior or intermediate certificate (year 10) level of education or less; 21% completed a senior or leaving certificate (years 11-12); 29% completed a TAFE (Technical and Further Education) certificate or equivalent; 10% completed an undergraduate degree; and 4% held postgraduate degrees. In addition, almost 29% of participants, were diagnosed with coronary artery disease; 29% with non-ST-segment elevation myocardial infarction (NSTEMI); 28% with ST-segment elevation myocardial infarction (STEMI); 6% with valvular heart disease; 3% with cardiovascular risk factors; and 5% with arrhythmia.
Table 7.1 Participants’ demographic profile (n = 217)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sample Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>57 (26)</td>
</tr>
<tr>
<td>Male</td>
<td>160 (74)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>30-45 years old</td>
<td>14 (6)</td>
</tr>
<tr>
<td>46-61 years old</td>
<td>69 (35)</td>
</tr>
<tr>
<td>62-77 years old</td>
<td>98 (48)</td>
</tr>
<tr>
<td>78-93 years old</td>
<td>35 (11)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
</tr>
<tr>
<td>Married/De-facto</td>
<td>149 (69)</td>
</tr>
<tr>
<td>Divorced/Widowed</td>
<td>39 (18)</td>
</tr>
<tr>
<td>Single</td>
<td>29 (13)</td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
</tr>
<tr>
<td>Catholic</td>
<td>44 (20)</td>
</tr>
<tr>
<td>Protestant</td>
<td>47 (22)</td>
</tr>
<tr>
<td>Islam</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Other</td>
<td>47 (22)</td>
</tr>
<tr>
<td>No religion</td>
<td>62 (29)</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>16 (7)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Australian</td>
<td>143 (66)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Asian</td>
<td>5 (2)</td>
</tr>
<tr>
<td>Middle East</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Caucasian/ European</td>
<td>31 (14)</td>
</tr>
<tr>
<td>South Sea or other Pacific Islander</td>
<td>3 (1)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>16 (7)</td>
</tr>
<tr>
<td>Other</td>
<td>16 (7)</td>
</tr>
<tr>
<td><strong>Work status</strong></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>15 (7)</td>
</tr>
<tr>
<td>Pension</td>
<td>55 (25)</td>
</tr>
<tr>
<td>Self-funded</td>
<td>13 (6)</td>
</tr>
<tr>
<td>Retiree</td>
<td>33 (15)</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>18 (8)</td>
</tr>
<tr>
<td>Employed full-time</td>
<td>52 (24)</td>
</tr>
<tr>
<td>Pension and employed part-time</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Pension and retiree</td>
<td>16 (7)</td>
</tr>
<tr>
<td>Self-funded and retiree</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Pension, retiree and employed part-time</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Other</td>
<td>11 (5)</td>
</tr>
</tbody>
</table>
Multi-collinearity of Constructs and Outliers

The matrix of pairwise linear correlations for all latent and observed variables to be investigated in the pathways analysis revealed no evidence of multi-collinearity: all Pearson correlations were less than 0.80 (Table 7.2), all VIFs less than 2.5, and all tolerance values were greater than 0.1. Moreover, the Mahalanobis distance had a value less than $\chi^2 = 42.56$ indicating that no obvious multivariate outliers amongst the 217 individuals.

### Table 7.1 Continued

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sample Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest level of education</td>
<td></td>
</tr>
<tr>
<td>Junior/Intermediate certificate (year 10) or before</td>
<td>78 (36)</td>
</tr>
<tr>
<td>Senior/Leaving certificate (years 11-12)</td>
<td>45 (21)</td>
</tr>
<tr>
<td>TAFE certificate or equivalent</td>
<td>64 (29)</td>
</tr>
<tr>
<td>Undergraduate degree</td>
<td>22 (10)</td>
</tr>
<tr>
<td>Postgraduate degree</td>
<td>8 (4)</td>
</tr>
<tr>
<td>Annual combined household income</td>
<td></td>
</tr>
<tr>
<td>Less than $19,999</td>
<td>26 (12)</td>
</tr>
<tr>
<td>$20,000-$39,000</td>
<td>57 (26)</td>
</tr>
<tr>
<td>$40,000-$59,000</td>
<td>24 (11)</td>
</tr>
<tr>
<td>$60,000-$79,000</td>
<td>35 (16)</td>
</tr>
<tr>
<td>More than $80,000</td>
<td>29 (13)</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>46 (21)</td>
</tr>
<tr>
<td>Medical diagnosis</td>
<td></td>
</tr>
<tr>
<td>Coronary Artery Disease (CAD)</td>
<td>63 (29)</td>
</tr>
<tr>
<td>Non-ST-segment elevation myocardial infarction (NSTEMI)</td>
<td>64 (29)</td>
</tr>
<tr>
<td>ST-segment elevation myocardial infarction (STEMI)</td>
<td>60 (28)</td>
</tr>
<tr>
<td>Valvular heart disease</td>
<td>14 (6)</td>
</tr>
<tr>
<td>Cardiovascular risk factors</td>
<td>6 (3)</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>10 (5)</td>
</tr>
</tbody>
</table>
Table 7.2 Pearson Correlations among variables (n = 217)

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>W</th>
<th>PN</th>
<th>OE</th>
<th>PSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
<td>0.36**</td>
<td>0.41**</td>
<td>0.24**</td>
<td>−0.00</td>
</tr>
<tr>
<td>W</td>
<td>0.36**</td>
<td>1</td>
<td>0.60**</td>
<td>0.48**</td>
<td>−0.13</td>
</tr>
<tr>
<td>PN</td>
<td>0.41**</td>
<td>0.60**</td>
<td>1</td>
<td>0.68**</td>
<td>−0.17*</td>
</tr>
<tr>
<td>OE</td>
<td>0.24**</td>
<td>0.048**</td>
<td>0.68**</td>
<td>1</td>
<td>−0.01</td>
</tr>
<tr>
<td>PSE</td>
<td>−0.00</td>
<td>−0.13</td>
<td>−0.17*</td>
<td>−0.00</td>
<td>1</td>
</tr>
</tbody>
</table>

**Note I**: Intention to Engage in Cardiac Rehabilitation; W: Willingness to Consider the Treatment; PN: Perceived Need; OE: Outcome Expectancies; and PSE: Perceived Self-efficacy.

** p ≤ 0.01; * p ≤ 0.05

Measurement Model-Confirmatory Factor Analysis

Table 7.3 shows the sub-scales and items that define each construct that were examined during confirmatory factor analysis (CFA). Cronbach’s alpha for constructs in the model varied from 0.75 to 0.90, which indicates the internal consistency amongst all items, so that the scales were acceptable. Perceived need items were similarly weighted (0.63–0.78) and in strong agreement (Cronbach’s alpha: awareness of deficits = 0.86, and perceived benefits from rehabilitation = 0.84). Items in outcome expectancies had a range of loadings (0.64–0.89) and were in strong agreement (Cronbach’s alpha: perceived success = 0.84 and value of outcomes = 0.90). On closer inspection, one item (item 4, perceived success) was slightly less related to the other three items in this construct (loading 0.64 compared to 0.71–0.88). Perceived self-efficacy items had a range of loadings 0.64–0.81. Cronbach’s alpha for these variables fell within the acceptable range (Cronbach’s alpha: awareness of capabilities = 0.75 and perceived demands associated with rehabilitation = 0.83). In addition, Cronbach’s alpha for intention to engage in CR
and willingness to consider the treatment fell within strong agreement (intention to engage in CR = 0.88 and willingness to consider the treatment = 0.82).

The composite reliability (CR) indices for all variables of the constructs were higher than the 0.7 threshold, indicating high reliability of the constructs on this Australian population. Furthermore, the average variance extracted (AVE) indices for all sub-scales were greater than 0.5, indicating an adequately high convergent validity for all sub-groups.

Seven indices of goodness-of-fit were examined to determine how well the measurement model fitted to the collected data. At the first stage, when all scales with their indicators were included, the model fitted the data poorly (Chi-Square / df = 1.87, p-value = 0.000, PCFI = 0.73, CFI = 0.77, IFI = 0.78, TLI = 0.76, and RMSEA = 0.06). After removing indicators with low loadings comprising: 3 items from the original scale of intention (items 4, 5, 6); 4 items from the original scale of willingness to consider the treatment (items 1, 2, 5, 6); 6 items from the original sub-scales of perceived need: 5 items from the sub-scale of awareness of deficits (items 2, 5, 6, 7, 8), and one item from the sub-scale of perceived treatment benefits (item 2); 2 items from the original sub-scales of outcome expectancies: items 4, 6 from the sub-scale of perceived success; 7 items from the original sub-scales of perceived self-efficacy: items 2, 3, 5, 6 from the sub-scale of awareness of capabilities and items 1, 2, 3 from the sub-scale of perceive demands associated with rehabilitation,\(^\text{15}\) and also consideration of co-variances between error terms with high modification, the model fit was acceptable (Chi-Square / df = 1.51, p-value = 0.000, PCFI = 0.81, CFI = 0.94, IFI = 0.94, TLI = 0.93, and RMSEA = 0.05). The model fit indices are presented in Table 7.4.

\(^{15}\) A full list of items is reported in Appendix C, p. 338.
### Table 7.3 Instrument reliability, convergent validity, and sources of the constructs (n = 217)

<table>
<thead>
<tr>
<th></th>
<th>Standardized loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intention to engage in the programs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I intend to make sufficient opportunities for my rehabilitation</td>
<td>0.84</td>
<td>0.88</td>
<td>0.71</td>
<td>0.88</td>
</tr>
<tr>
<td>2. I intend to have enough possibilities for a good recovery</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I intend to make rehabilitation a part of my daily routine</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Willingness to consider the treatment to reach outcome goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I always follow medical orders because I think they will help me</td>
<td>0.91</td>
<td>0.82</td>
<td>0.72</td>
<td>0.83</td>
</tr>
<tr>
<td>2. Doctors know what I need and I will do what they say</td>
<td>0.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived need</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Awareness of deficits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. If I were recommended to, I would see a rehabilitation therapist.</td>
<td>0.64</td>
<td>0.86</td>
<td>0.67</td>
<td>0.86</td>
</tr>
<tr>
<td>2. Rehabilitation will probably help me.</td>
<td>0.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Rehabilitation will be very useful for me.</td>
<td>0.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 7.3 Continued

<table>
<thead>
<tr>
<th>Perceived general benefits of treatment</th>
<th>Standardized loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rehabilitation is useful, but I don’t think I need it.</td>
<td>0.78</td>
<td>0.84</td>
<td>0.53</td>
<td>0.81</td>
</tr>
<tr>
<td>2. I do not have any problems worth mentioning.</td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I am very interested in rehabilitation, but it is not for me.</td>
<td>0.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I do not have time for rehabilitation.</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Outcome expectancies

Value of outcomes

| 1. Rehabilitation will have a positive impact on my health | 0.82 | 0.90 | 0.66 | 0.91 |
| 2. I will feel better after rehabilitation. | 0.89 | | | |
| 3. I will feel fit after rehabilitation | 0.75 | | | |
| 4. Rehabilitation will have a positive impact on my wellbeing | 0.81 | | | |
| 5. I will get to know other people during rehabilitation | 0.67 | | | |

Perceived success

| 1. Rehabilitation will help me learn new ways of doing things | 0.71 | 0.84 | 0.59 | 0.85 |
| 2. Rehabilitation will increase my independence | 0.88 | | | |
| 3. Rehabilitation will help me to come to terms with my heart | 0.83 | | | |
| 4. Rehabilitation will give me more of a purpose in life | 0.64 | | | |
Table 7.3 Continued

<table>
<thead>
<tr>
<th>Perceived self-efficacy</th>
<th>Standardized loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Awareness of capabilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I have confidence that I can cope with doing rehabilitation</td>
<td>0.85</td>
<td>0.75</td>
<td>0.61</td>
<td>0.76</td>
</tr>
<tr>
<td>2. It is important that I try to overcome my difficulties</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived demands associated with rehabilitation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I do not have any difficulties; there is nothing wrong with me so rehabilitation will waste my time</td>
<td>0.76</td>
<td>0.83</td>
<td>0.56</td>
<td>0.836</td>
</tr>
<tr>
<td>2. Rehabilitation involves too much repetition of the same thing</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I have more important things to get on with than doing rehabilitation</td>
<td>0.64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Being around other people with disabilities or illnesses makes me feel down</td>
<td>0.69</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 7.4 Measures of the model fit (n = 217)

<table>
<thead>
<tr>
<th>The goodness of fit measures</th>
<th>Chi-Square / df</th>
<th>p-value</th>
<th>PCFI</th>
<th>CFI</th>
<th>IFI</th>
<th>TLI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptable values given recommended threshold</td>
<td>≤ 3.00</td>
<td>&gt; 0.05</td>
<td>&gt; 0.5</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≤ 0.08</td>
</tr>
<tr>
<td>CFA (before omitting variables)</td>
<td>2923.46/1559 = 1.87</td>
<td>0.000</td>
<td>0.73</td>
<td>0.77</td>
<td>0.78</td>
<td>0.76</td>
<td>0.06</td>
</tr>
<tr>
<td>CFA (after omitting variables)</td>
<td>725.56/481 = 1.51</td>
<td>0.000</td>
<td>0.81</td>
<td>0.94</td>
<td>0.94</td>
<td>0.93</td>
<td>0.05</td>
</tr>
<tr>
<td>Pathways analysis for MTE (without willingness as a mediator)</td>
<td>555.87/262 = 2.12</td>
<td>0.000</td>
<td>0.79</td>
<td>0.91</td>
<td>0.91</td>
<td>0.90</td>
<td>0.07</td>
</tr>
<tr>
<td>Pathways analysis for MTE (with willingness as a mediator)</td>
<td>613.23/308 = 1.99</td>
<td>0.000</td>
<td>0.80</td>
<td>0.91</td>
<td>0.91</td>
<td>0.90</td>
<td>0.07</td>
</tr>
</tbody>
</table>
**Structural Model**

A structural equation model was applied to test the relationships among the variables, specified in the original MTE. Table 7.4 shows that all goodness-of-fit indices fall within the recommended range, after omitting variables deemed unnecessary based on the modification index.

Results revealed significant positive relationships with intention to engage in CR increasing with perceived need (unstandardized effect $B = 0.83$; standardized effect $\beta = 0.82$; $SE = 0.22$; $p < 0.001$), and also increasing with perceived self-efficacy ($B = 0.28$; $\beta = 0.33$; $SE = 0.11$; $p = 0.01$). However, there was no significant relationship found of intention to engage in CR depending on outcome expectancies ($B = -0.19$; $\beta = -0.22$; $SE = 0.13$; $p = 0.15$). There was no relationship detected for perceived self-efficacy explaining outcome expectancies ($B = 0.06$; $\beta = 0.06$; $SE = 0.09$; $p = 0.50$). In contrast, perceived need was significantly positively associated with outcome expectancies in this study ($B = 1.03$; $\beta = 0.86$; $SE = 0.13$; $p < 0.001$). Figure 7.2 depicts the final results of the SEM path analysis, with further details in Supplemental Figure 1 (Appendix E, p. 358).

**Figure 7.2** SEM path analysis with standardized regression coefficients ($p$-value),

$n = 217$

**Note:** $***p \leq 0.001$
Analysis of Mediation and Moderation Effects

Lequerica and Kortte (2010) had proposed that willingness to consider the treatment would act as a mediator between the social cognition predictors: outcome expectancies, perceived self-efficacy, and perceived need and the outcome of intention to engage in CR. The bootstrap estimates revealed that willingness to consider the treatment fully mediated the effect of perceived self-efficacy on intention to engage in CR ($\beta_{\text{Indirect}} = -0.16$, CI: 0.04–0.36, $p = 0.03$; $\beta_{\text{direct}} = 0.15$, CI: 0.06–0.30, $p = 0.20$) [Table 7.5]. With willingness to consider the treatment as a mediator, the model can explain 48% of the variability in intention to engage, compared to 24% without. Thus, although the social cognitive variables directly predicted intention, there was an additional impact of perceived self-efficacy through willingness to consider the treatment.

Multiple-group analyses examining the differences between groups showed that age and gender did not significantly moderate the relationships among the proposed variables.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Indirect effect (standardized regression coefficient with p-value)</th>
<th>95% CI</th>
<th>Direct effect (standardized regression coefficient with p-value)</th>
<th>95% CI</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN</td>
<td>0.15 (0.47)</td>
<td>–0.15, 0.41</td>
<td>0.48 (0.06)</td>
<td>0.04, 0.88</td>
<td>No effect</td>
</tr>
<tr>
<td>OE</td>
<td>–0.06 (0.41)</td>
<td>–0.28, 0.06</td>
<td>–0.16 (0.35)</td>
<td>–0.33, 0.06</td>
<td>No effect</td>
</tr>
<tr>
<td>PSE</td>
<td>0.16 (0.03)</td>
<td>0.04, 0.36</td>
<td>0.15 (0.20)</td>
<td>0.06, 0.30</td>
<td>Full mediation</td>
</tr>
</tbody>
</table>

Note: CI: Confidence Interval; IV: Independent Variables; DV: Dependent Variable; I: Intention to Engage in CR; W: Willingness to Consider the Treatment; PN: Perceived Need; OE: Outcome Expectancies; and PSE: Perceived Self-efficacy.
7.5 Discussion

Despite many efforts to increase engagement in CR, attendance, which is a fundamental prerequisite of engagement, remains a major concern for healthcare providers (Sumner, Grace, & Doherty, 2016). Motivation is an important factor in encouraging individuals to attend rehabilitation and underpins many approaches to engagement (Danzl, Etter, Andreatta, & Kitzman, 2012). The main purpose of this study was to use SEM to evaluate the motivational component of a theory of engagement in rehabilitation (Lequerica & Kortte, 2010) to better understand individual intentions to engage in CR programs following their discharge from hospital.

The first stage of the MTE emphasizes the motivational factors that enhance individual engagement by influencing the intention to engage in CR programs. This empirical study confirmed the conceptual framework projected by Lequerica & Kortte (2010): the majority of the proposed relationships were found to be significant. The findings showed that intention to engage in the CR program significantly increased with both perceived need for rehabilitation as well as perceived self-efficacy, although the latter was fully mediated by willingness to consider the treatment: those with higher levels of perceived self-efficacy were more likely to express willingness to consider the treatment, which in turn predicted intention to engage in the CR program. Perceived need was also strongly positively associated with outcome expectancies, presumably because the need was partly constructed from a belief that deficits could be remedied by rehabilitation. However, in this study, outcome expectancies were not strongly associated with the intention to engage in the CR program. Altogether, these findings are well aligned with the first stage of the MTE (Lequerica & Kortte, 2010) and with previous health behaviour change research in the CR context (Broadbent et al., 2009; de Melo Ghisi et al., 2015; Dohnke et al., 2010; Sniehotta et al., 2005). By considering
the role of willingness to consider the treatment as a mediator, the MTE model was improved in accounting for the variability of intention to engage in the CR program.

The variability accounted for by other models of motivation to explain exercise intentions, such as Protection Motivation Theory (Blanchard et al., 2009) and the HAPA model (Barg et al., 2012; Sniehotta et al., 2005) has ranged between 29% and 65%. The three studies involved may not be comparable to this study because of their differing target populations; however, the HAPA model reported a better explanation of intention (with variability explained between 57% and 65%). The study by Sniehotta et al. (2005) was conducted on a 50% larger sample size of 307 CR individuals who were encouraged to adopt or maintain regular exercise, and reported a greater explanation of variability in intention to exercise. Their findings showed that task self-efficacy, outcome expectancies, and risk awareness accounted for 65% of the variability in intention to engage in regular exercise.

Several relationships proposed in the MTE did not emerge as having strong evidence provided by this dataset of CR patients. For example, outcome expectancies did not measurably predict intention to engage in CR, and perceived self-efficacy was not strongly associated with outcome expectancies. These results may not necessarily indicate the absence of these effects, and may instead be attributable to limitations of this first study (e.g. sample size and/or representativeness). Further studies will be required to confirm one way or the other. Participants were recruited from a single CR center and participation in this study was voluntary, so that results may not present the diverse characteristics of participants. In a study conducted by Steca and colleagues (2017) on people with coronary conditions and hypertension, outcome expectancies was found to be a predictor of intention to increase physical activity, so this study’s inability to find a relationship between outcome expectancies and intention to engage in CR may simply reflect a lack of specificity. However, a number
of explanations may account for this discrepancy. First, the heterogeneity of cardiac diseases in our sample is both a strength, in providing coverage of diseases, but possibly also a weakness, as different conditions may produce unique impacts on outcome expectancies. There was insufficient data on each diagnosed disease to investigate the effect of disease as a moderator (ranging from n = 6 to 64 across disease categories, Table 7.1). Second, it is possible that outcome expectancies have greater impact at later stages of engagement, after participants have commenced a CR program and have some experience of the benefits of participation. The participants in this study had not attended any CR programs before. However, the majority of previous studies using the HAPA included individuals who had commenced CR rehabilitation sessions (Dohnke et al., 2010; de Melo Ghisi et al., 2015; Sniehotta et al., 2005).

Thirdly, although age was not found to be a significant moderator in the model, 61.3% of participants in this study were over 60 years of age and may have been less motivated by outcome expectancies. A study conducted by Ayotte and colleagues (2010) on a sample of middle-aged and young-aged adults in the context of physical activities demonstrated that there was a significant negative relationship between age and positive outcome expectancies. It is likely that this cohort have been more motivated by the perception of developing health problems that could interfere with their lifestyle (i.e. perceived need). More research is required to investigate the role of outcome expectancies in predicting the intention to engage in rehabilitation for different age groups. Although age and gender were not found to be significant moderators in the MTE, this may be attributed to the small sample size within each sub-population having the same age and gender (Table 7.1). Previous research has supported that age (Anderson-Bill, Winett, Wojcik, & Williams, 2011; Ayotte, Margrett, & Hicks-Patrick, 2010; Reuter et al., 2010) and gender (Ayotte, Margrett, & Hicks-Patrick, 2010).
2010; Choi, Chang, & Choi, 2015) affected the strength of relationships of social-cognitive variables with physical activity behavior. However, other studies in the context of CR have also found that gender and age (McKee et al., 2014; Sharp & Freeman, 2009) did not impact the proposed relationships in other social-cognitive models, similar to in the MTE tested in this study. In the research conducted by McKee and colleagues (2014), age accounted for only a small proportion of the variance in pre-discharge intention to attend CR. Perhaps, demographic factors have a stronger influence once the acuteness of a cardiac event has subsided.

As the first of its kind to empirically evaluate the conceptual MTE proposed by Lequerica and Kortte (2010), this study provides initial evidence for some of the proposed links and therefore suggests directions for future research to confirm the absence of other links. These findings also suggest that engagement interventions may need to focus on increasing awareness of specific post-cardiac deficits that are amenable to recovery, providing evidence about the potential benefits of treatment, and promoting the sense that one can successfully engage in the demands of treatment. These interventions should occur during the inpatient period of acute treatment to increase the likelihood of engagement following discharge. A deeper understanding of how intention to engage in CR is formulated within the cardiac population during inpatient treatment will increase the likelihood of engagement, leading to improved outcomes. Although the self-reported questionnaire has produced a social desirability bias, the findings are an essential indicator of the social-cognitive processes that influence individuals’ decisions during the immediate post-cardiac hospitalization period.

The analysis of the data collected in this study found that perceived need has a more significant and larger (more than double) impact on individual intention to engage in CR than
does perceived self-efficacy. Therefore, the MTE provides evidence in support of designing
effective intervention strategies that focus on increasing awareness of specific post-cardiac
deficits, as well as educating about the potential benefits of treatment so as to promote the
sense that one can successfully engage in the demands of treatment. These explanatory
findings may support clinicians to identify key dimensions for facilitating individual
intention to engage in CR programs. Perceived need, which includes individual perceived
treatment benefits and awareness of deficits, is such a management lever. If individuals’
perceived need increases, their intention to engage in CR could significantly strengthen. Also,
it is essential for therapists to consider that rehabilitation demands could decrease the level
of perceived self-efficacy and outcome expectancies in individuals; ultimately reducing
individuals’ intention to engage in CR. Therefore, therapists need to establish treatment goals
consistent with individuals’ capabilities.

A major strength of this study is the examination of a well-defined theory of
engagement. The MTE helps achieve a better understanding of the process of intention
formation as the components of the motivation stage bring both individuals’ perception of
self and individuals’ impression of the treatment environment together. Previous models of
health behavior change focused on the motivation stage as individuals’ perception of self and
the role of individuals’ impression of the treatment environment in intention formation has
been neglected. The current study provides evidence of validity and reliability for all eight
scales within the first stage of the MTE. Despite these strengths, there are a number of
limitations that need to be considered when interpreting the findings. The sample consisted
of participants from only one hospital in Australia that may not be representative of other
regions. Data was collected using a self-reported survey, which could introduce a
measurement bias (Coughlan, Cronin, & Ryan, 2009). Therefore, future studies with larger
samples are required to confirm the present results. Nevertheless, this study is the first of its kind to measure of the first stage of the MTE. Further validation of the measures used in this study would be necessary in future research.

Although the involvement of socio-environmental barriers in stage One of the MTE is absent, the barriers have been integrated into most models of health behavior as a key factor. Long established theoretical frameworks proposed for describing and predicting the health behavior, such as the Health Belief Model (Becker, 1974) are well representative examples where the role of CR barriers are substantial. In addition, it has been argued that individuals’ emotions, including depression, anger and anxiety about their illness, can negatively impact on engagement in CR programs (Blakemore et al., 2016). These variables are not adequately addressed in the MTE, although they may be related to variables contained in the MTE. Integrating negative emotions into the MTE could substantially enhance the model’s performance.

7.6 Conclusion

The study findings suggest that awareness of deficits and perceived treatment benefits (perceived need); and awareness of capabilities and perceived treatment demands (perceived self-efficacy) may help cardiac patients to form an intention to engage in CR programs. Therefore, the MTE appears to provide evidence in support of designing effective intervention strategies that focus on perceived need and perceived self-efficacy as points of action. However, perceived need showed a greater influence on individuals’ intention to engage in CR.

The evidence that is available about the role of perceived socio-environmental barriers and individuals’ emotional feelings in predicting recovery and wellbeing suggests
that they need to be included in the current model. These factors can contribute to perceptions
that either fortify or weaken individual intention formation and moderate
actions. Inclusion of socio-environmental barriers and individuals’ emotional feelings in the
MTE is likely to maximize the prediction of individual intention to engage in CR, and is
recommended as a priority for future research.
7.7 References


Chapter Eight

The Process of Individual Engagement in Cardiac Rehabilitation Programs

The previous chapter examined the intention to engage in cardiac rehabilitation (CR) among all individuals referred to the CR program. In this chapter, three stages of the process of engagement have been measured and modelled in a sample of 101 individuals who commenced CR. The purpose of this analysis is to understand complexities of all three stages of the MTE, a more complete view of the process of engagement.

The information in this chapter has been submitted to a peer-reviewed journal as an original paper:

Jahandideh, S., Kendall, E., Low-Choy, S., Donald, K., & Jayasinghe, R., Barzegari, E. (2018d). The process of individual engagement in cardiac rehabilitation programs. Accepted for publication in the journal Behaviour Change.

The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Completed and obtained the required human research ethics approval;
- Developed the survey questionnaire;
- Collected data;
- Performed data analysis and interpreted the findings;
- Wrote the manuscript;
- Prepared the manuscript and submitted to the journal.
8.1 Abstract

Purpose: The primary aim of this study was to test the causal structure of the Model of Therapeutic Engagement (MTE) for the first time to examine if the model assists in understanding the process of individual engagement in cardiac rehabilitation (CR) programs.

Method: This study used a prospective design, following up individuals from the Gold Coast University Hospital Cardiology Ward who attended the Robina Cardiac Rehabilitation Centre.

Results: A structural equation model of the interactions among the proposed variables within the three stages of the MTE (intention to engage in CR programs, CR initiation, and maintenance of participation in CR) revealed significant relationships among these variables in a sample of 101 individuals who attended a CR program. However, no relationship was discerned between outcome expectancies and individual intention to engage in CR. Individuals’ willingness to consider the treatment was confirmed to act as a mediator between perceived self-efficacy and individual intention to engage in CR.

Conclusion: These findings help clarify the process proposed by Lequerica and Kortte in the context of individual engagement in CR programs. The findings also reveal information on how individuals engage in CR programs. Importantly, this provides new information for healthcare providers, enabling them to effectively engage individuals according to their stage of engagement.

Impact and implications: Research in the area of individual engagement in CR programs could benefit from the application of a theoretical model that incorporates multiple stages of CR, thus facilitating a more organised, structured approach to researching the process of engagement. Lequerica and Kortte (2010) presented a theoretical Model of Therapeutic Engagement which aimed to clarify how and why individuals engage in medical
rehabilitation. The complete model is yet to be applied and evaluated for any rehabilitation population. The import of the present study is the development of an empirical evidence basis for evaluating individual components of this theoretical engagement model.

This study aims to broaden the understanding about the complex multi-stage processes underlying therapeutic engagement, and also identifies potential points of influence for improving engagement. Understanding the process of individual engagement in CR programs could enable healthcare providers to individualise a care management plan based on understanding how various factors affect the chance of an individual engaging (or not) in outpatient CR programs.

**Keywords:** Model of Therapeutic Engagement; Cardiac Rehabilitation; Intention to Engage; Initiation; Maintenance; Structural Equation Modelling
8.2 Introduction

Cardiovascular disease is the leading cause of death among non-communicable diseases in the world (Roth et al., 2017), including Australia (Australian Bureau of Statistics, 2017). Cardiac rehabilitation (CR) is a systematic program, which has been shown to reduce mortality rate and prevent future cardiac events through health behaviour change (Anderson et al., 2016). Despite evidence from previous research supporting CR advantages (del Pozo-Cruz, Carrick-Ranson, Reading, Nolan, & Dalleck, 2018; Dunlay, Pack, Thomas, Killian, & Roger, 2014), a large number of eligible individuals in Australia opt not to participate in the program (Clark, Redfern, & Briffa, 2014). Mere participation is not sufficient: individuals must be actively involved or engaged in the program to maximise rehabilitation benefits (Lequerica & Kortte, 2010).

Individual engagement is a concept that aims to describe the construct of participation more profoundly than in terms of therapy attendance and motivation (Kortte et al., 2007). Engagement in rehabilitation has been defined as “an interest in, and an intentional effort to, work toward the rehabilitation goals” (Kortte et al., 2007, p. 878). Increasing individual engagement in management of their health care is a priority for healthcare programmers to develop more responsive services based on individual preference (Graffigna, Barello, & Triberti, 2016). Whether a rehabilitation effort will succeed or fail depends on the program’s success in facilitating the engagement of individuals, which impacts their motivation to attend, as well as their participation in the program (Kortte et al., 2007; Medley & Powell, 2010).

Engagement has been proposed as being both a state and a process (Bright et al., 2015; Ferrer, 2015; Fumagalli et al., 2014) representing various levels of capacity, activity and interest that individuals employ in balancing information and professional advice with
their own needs in order to shape their health outcomes (Ferrer, 2015; Fumagalli et al., 2014). The process and state of engagement are affected by both environmental and intrinsic factors (Godlaski et al., 2009; Lequerica & Kortte, 2010; O'Brien et al., 2009). However, the detail about how individual engagement develops over time remains largely unexplained (Graffigna et al., 2016). The Model of Therapeutic Engagement (MTE), although untested in any form of rehabilitation program, has been formulated in an attempt to articulate the complexity of the engagement process and state in the rehabilitation context (Lequerica & Kortte, 2010). The MTE contains three temporal stages: 1) intention to engage in CR programs; 2) CR initiation; and 3) maintenance of participation in CR programs. The first stage is shaped by perceived need, outcome expectancies, and perceived self-efficacy, which are mediated by willingness to consider the treatment. In the second stage, goals must be set, and a treatment plan must be developed accordingly, leading to CR initiation. In the third stage, individuals who have engaged in CR assess the advantages and disadvantages of CR programs and decide whether to continue CR.

A recent systematic review has demonstrated that much less is known about the process of translating individual intention into action and then sustaining the engagement over time (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018a). That review examined the extent to which existing evidence supports each of the relationships proposed in the MTE, and importantly, found no research examining the rehabilitation engagement process from this holistic perspective. The majority of existing research focuses on the initial stage of the MTE, namely prediction of an individual’s intention to engage in a CR program (Bakker, Nijkamp, Sloot, Berndt, & Bolman, 2015; Bennett, Mayfield, Norman, Lowe, & Morgan, 1999; Blanchard et al., 2009; Broadbent, Ellis, Thomas, Gamble, & Petrie, 2009; de Melo Ghisi, Grace, Thomas, & Oh, 2015; Dohnke et al., 2010; Sniehotta, Scholz, &
Schwarzer, 2005; Sullivan, White, Young, & Scott, 2009). The principle of the MTE was consistently supported, with all studies confirming that intention to engage in rehabilitation depended on perceived need, perceived self-efficacy, and outcome expectations. However, much less is known about the latter two stages of the MTE: CR initiation (Hutchinson et al., 2015; Jolly et al., 2007; Sniehotta, Gorski, & Araújo-Soares, 2010); and maintenance of participation in CR programs (Alexander & Wagner, 2006; Araya-Ramírez et al., 2010; Gardiner et al., 2018; Marzolini, Mertens, Oh, & Plyley, 2010).

The current research (Chapter Seven; Jahandideh et al., 2019c) has examined the first stage of the MTE, where 217 participants were referred to the CR program (Stage One of the MTE) of which only 46% commenced the program (Stage Two of the MTE). This study focuses only on this latter, smaller group of individuals who actually commenced the CR.

To deeply examine the way in which the proposed constructs influence different stages of individual engagement, this study explicitly tests the proposed relationships embedded in the MTE, with the aim of achieving a more holistic understanding of individual engagement. Therefore, to refine our understanding of the complex multi-stage processes underlying therapeutic engagement, the specific study objectives were to apply the conceptual framework provided by the whole MTE for the first time into an empirical setting, and evaluate how well theory translates into practice, in the context of physical activity behaviour. The study further identified the potential ways that these findings could help design a plan to improve the process of engagement.
8.3 Method

Participants and Procedure\textsuperscript{16}

This study used a prospective design with consecutive recruitment of individuals in hospital, from April, 2017 to February, 2018. Individual eligibility criteria were: hospitalised for cardiac disease; eligible for CR (including people who had myocardial infarction (ST elevation MI, non-ST elevation MI), re-vascularisation procedures, stable or unstable angina, controlled heart failure, and other vascular or heart diseases); not received CR services before; without severe neurological impairments; not too ill, to volunteer in the study; able to speak and read English; and consenting to participate in the study. Consenting participants were firstly recruited as the Gold Coast University Hospital (GCUH) cardiology ward inpatients; and followed up as the Robina Cardiac Rehabilitation Centre outpatients.

Two questionnaires were used to collect data at the first stage separately to the second, and third stages of the MTE. Participants completed the first questionnaire while they were in hospital. The second questionnaire was mailed at the end of the program to participants’ home addresses with a stamped return-addressed envelope. For participant convenience and to improve response rate, questionnaires were available in either paper or online format through the SoGo Survey website (https://www.sogosurvey.com/). In addition, the participants could have their questionnaires collected from their home and were invited to contact the researcher with any research project questions by telephone or email. Intensive follow-up sought participant agreement (via phone call) to mail questionnaires with unanswered questions back to participants for completion, with a stamped return-addressed

\textsuperscript{16} The material contained in this section is a duplication of material from the method described in Chapter Four of this thesis. It is repeated here for completeness as it forms part of the submitted / published manuscript.
envelope. The quadrant software program was utilised to manage the prospective data collection process (http://www.quadrant.edu.au/).

Given that the MTE focuses on a potentially fluctuating, dynamic concept of engagement, participants could drop out during the process of engagement. This attrition cannot be ignored. Hence, the participants eventually included in this study were those who provided informed consent, completed the first and second questionnaires, and also enrolled in the CR program. This sample size met the minimum of 100 participants considered adequate for structural equation modelling (SEM), based on the standard sample size rule (Ding, Velicer, & Harlow, 1995) calculated using an online calculator (Soper, 2018). The required sample size was based on the number of observed and latent variables in the MTE, the anticipated effect size of interest, the desired significance and statistical power levels (Cohen, 1988; Westland, 2010). A minimum sample size of 85 would have power of 80% to detect an effect of 0.4 with a significance level of 5% for the entire MTE for performing confirmatory factor analysis for all latent constructs. For pathway analysis, given the number of latent constructs (9), a sample size of 89 for the entire MTE would have power of 80% to detect an effect of 0.3 with a significance level of 5%.

The National Ethics Application Form (NEAF) was approved by the Gold Coast Health Service District Human Research Ethics Committee (HREC) in April 2017, before study commencement (Reference: HREC/16/QGC/329).

**Study Measures**

Questionnaire 1 addressed the first stage of the MTE, Intention to Engage in CR and the second questionnaire covered the second and third stages of the MTE (CR initiation, and maintenance of participation in CR programs). One part of the second questionnaire was
completed by a clinician in the CR centre. The measures for both questionnaires were validated previously but re-validated for this study’s population using Cronbach’s alpha with $\alpha > 0.60$ considered acceptable for reliability in behavioural research (Cronbach, 1960).

**Stage One questionnaire**

**Measures**

The survey was comprised of 65 items, 56 using a five-point Likert scale, and 9 using a semantic differential scale. A pilot study was conducted on 10 individuals in the Robina Cardiac Rehabilitation Centre and colleagues in academia to identify and amend vague questions before collecting data. The scales are summarised below.

**Demographic and Medical Variables**

The demographic and medical questions comprising of 9 items assessed the participant’s age, gender, marital status, religion, ethnicity, work status, highest level of education, annual combined household income, and medical diagnosis.

**Dependent Variable Stage One: Intention to Engage in Cardiac Rehabilitation Programs**

Intention refers to personal goals, imposed by self or others (Fishbein & Ajzen, 1975). The *Short Version of Recovery Intention Questionnaire* (6 items) was adapted to a rehabilitation setting through a slight change of question-wording; the original scale was validated on 380 Australian employees (Blasche & Marktl, 2011). The internal consistency of the scale in that population was found to be good (Cronbach’s alpha = 0.87).
Predictor Variables Stage One: Intention to Engage in Cardiac Rehabilitation Programs

**Perceived Need for Rehabilitation.** Two sub-scales, awareness of deficits, and perceived general benefits of rehabilitation, were used to measure perceived need for rehabilitation. Awareness of deficits was measured using a subscale of *the Motivation for Traumatic Brain Injury Rehabilitation Questionnaire (MOT-Q): Lack of Denial* (8 items) (Chervinsky, Ommaya, Spector, Schwab, & Salazar, 1998). Perceived general benefits of rehabilitation was measured using two subscales from *the MOT-Q*: a) *Interest in Rehabilitation* (7 items), and b) *Lack of Anger* (5 items). Each item of the scales ranged from strongly disagree to strongly agree. The scales were validated on 122 inpatients and 92 outpatients in the brain injury rehabilitation program in the Netherlands by Boosman and colleagues (2016). Internal consistency of the subscales Interest in Rehabilitation and Lack of Denial, was acceptable in the inpatient group (α = 0.66, α = 0.63, respectively) and good in the outpatient group (α = 0.83, α = 0.84, respectively). Regarding Lack of Anger, internal consistency was good in the inpatient group (α = 0.80) and acceptable in the outpatient group (α = 0.68) (Boosman et al., 2016).

**Outcome Expectancies.** These refer to beliefs about the positive and negative outcomes of alternative behaviours. Outcome expectancies were measured by two sub-scales: a) perceived success and b) value of outcomes. A subscale of *Rehabilitation Representations Scale, Treatment Outcome Beliefs* (Bains, Powell, & Lorenc, 2007), was used to assess perceived success (6 items), and *the Outcome Expectancies Questionnaire* (Sniehotta, Scholz, & Schwarzer, 2005) was used to measure the value of outcomes (5 items). The Rehabilitation Representations Scale had been validated on a population of 40 individuals with acquired brain injury rehabilitation in the United Kingdom (Bains, Powell,
& Lorenc, 2007). The internal consistency of this scale was found to be good (Cronbach’s alpha = 0.70) (Bains et al., 2007). Also, the Outcome Expectancies Questionnaire had previously been validated on 307 CR participants in the United Kingdom (Sniehotta et al., 2005).

**Perceived Self-efficacy.** Two sub-scales were used to measure perceived self-efficacy: a) awareness of capabilities and b) perceived demands. Six items of the Control Cognition subscale from *the Rehabilitation Representations Scale (RRS)* were used to measure awareness of capabilities (Bains et al., 2007). The internal consistency for this scale was found to be good in this study (Cronbach’s alpha = 0.83) (Bains et al., 2007). Seven items from *the Perceived Barriers subscale of the RRS* were used to measure the construct perceived demands (Bains et al., 2007). The internal consistency for this subscale was found to be good for Australian data (Cronbach’s alpha = 0.89). Subjects responded on a Likert scale ranging from strongly disagree to strongly agree. Both subscales of the RRS, Control Cognition and Perceived Barriers, were validated on a population of 40 acquired brain injury rehabilitation participants (Bains et al., 2007).

**Willingness to Consider the Treatment.** This was suggested as a mediating variable between outcome expectancies and intention to engage in CR; perceived need and intention engage in CR; and perceived self-efficacy and intention to engage in CR (Lequerica & Kortte, 2010). The construct *Willingness to Follow Treatment Recommendations* (6 items) (Chervinsky et al., 1998) was used, which had been validated on 122 inpatients and 92 outpatients in the brain injury rehabilitation program in the Netherlands (Boosman, van Heugten, Winkens, Smeets, & Visser-Meily, 2016). Items were rated on a five-point scale ranging from strongly disagree to strongly agree. Internal consistency of the sub-scale was acceptable for both the inpatient and outpatient groups ($\alpha = 0.70$, $\alpha = 0.73$, respectively).
Stages Two and Three Questionnaire

Measures

The second questionnaire covered the initiation of rehabilitation (15 items) and maintenance of participation in CR stages (29 items). Several measures have been considered to cover these stages.

Dependent Variable Stage Two: CR Initiation

CR Initiation required both (i) the initiation of a formal CR program, and (ii) attendance at a minimum of four out of the first six exercise sessions (Shanks, Moore, & Zeller, 2007) based on a nurse report of participant attendance in at least four out of the first six CR sessions. Otherwise, the participant was categorised as not initiating CR.

Predictor Variables Stage Two: CR Initiation

Preparation for Rehabilitation was measured by two constructs: goal setting and treatment planning.

Goal Setting. One question measured goal engagement and goal satisfaction, which accounted for a number of factors: how well goals matched patient priorities for rehabilitation; the extent to which the individuals agreed with the goals; the extent of choices available regarding goals; and the extent to which an individual felt involved with/in charge of the goal-setting process. This questionnaire consisted of 1 item with a Likert scale ranging from excellent to none (Turner-Strokes et al., 2015).

Treatment Planning. Treatment planning was measured using the Client-Centeredness of Goal Setting construct [C – COGS] (Doig, Prescott, Fleming, Cornwell, & Kuipers, 2015). The C – COGS scale has three subscales evaluating goal alignment, goal
planning participation, and client-centredness of goals, and can be used to evaluate goal planning from the individual’s perspective. This scale consists of 13 items using a Likert scale from strongly disagree to strongly agree and had been validated on 42 Australian participants in a brain injury rehabilitation program. The reliability of the scale in that population was found to be fair, with an average 67% agreement across all test items (Doig et al., 2015).

**Dependent Variable Stage Three: Maintenance of Participation in CR**

**Maintenance**

Maintaining attendance was defined as attendance at 90% of scheduled exercise sessions, measured by a nurse report. Otherwise, the participant was categorised as not maintaining CR.

**Predictor Variables Stage Three: Maintenance of Participation in Cardiac Rehabilitation Programs**

**Analysis of Experience**

Analysis of experience was measured by two variables: perceived quality of service and perceived achievements.

**Perceived Quality of Service.** The outpatients’ perceptions of the quality of services were measured using McMurray et al.’s (2016) questionnaire, with 10 items measured via a five-point Likert scale from never to always. The reliability of the questionnaire has been found to be good in that study, with inter-item Pearson correlations ranging from 0.13 to 0.74, and an internal consistency of 0.88 (McMurry et al., 2016).
Perceived Achievements. The Canadian Model of Occupational Performance (COPM) questionnaire is based on a client-centred approach to establishing treatment goals and assessing changes in perceived performance and satisfaction with occupational performance over time (Law et al., 2014). The COPM questionnaire consisting of 13 items, has demonstrated acceptable test-retest measured using the Spearman’s rho correlation coefficient and interrater reliability measured via intra-class correlation coefficient, and has also demonstrated acceptable content, criterion, and construct validity (Cup, Scholte op Reimer, Thijssen, & van Kuyk-Minis, 2003).

Individual Engagement in Cardiac Rehabilitation

The psychometric properties of the Hopkins Rehabilitation Engagement Rating Scale (HRERS) were used to quantify information from a rehabilitation nurse regarding individuals’ levels of engagement in therapy, at various stages of their rehabilitation (Kortte et al., 2007). The HRERS contains 5 items with a five-point Likert scale from never to always, and was designed to be completed by a clinician to quantify individual engagement in rehabilitation settings. The HRERS was validated on a population of 206 subjects (with spinal cord injury, ischemic or hemorrhagic stroke, amputation, or hip or knee replacement) from inpatient rehabilitation programs in the United State, and found to have good internal consistency (0.91) and interrater reliability (intraclass correlation coefficient, 0.73), hence useful as a unidimensional construct (Kortte et al., 2007).

Statistical Analysis

SPSS (Version 21.0 for Windows; IBM SPSS Statistics, Armonk, NY, USA) was used for calculating descriptive statistics and performing preliminary analyses. Also, SPSS Amos
(Version 21.0; Arbuckle, 2012) was used to fit structural equation models (SEM), to examine
(a) the measurement model that defines latent constructs in terms of measured indicators, and
also fit (b) the structural model specified by the proposed relationships among constructs.

Prior to analysis, Mahalanobis distance score was used to identify multivariate outliers (Hair, Black, Babin, Anderson, & Tatham, 2006). The use of SEM may also be affected (in terms of goodness-of-fit) by multi-collinearity, where the measured indicators are so highly correlated that some are redundant (Baumgartner & Homburg, 1996). Therefore, bivariate correlations of all indicators were screened, with values exceeding r = 0.85 indicative of multi-collinearity (Kline, 2005). Furthermore, a variance inflation factor [VIF] was calculated, with values exceeding 2.5 associated with multi-collinearity (Hair, Black, Babin, & Anderson, 2010).

The next step before fitting the SEM was to test the measurement model by conducting a confirmatory factor analysis (CFA). The resulting loadings quantify the contribution of each indicator to each latent construct (like components of a score) and therefore help assess the reliability and validity of each construct (Kline, 2005). Convergent validity estimates to what degree the indicators within each construct should be related to each other in order to arrive at the same results if some are missing (Hair et al., 2010). Average variance extracted (AVE) for each construct should exceed the recommended threshold of 0.50, to indicate that convergent validity is adequate (José Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014). Discriminant validity ensures that a construct and its indicators are unique compared to other constructs and their indicators. If the AVE of each construct is more than its corresponding squared correlations or maximum shared variance (MSV), then its discriminant validity is deemed acceptable (George & Mallery, 2003). Furthermore, internal consistency reliability of constructs was checked using
Cronbach’s alpha, with values below 0.5 reflecting unacceptable reliability (George & Mallery, 2003). The Stats Tools Package (Gaskin, 2016) was used to measure convergent and discriminant validity.

Then, after the measurement model was validated, SEM was employed to analyse the relationships proposed within the MTE. SEM permitted testing of the direct effect of the proposed variables at each stage of the MTE and the mediating effect of willingness to consider the treatment on intention to engage in CR. Using 2000 bootstrap samples estimates were provided of standard errors and 95% bias-corrected two-tailed confidence interval for the effect of the mediator. In this way, SEM enables evaluation of the general compatibility (i.e. the goodness of fit) of the model with the data, as well as the estimated strength of relationships among constructs. Goodness-of-fit of the model was judged using six indices, which should be considered together (Schermallen-Engel, Moosbrugger, & Müller, 2003). We view test statistic values with caution, since, like all null hypothesis tests, they have a high tendency to indicate significance with increasing sample size (Hair et al., 2010; Wasserstein & Lazar, 2016). Firstly, the ratio of a chi-squared statistic to the degrees of freedom is one of goodness-of-fit indices which was used to assess whether predictions from the proposed model were aligned with the data, with a recommended threshold of 3 (Norušis, 2012). Secondly, five other indices of model fit were used: the Parsimony Comparative Fit Index (PCFI) (recommended > 0.5) (Safarnia, Akbari, & Abbasi, 2011), the Comparative Fit Index (CFI) (recommended ≥ 0.90) (Hair et al., 2010), the Incremental Fit Index (IFI) (recommended ≥ 0.90) (Arbuckle & Wothke, 1999), Tucker-Lewis Index (TLI) (recommended ≥ 0.90) (Arbuckle & Wothke, 1999), and Root Mean Square Error of Approximation (RMSEA) (recommended ≤ 0.08) (Browne & Cudeck, 1993) with standard thresholds. In addition, indicators with low loadings and modification indices (MI) were
considered to identify any areas of misfit in the proposed model, where the fit indices revealed that the proposed model did not provide a satisfactory fit to the collected data. The parameter with the largest MI value was freed only if it made substantive sense; if it was not meaningful, then the parameter with the next largest MI value was considered (Hair et al., 2010). In this study, we also evaluated the model after omitting variables found non-significant, following best practice (Greenland et al., 2016).

8.4 Data Analysis Results
The findings are presented in four steps: 1) participants’ demographic and clinical characteristics; 2) preliminary data analyses; 3) the measurement model via confirmatory factor analysis; and 4) the pathways analysis via a structural equation model.

Participants’ Demographic and Medical Characteristics
The flow of participants throughout all stages of the engagement process in this study is presented in Figure 8.1 (p. 223). The participants for this study were those individuals who provided informed consent, completed the first and second questionnaires, and also enrolled in the CR program. Of 310 individuals who were eligible to participate in this study, 217 completed the consent form. Of those 217, 10 were lost to follow up, and 106 failed to attend the CR program. Finally, a sample of 101 individuals out of 217 consenting individuals remained for inclusion in this study on all three CR stages. Of these 101, 63 participants initiated the rehabilitation program, whilst 38 did not.

The participants’ demographic and medical profiles are summarised in Table 8.1 (p. 224). Approximately two-thirds majority of the sample were males: 63% male. The average age of the participants was 65 (SD = 12, range 36-91). Approximately 42% reported receiving
a level of education of junior or intermediate certificate (year 10) or less; 17% completed a senior or leaving certificate (year 11-12); 26% completed a TAFE certificate or equivalent; 11% completed an undergraduate degree; and 4% attained postgraduate degrees. Furthermore, regarding diagnosis of disease, nearly 36% of participants were diagnosed with coronary artery disease; 29% with non-ST-segment elevation myocardial infarction (NSTEMI); 31% with ST-segment elevation myocardial infarction (STEMI); 4% with valvular heart disease; and 1% with cardiovascular risk factors.

**Preliminary Analyses**

All received questionnaires containing unanswered questions were posted back to participants and then returned to the researcher, to the researcher fully completed, so ultimately there was no missing data. Multi-collinearity was rejected since all VIFs ranging between 1.23 and 3.02, below the decision threshold of 10. Also, all pairwise correlations ranged between 0.00 and 0.71, among outcome expectancies, perceived self-efficacy, perceived need, willingness to consider the treatment, intention to engage in the CR programs, preparation, CR initiation, engagement, maintenance, and analysis of experience. Lastly, the Mahalanobis distance scores evidenced there were no obvious multivariate outliers among the 101 participants.
Figure 8.1 Flow diagram of study participants
Table 8.1 Participants’ demographic and medical profile (n = 101)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sample Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>37 (37)</td>
</tr>
<tr>
<td>Male</td>
<td>64 (63)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>30-45 years old</td>
<td>7 (7)</td>
</tr>
<tr>
<td>46-75 years old</td>
<td>27 (27)</td>
</tr>
<tr>
<td>61-75 years old</td>
<td>51 (50)</td>
</tr>
<tr>
<td>76-99 years old</td>
<td>16 (16)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
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<tr>
<td>Married/De-facto</td>
<td>69 (68)</td>
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<tr>
<td>Divorced/Widowed</td>
<td>24 (24)</td>
</tr>
<tr>
<td>Single</td>
<td>8 (8)</td>
</tr>
<tr>
<td><strong>Religion</strong></td>
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</tr>
<tr>
<td>Catholic</td>
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<tr>
<td>Protestant</td>
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</tr>
<tr>
<td>Islam</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Other</td>
<td>24 (24)</td>
</tr>
<tr>
<td>No religion</td>
<td>29 (29)</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>7 (7)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Australian</td>
<td>65 (64)</td>
</tr>
<tr>
<td>Asian</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Caucasian/ European</td>
<td>20 (20)</td>
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<tr>
<td>South Sea or other Pacific Islander</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Other</td>
<td>14 (14)</td>
</tr>
<tr>
<td><strong>Work status</strong></td>
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<tr>
<td>Pension</td>
<td>36 (36)</td>
</tr>
<tr>
<td>Self-funded</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Retiree</td>
<td>17 (17)</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>10 (10)</td>
</tr>
<tr>
<td>Employed full-time</td>
<td>16 (16)</td>
</tr>
<tr>
<td>Pension and employed part-time</td>
<td>6 (6)</td>
</tr>
<tr>
<td>Pension and retiree</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Self-funded and retiree</td>
<td>1 (1)</td>
</tr>
<tr>
<td><strong>The highest level of education</strong></td>
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</tr>
<tr>
<td>Junior/Intermediate certificate (year 10) or before</td>
<td>42 (42)</td>
</tr>
<tr>
<td>Senior/Leaving certificate (years 11-12)</td>
<td>17 (17)</td>
</tr>
<tr>
<td>TAFE certificate or equivalent</td>
<td>26 (26)</td>
</tr>
<tr>
<td>Undergraduate degree</td>
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</tr>
<tr>
<td>Postgraduate degree</td>
<td>5 (4)</td>
</tr>
</tbody>
</table>
Table 8.1 Continued

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sample Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual combined household income</td>
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</tr>
<tr>
<td>Less than $19,999</td>
<td>16 (16)</td>
</tr>
<tr>
<td>$20,000-$39,000</td>
<td>31 (31)</td>
</tr>
<tr>
<td>$40,000-$59,000</td>
<td>8 (8)</td>
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<tr>
<td>$60,000-$79,000</td>
<td>18 (18)</td>
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<tr>
<td>More than $80,000</td>
<td>11 (11)</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>17 (17)</td>
</tr>
<tr>
<td>Medical diagnosis</td>
<td></td>
</tr>
<tr>
<td>Coronary Artery Disease (CAD)</td>
<td>36 (36)</td>
</tr>
<tr>
<td>Non-ST-segment elevation myocardial infarction (NSTEMI)</td>
<td>29 (29)</td>
</tr>
<tr>
<td>ST-segment elevation myocardial infarction (STEMI)</td>
<td>31 (31)</td>
</tr>
<tr>
<td>Valvular heart disease</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Cardiovascular risk factors</td>
<td>1 (1)</td>
</tr>
</tbody>
</table>

The Measurement Model

The contributions of sub-scales and items for each MTE construct, estimated during the confirmatory factor analysis, are shown in Table 8.3. Cronbach’s alpha for each construct varied from 0.71 to 0.95, showing that their internal consistency fell within an acceptable range. Perceived Need items were similarly weighted (0.77–0.92) and in strong agreement (Cronbach’s alpha: awareness of deficits = 0.80, and perceived benefits from rehabilitation = 0.76). Factor loadings of items in outcome expectancies ranged from 0.61–0.95 and items were in strong agreement (Cronbach’s alpha: perceived success = 0.78 and value of outcomes = 0.87). Closer inspection showed that items 1 and 4 from perceived success (Table 8.2), and item 4 from value of outcomes (Table 8.3) differed slightly from other sub-scale items. Factor loadings of perceived self-efficacy items ranged from 0.56–0.99. These constructs were sufficiently internally consistent (Cronbach’s alpha: awareness of capabilities = 0.71 and Perceived demands associated with Rehabilitation = 0.77). Also, Cronbach’s alpha for intention to engage in CR and
willingness to consider the treatment indicated strong agreement and had high loadings (intention to engage in CR = 0.91 and willingness to consider the treatment = 0.89).

The composite reliability indices (CR) for all constructs exceeded the 0.7 threshold, indicating high reliability of each construct. Furthermore, the average variance extracted (AVE) indices for all sub-scales always fell above 0.5, representing an adequately high convergent validity for all sub-scales.

Six goodness-of-fit indices were evaluated to determine how well the measurement model fitted with the collected data. At the first stage, when all scales with their indicators were included, the model fit the data poorly. For this reason, indicators with low loadings were removed: 3 items from the intention questionnaire (items 4, 5, 6); 4 items from the willingness to consider the treatment questionnaire (items 1, 2, 5, 6); 9 items from the perceived need questionnaire (6 items from the sub-scale of awareness of deficits: items 2, 3, 5, 6, 7, 8; and 3 items from the sub-scale of perceived treatment benefits: items 1, 3, 5); 3 items from the outcome expectancies questionnaire (2 items from the sub-scale of awareness of capabilities: items 4, 6; and one item from the sub-scale of value of outcomes: item 3); 8 items from the perceived self-efficacy questionnaire (4 items from the sub-scale of perceived demands: items 1, 2, 3, 4; and 4 items from the sub-scale of awareness of capabilities: items 2, 3, 5, 6); 8 items from the treatment planning questionnaire (items 1, 2, 3, 4, 5, 6, 7, 8); 14 items from the experience analysis questionnaire (5 items from the sub-scale of perceived quality of services: items 1, 2, 5, 6, 7; and 9 items from the sub-scale perceived achievement: items 1, 2, 4, 5, 7, 8, 9, 10, 13); and 1 item from the engagement questionnaire (item 2). Modification indices showed that the model fit was acceptable after omitting items with low loadings (Table 8.3).

17 A full list of items is reported in Appendix C, p. 338.
Table 8.2 Instrument reliability and convergent validity (n = 101)

<table>
<thead>
<tr>
<th></th>
<th>Standardised loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intention to Engage in CR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I intend to make sufficient opportunities for my rehabilitation.</td>
<td>0.84</td>
<td>0.91</td>
<td>0.78</td>
<td>0.92</td>
</tr>
<tr>
<td>2. I intend to have enough possibilities for a good recovery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I intend to make rehabilitation as a part of my daily routine.</td>
<td></td>
<td></td>
<td></td>
<td>0.92</td>
</tr>
<tr>
<td><strong>Willingness to Comply with Treatment to Reach Outcome Goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I always follow medical orders because I think they will help me.</td>
<td>0.95</td>
<td>0.89</td>
<td>0.82</td>
<td>0.90</td>
</tr>
<tr>
<td>2. Doctors know what I need and I will do what they say.</td>
<td></td>
<td></td>
<td></td>
<td>0.85</td>
</tr>
<tr>
<td><strong>Perceived Need</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Awareness of Deficits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. If I were recommended, I would see a rehabilitation therapist.</td>
<td>0.81</td>
<td>0.80</td>
<td>0.68</td>
<td>0.81</td>
</tr>
<tr>
<td>2. Rehabilitation will be very useful for me.</td>
<td></td>
<td></td>
<td></td>
<td>0.77</td>
</tr>
<tr>
<td><strong>Perceived Benefits from Rehabilitation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Rehabilitation is useful, but I don’t think I need it.</td>
<td>0.92</td>
<td>0.76</td>
<td>0.62</td>
<td>0.77</td>
</tr>
<tr>
<td>2. I am very interested in rehabilitation, but it is not for me.</td>
<td></td>
<td></td>
<td></td>
<td>0.83</td>
</tr>
<tr>
<td>Table 8.2 Continued</td>
<td>Standardised loading</td>
<td>Cronbach’s Alpha</td>
<td>Average variance extracted (AVE)</td>
<td>Composite Reliability</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------</td>
<td>------------------</td>
<td>-------------------------------</td>
<td>-----------------------</td>
</tr>
</tbody>
</table>

**Outcome Expectancies**

*Value of Outcomes*
1. Rehabilitation will have a positive impact on my health. 0.76 0.87 0.650 0.88
2. I will feel better after rehabilitation. 0.86
3. Rehabilitation will have a positive impact on my wellbeing. 0.95
4. I will get to know other people during rehabilitation. 0.61

*Perceived Success*
1. Rehabilitation will help me learn new ways of doing things. 0.61 0.78 0.50 0.80
2. Rehabilitation will increase my independence. 0.80
3. Rehabilitation will help me to come to terms with my heart disease. 0.79
4. Rehabilitation will give me more of a purpose in life. 0.61
<table>
<thead>
<tr>
<th>Table 8.2 Continued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Self-efficacy</td>
</tr>
<tr>
<td>Perceived Demands associated with Rehabilitation</td>
</tr>
<tr>
<td>1. Rehabilitation involves too much repetition of the same thing.</td>
</tr>
<tr>
<td>2. I have more important things to get on with than doing rehabilitation.</td>
</tr>
<tr>
<td>3. Being around other people with disabilities or illnesses makes me feel down.</td>
</tr>
</tbody>
</table>

| Awareness of Capabilities |
| 1. I have confidence that I can cope with doing rehabilitation. | 0.99 | 0.71 | 0.65 | 0.77 |
| 2. It is important that I try to overcome my difficulties. | 0.56 |

| Preparation |
| 1. I made the final decision about which goals were set. | 0.72 | 0.93 | 0.74 | 0.93 |
| 2. My rehabilitation goals are meaningful and important to me and relate to who I am and my future. | 0.92 |
| 3. My rehabilitation goals are relevant to my everyday life and to what I want to do at home, work, or in the community. | 0.87 |
Table 8.2 Continued

<table>
<thead>
<tr>
<th>Statement</th>
<th>Standardised loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. My rehabilitation goals were what I am motivated to work on.</td>
<td>0.94</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. My rehabilitation goals were my own goals.</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Experience Analysis**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Standardised loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My chosen family/friends were given the information they needed about my rehabilitation.</td>
<td>0.87</td>
<td>0.95</td>
<td>0.70</td>
<td>0.95</td>
</tr>
<tr>
<td>2. The place where I received rehabilitation had a positive impact on my experience.</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I always felt safe when taking part in rehabilitation activities.</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. From now on I know what to expect about my rehabilitation.</td>
<td>0.91</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I am likely to recommend this rehabilitation program to friends and family if they need the same care.</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Did you feel that the staff listened to what was important to you?</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Did you get the opportunity to practice what was recommended?</td>
<td>0.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Did you reach the expected result of your treatments?</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Are you satisfied with the treatment received?</td>
<td>0.94</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 8.2 Continued

<table>
<thead>
<tr>
<th>Engagement</th>
<th>Standardised loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The patient regularly attended my therapy/rehabilitation activity.</td>
<td>0.76</td>
<td>0.95</td>
<td>0.84</td>
<td>0.95</td>
</tr>
<tr>
<td>2. The patient expressed a positive attitude towards my therapy/rehabilitation activity.</td>
<td>0.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The patient acknowledged a need for rehabilitation services and the benefit of therapy exercises or rehabilitation activities.</td>
<td>0.99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The patient actively participated in his/her rehabilitation therapy/activity.</td>
<td>0.92</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Structural Model

Table 8.3 demonstrates that all goodness-of-fit indices fell within the recommended range, after this modification. The SEM confirmed that the collected data were consistent with the majority of the proposed relationships within the MTE (see Appendix E, Supplemental Figure 2). The exceptions were the relationship between outcome expectancies and intention to engage in the CR program (unstandardised effect $B = -0.31$; standardised effect $\beta = -0.27$; $SE = 0.23$; $p = 0.18$). Although a negative effect was estimated, the variability was too large to reject a null hypothesis that the effect was in fact zero. A negative effect was found for perceived self-efficacy on outcome expectancies ($B = -0.16$; $\beta = -0.18$; $SE = 0.07$; $p = 0.02$). Results also showed significant though typically positive effects of moderate size, of predictors on engagement: perceived need and intention to engage in CR ($B = 0.63$; $\beta = 0.43$; $SE = 0.29$; $p = 0.03$); perceived self-efficacy and intention to engage in CR ($B = 0.24$; $\beta = 0.23$; $SE = 0.13$; $p = 0.05$); intention and preparation ($B = 0.28$; $\beta = 0.37$; $SE = 0.09$; $p = 0.001$), CR initiation and engagement ($B = 0.20$; $\beta = 0.68$; $SE = 0.03$; $p \leq 0.001$); engagement and analysis of experience ($B = 0.38$; $\beta = 0.381$; $SE = 0.08$; $p \leq 0.001$); analysis of experience and maintenance ($B = -0.30$; $\beta = -0.58$; $SE = 0.05$; $p \leq 0.001$); and maintenance and engagement ($B = 0.56$; $\beta = 0.20$; $SE = 0.29$; $p = 0.05$). A very large positive relationship

<table>
<thead>
<tr>
<th>The goodness of Fit Measures</th>
<th>Chi-Square / df</th>
<th>PCFI</th>
<th>CFI</th>
<th>IFI</th>
<th>TLI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended</td>
<td>≤ 3.00</td>
<td>&gt; 0.5</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≤ 0.08</td>
</tr>
<tr>
<td>CFA Model</td>
<td>1.40</td>
<td>0.81</td>
<td>0.92</td>
<td>0.92</td>
<td>0.91</td>
<td>0.06</td>
</tr>
<tr>
<td>Structural Model</td>
<td>1.54</td>
<td>0.82</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
<td>0.07</td>
</tr>
</tbody>
</table>
was found between preparation and initiation (B = 2.70; β = 0.45; SE = 0.70; p ≤ 0.001).

Figure 8.2 illustrates the final results of the SEM path analysis.

**Analysis of Mediation effects**

It was proposed that willingness to consider the treatment would act as a mediator between the predictors outcome expectancies, perceived self-efficacy, perceived need, and the outcome intention to engage in CR (Lequerica & Kortte, 2010). As presented in Table 8.4, willingness to consider the treatment fully mediated the relationship between perceived self-efficacy and intention to engage in CR, with small positive effects ($\beta_{\text{indirect}} = 0.18$, CI = [0.03, 0.52], $p = 0.02$). Thus, although perceived need and perceived self-efficacy did not significantly directly predict intention ($\beta_{\text{direct}} = 0.07$, CI = [−0.23, 0.33], $p = 0.54$), the impact of perceived self-efficacy on intention to engage in CR was only through willingness to consider the treatment. However, outcome expectancies directly affected intention to engage in CR ($\beta_{\text{direct}} = 0.43$, CI = [0.15, 0.87], $p = 0.05$), with moderate positive effect.
Figure 8.2 SEM path analysis results for the full MTE, based on only those 101 participants that completed all three stages, with standardised regression coefficients (and p-value) shown on each path. Note: that *** denotes that this p-value $p \leq 0.001$. 
<table>
<thead>
<tr>
<th>Variables</th>
<th>Indirect effect (standardised regression weight coefficient (p-value))</th>
<th>95% CI</th>
<th>Direct effect (standardised regression weight coefficient (p-value))</th>
<th>95% CI</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN W I</td>
<td>-0.29 (0.34)</td>
<td>[-1.67-0.28]</td>
<td>0.55 (0.14)</td>
<td>[-0.18-2.16]</td>
<td>No effect</td>
</tr>
<tr>
<td>OE W I</td>
<td>0.05 (0.31)</td>
<td>[-0.07-0.67]</td>
<td>0.43 (0.05)</td>
<td>[0.15, 0.87]</td>
<td>Direct effect</td>
</tr>
<tr>
<td>PSE W I</td>
<td>0.18 (0.02)</td>
<td>[0.03-0.52]</td>
<td>0.07 (0.54)</td>
<td>[-0.23-0.33]</td>
<td>Full mediation</td>
</tr>
</tbody>
</table>

Note: IV: Independent Variables; M: Mediator; DV: Dependent Variable; CI: Confidence Interval; I: Intention to Engage in CR; W: Willingness to Consider the Treatment; PN: Perceived Need; OE: Outcome Expectancies; and PSE: Perceived Self-efficacy.
8.5 Discussion

The concept of engagement encompasses multiple elements, including the individual’s attitudes about the treatment; the level of understanding or acknowledgement of a need for therapy; the need for verbal or physical cues to participate; and the level of active participation in the treatment activities (Faller, 2003; Geelen & Soons, 1996; Jeffrey, 1981; Lenze et al., 2004). Researchers had not proposed this level of complexity until Lequerica and Kortte (2010) proposed the theoretical Model of Therapeutic Engagement (MTE); and this present study is the first to examine these relationships at this level of complexity, in a holistic manner. SEM provides a mechanism for evaluating the MTE. Visually the nodes and pathways in the SEM provides a smooth transition from the nodes and links in Lequerica and Kortte’s (2010) causal model, and statistically the signs of the effect sizes in the SEM explicitly test the signs on links in the original causal model.

The MTE conceptualises engagement as a complicated multi-stage process influenced by different factors at different points in time, which we explicitly tested using surveys targeted to each of the three stages of individual engagement. The MTE also incorporates multiple dimensions of engagement, including a process and an individual state (Bright, Kayes, Worrall, & McPherson, 2015). This SEM transparently evaluates their role by defining latent constructs to represent each dimension. At each stage of the MTE, the measurement error analysis (conducted via a factor analysis in SEM) evaluated whether the set of predictors obtained from surveys adequately represent each dimension. The MTE, proposed in concept by Lequerica and Kortte (2010) and quantified via our SEM, provides an explicit empirical mechanisms for evaluating the theoretical proposals contained in the MTE. In addition to providing empirical evidence for the MTE, our research addresses two other significant gaps in the literature: the MTE had not previously been evaluated in any
actual rehabilitation settings; research had been limited to subsets of its stages, so that the MTE required examination as a whole to improve understanding of causal pathways.

By using empirical data to understand individual engagement, this study explored, measured and validated the components of the MTE and then examined the way in which the components of this conceptual model interact with each other. The findings showed that the proposed relationships between the variables are mainly consistent with the overall model proposed by Lequerica and Kortte (2010) and the findings from previous research conducted in the CR context. One exception was the relationship between outcome expectancies and intention to engage in CR, where the estimated effect size was consistent with the original MTE, but variability was too large to enable clear detection of a ‘signal’. Previous studies have found outcome expectancies to be a predictor of intention to engage in physical activity (Bennett, Mayfield, Norman, Lowe, Morgan, 1999; Schwarzer, Lippke, & Luszczynska, 2011), suggesting that further research may be needed to explore this relationship in more detail. It is possible that this discrepancy has arisen because participants are not being motivated by outcome expectancies, at least not at this early stage of their cardiac illness and treatment continuum. Alternatively, it is likely that the exception has arisen because previous empirical studies have not been explicit about what stage of engagement was most strongly related to perceived outcome expectancies. The current study has examined engagement in multiple stages, allowing a more fine-grained analysis of the relationships between variables.

Another exception was the negative relationship between perceived self-efficacy and outcome expectancies in contrast to the expected positive relationship (Williams, 2010). In the MTE like previous research (Blanchard et al., 2007; Woodgate, Brawley, & Weston, 2005), self-efficacy is not only examined by an individual capability to engage in the program (task self-efficacy) but also examined by an individual capability to engage in the program
in the context of demands and challenges (barrier self-efficacy). This negative relationship found in the current study shows that the higher level of perceived demands associated with rehabilitation, as a subgroup of perceived self-efficacy, may cause a negative impact on outcome expectancies. However, this negative relationship arose because of the sample. In the current study, the sample was individuals who started the program. Therefore, participants perceived that they are capable of carrying out the CR program, but perceived demands related to the rehabilitation were dominant at this stage.

The findings also confirmed that perceived self-efficacy was mediated by willingness to consider the treatment, i.e. those with higher levels of perceived self-efficacy were more likely to express willingness to consider the treatment, which in turn predicted intention to engage in the CR program. Despite the importance of willingness in changing risky health behaviour (Kasila, Hallman, Kautiainen, Vanhala, & Kettunen, 2018), to our knowledge, no empirical research has explored the role of willingness to consider the treatment of individual intention to engage in CR. Perceived need was the most influential predictor of intention to engage in the program in the present study. When considered together—perceived need, outcome expectancies, perceived self-efficacy, and willingness to consider the treatment—these variables formed the basis for intention to engage in CR. Thus, this model provides the first holistic and empirical perspective on how all of these variables interact, building on other studies that investigated only some of these links empirically (Dohnke et al., 2010; de Melo Ghisi et al., 2015; Sullivan et al., 2009).

In the MTE, intention to engage in rehabilitation programs is followed by preparation to engage in rehabilitation, which has been confirmed in different populations (Kersten, McPherson, Kayes, Theadom, & McCambridge, 2015). As such, participant involvement in the preparation process had a positive impact on the CR initiation stage, confirming the
findings of a study conducted on cardiac rehabilitation participants by Kjær, Gyrd-Hansen, and Willaing (2006). CR initiation was also proposed to be positively associated with engagement in CR. The data analysis in the current study revealed that there was a positive relationship between CR initiation and engagement in CR. The MTE process then follows a feedback loop where participants assess the advantages and disadvantages of engagement and make decisions based on their experience, whether to continue the activity or disengage. This feedback loop had not previously been tested (Jahandideh et al., 2018a, p. 15). Participant expectations of the rehabilitation programs may be met, and this was found to be negatively associated with CR maintenance. Furthermore, reassessment of previous attitudes, beliefs, and expectations may support an individual’s decision whether to continue to be involved in the program or not. We found that this reassessment of the individual’s experience is a critical regulatory step in the process, in line with findings of the previous studies in the CR context (Banner et al., 2017; Hansen et al., 2018). In addition, we found a negative relationship between analysis of experience and maintenance in line with the findings reported by Gardiner et al. (2018) in a sample of CR participants. It can be concluded that individuals simply decided to continue to attend the program if their needs were not met and also if their experiences were enjoyable and worthwhile (Lequerica & Kortte, 2010). Furthermore, the collected data showed a positive relationship between CR maintenance and engagement in CR, which indicated that a higher level of maintenance was associated with a higher level of engagement in CR. Also, a higher level of engagement may lead to a higher level of sense of accomplishment in CR participants (Araya-Ramirez et al., 2010). These results showed that the therapist and individual might need to adjust goals and the treatment plans to take full advantage of any preferred individual outcomes at this stage.
Research on the process of individual engagement in CR is still in its infancy, with several papers investigating only one or two pathways in this model. For instance, a study has focused on the way in which an individual’s knowledge about rehabilitation and goals has facilitated participation (Carroll, Rankin, & Cooper, 2007). Furthermore, individual motivation has received a great deal of attention as an important construct that can partly explain individual intention to engage in CR (Broadbent et al., 2009; Dohnke et al., 2010; Rouleau et al., 2018). This study makes an essential contribution by mapping out the relationships between the variables within the three stages of the MTE for the first time in an actual cardiac rehabilitation setting. Through a significant effort to approach 317 potential individuals, sufficient individuals were enlisted to investigate each stage of the MTE: intention to engage in CR programs; CR initiation; and maintenance of participation in CR program (N = 101 from 317). Thus, this study acquired a minimal sample size (Ding, Velicer, & Harlow, 1995) to investigate the previously untested MTE. These findings revealed the data are consistent with a finding that the MTE is applicable for understanding the process of patient engagement in CR programs, thus narrowing the gap that currently exists in the literature.

Healthcare providers may be able to use these findings to implement interventions, that suit individuals’ needs, and alter variables that represent points of leverage, so as to foster individual engagement in outpatient CR programs and facilitate the recovery journey. Due to its large loading, an obvious lever is CR Preparation, which if increased, could greatly improve the chance of whether an individual chooses to CR initiate. Therapists could choose to motivate individuals by involving them in the goal setting stage to design an individualised treatment plan based on individuals’ preference. Another lever is perceived need including individual perceived treatment benefits and awareness of deficits, which if increased, could
greatly improve patient intention to engage in CR. As stated above, it is important that therapists note that amongst the negative effects are Demands, which could deter individual’s perceived self-efficacy and outcome expectancies and eventually could act as a marker to decrease individual intention to engage in CR.

The findings of the current prospective study are limited as data has been collected from only one CR centre. Accordingly, the generalisability of these findings might be limited (Colombo, Bucher, & Sprenger, 2017). In addition, it is well established that small studies may lack power, making it difficult to refute the proposed relationships (Wasserstein & Lazar, 2016; Greenland et al., 2016). Also, there are many factors unaccounted for in the MTE. Greater consideration should be given to facilitators or barriers of engagement, such as health professional-related factors (e.g. clinicians’ communicative and relational skills); factors associated with family caregivers of individuals; and mental distress factors. Facilitators of engagement are inherent in the process of overcoming barriers. For example, social support, as a facilitator, can help improve the process of CR engagement. Conversely, a lack of family support may act as a barrier that prevents an individual from engaging in CR programs. For future studies, we suggest integrating these elements of engagement into the MTE, to achieve a better understanding of the process of individual engagement, and to ensure that model misspecification has not distorted the findings thus far (Weston, Gore, Chan, & Catalano, 2008). Furthermore, in-depth interviews with individuals at various stages of the MTE could be used as a supplementary approach, providing deeper and richer information about individuals’ experiences during the process of engagement.
8.6 Conclusion

Conceptually narrow definitions of engagement have been a limitation for exploring strategies in previous studies. More importantly, this approach has led to inadequate knowledge about the overall process of engagement. This study has used the Lequerica and Kortte Model of Therapeutic Engagement developed in the context of brain injury rehabilitation to explore how individuals became engaged in CR from the time of hospitalisation. Despite being a relatively small study on a single population, this quantitative study provides proof-of-concept, as well as initial evidence about the utility of the MTE. It is the first empirical demonstration that several factors facilitate or detract from (or mediate relationships) during the three stages of therapeutic engagement in CR. Hence, this study contributes to the more rigorous interrogation of the proposed relationships contained in the MTE, including support for future meta-analyses of evidence of effect sizes accumulated over multiple studies. Therefore, given the novelty of the results, replication is warranted before any firm conclusions can be drawn. In addition, this study provides a firm basis for further research expanding the MTE.
8.7 References


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*Patient Preference and Adherence, 12*, 145-152.


Chapter Nine

The Impact of Socio-environmental Barriers on the Process of Engagement in Cardiac Rehabilitation Programs

In the previous chapter, three stages of the process of engagement were modelled according to the baseline MTE model. This chapter aims to expand the primary model to account for the role of socio-environmental factors in the process of engagement. Socio-environmental factors can be experienced as barriers to individual engagement in cardiac rehabilitation (CR) programs. Socio-environmental barriers may occur at all three stages of the process of engagement: 1) individual intention to engage in CR; 2) CR initiation (i.e. attendance); and 3) maintenance of participation in CR programs (i.e. completion). Such barriers to individual attendance in CR programs include: interpersonal (work conflicts and family caregiver role); logistical (transport and distance); CR programs (exercise components, inconvenient timing and CR equipment); and health systems (long waiting lists and financial assistance for transport). This extension of the model is based on strong evidence from the literature (Banerjee, Grace, Thomas, & Faulkner 2010; Dunlay et al., 2009; Evenson & Fleury, 2000; Resurrección, Motrico, Rubio-Valera, Mora-Pardo, & Moreno-Peral, 2018; Rogerson, Murphy, Bird, & Morris, 2012; Rouleau et al., 2016). It is hypothesised that these barriers will impact on the proposed relationships within the Model of Therapeutic Engagement (MTE) (Lequerica & Kortte, 2010). In this chapter, the role of socio-environmental barriers within the MTE has been investigated using two groups of participants, those who commenced, and those who did not commence the CR program. The theoretical framework of this study is presented in Figure 9.1 (p. 256).
The information in this section has been submitted to a peer-reviewed journal as an original paper: Jahandideh, S., Kendall, E., Low-Choy, S., Donald, K., & Jayasinghe, R. (2018e). How do socio-environmental factors impact on the process of individual engagement in cardiac rehabilitation programs? Submitted to Western Journal of Nursing.

We note that by necessity, because this chapter represents a draft paper, some elements of the study design and materials repeat content presented in the Methods section of the thesis, and in chapters that are also papers or drafts.

The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Completed and obtained the required human research ethics approval;
- Developed the survey questionnaire;
- Collected data;
- Performed data analysis and interpreted the findings;
- Wrote and prepared the manuscript for submission to the journal.

Sepideh Jahandideh (16th December, 2018)

Principal supervisor: Elizabeth Kendall (16th December, 2018)

Corresponding author: Sepideh Jahandideh
Figure 9.1 Potential points where this study investigates where Socio-environmental Factors may impact on the original Model of Therapeutic Engagement of Lequerica & Kortte (2010)
9.1 Abstract

**Introduction:** There is a lack of prospective studies investigating the impact of socio-environmental barriers on engagement in cardiac rehabilitation (CR) programs over time. The Model of Therapeutic Engagement (MTE) is a comprehensive conceptual model for explaining the process of engagement in rehabilitation, which has not been evaluated empirically outside this thesis. Of concern is that the role of socio-environmental factors is absent from explaining individual engagement. This study aimed to expand the MTE, by illuminating the role of socio-environmental barriers in a three-stage process of engagement in CR programs. This analysis was conducted for two groups of participants, those who commenced the CR program and those who did not. **Method:** A prospective study was conducted, with individuals recruited from the Cardiology Ward in the Gold Coast University Hospital and the Robina Cardiac Rehabilitation Centre. Participants completed a questionnaire at discharge time including a checklist of socio-environmental barriers. For those who commenced the program, engagement in the CR program was also rated by a nurse. This sub-group of participants completed another questionnaire again at the last session of their CR program including the checklist of socio-environmental barriers. The collected data were examined using a structural equation model that added socio-environmental factors into the MTE, using multi-group analyses, for 101 participants commencing and 106 not commencing the CR program. **Results:** The findings of this study revealed that a high level of socio-environmental barriers impacted on some of the proposed relationships within the MTE, even once CR had been commenced. In this study, we found that socio-environmental factors were not associated with intention to engage in the CR program, but were related to actual attendance and maintenance of participation in CR programs. **Conclusion:** Participants constantly re-evaluate their engagement in CR programs.
and change their level of engagement based on their experience with barriers. Knowing how these socio-environmental barriers affect the process of engagement at different stages may help to tailor better and more accessible CR programs for the population.

**Keywords:** cardiac rehabilitation; patient engagement; socio-environmental barriers; Structural Equation Modelling.
9.2 Introduction

Engagement is considered to be an essential factor for improving rehabilitation outcomes (Kortte, Flak, Castillo, Johnson-Greene, & Wegener, 2007; Lequerica & Kortte, 2010). However, keeping people engaged in cardiac rehabilitation (CR) programs over time is challenging. Lequerica and Kortte (2010) proposed a conceptual model to explain the process of individual engagement in rehabilitation. They suggested that this process comprises three stages: intention to engage in CR programs, CR initiation (i.e. attendance), and maintenance of participation in CR programs (i.e. completion). The Model of Therapeutic Engagement (MTE) sets out a carefully chosen set of social cognitive variables, which are individuals’ perception of self and individuals’ impression of the treatment environment that predict each of these three stages: perceived self-efficacy, outcome expectancies, perceived need, CR preparation, analysis of experience and quality of engagement. However, to understand the process of engagement thoroughly, socio-environmental factors also need to be considered, however, they are not included in the MTE.

Socio-environmental barriers have been studied in previous research, but only in terms of their impact on specific outcomes or processes, rather than in relation to an entire model of engagement. Previous studies suggested that socio-environmental factors can act as either barriers or facilitators and impact on the process of engagement in CR programs (Banerjee, Grace, Thomas, & Faulkner, 2010; Dunlay et al., 2009; Evenson & Fleury, 2000; Rogerson, Murphy, Bird, & Morris, 2012; Rouleau et al., 2016). A review of the literature reveals that interpersonal factors (family caregiver roles and work conflicts); logistical factors (transport and distance); cardiac rehabilitation program characteristics (perception of the objective of cardiac rehabilitation, exercise component, inconvenient timing and cardiac rehabilitation equipment); and health system factors (financial assistance for transport and
long waiting list) have been found to impede individual engagement in CR programs (Al Quait, Doherty, Gutacker, & Mills, 2017; Banerjee et al., 2010; Dunlay et al., 2009; Evenson & Fleury, 2000; Resurrección, Motrico, Rubio-Valera, Mora-Pardo, & Moreno-Peral, 2018; Rogerson, Murphy, Bird, & Morris, 2012; Rouleau et al., 2016). In addition, there is evidence that the absence of these barriers can facilitate individual engagement in rehabilitation. For example, support from healthcare systems (physician referral, physician support and follow-up, and caring and supportive staff); support from family and friends; and also affordability and insurance coverage (Banerjee et al., 2010; Rouleau et al., 2016) have all been found to facilitate engagement. However, as yet, no studies have investigated the impact of socio-environmental barriers on each stage of the process of engagement in cardiac patients. This project addresses this gap, by examining the possible impact of these socio-environmental factors on the proposed relationships within each stage of the process of engagement. It is worth mentioning that there may be a gap in understanding all the key factors involved between individual intention to engage and actual engagement in the program. This gap could be partly explained by these socio-environmental barriers. The present empirical study expands the MTE to understand how socio-environmental barriers impact on each stage of engagement in the CR program and also investigate whether incorporating socio-environmental barriers improves the explanatory performance of the MTE.

The main aim of this study was to identify the impact of socio-environmental barriers on the proposed pathways within the MTE, and it was important that this was considered separately for two groups: those who did not commence the CR program, and those who did commence. In the first study concerning those who did not commence the CR program, the role of socio-environmental barriers was examined in the first stage of the MTE only, after which time they were no longer actively engaged in any rehabilitation. In the second study
focused on those who commenced the CR program, socio-environmental barriers were examined in all three stages of the MTE to determine their role in modifying the engagement process.

9.3 Method

Participants and Procedure for Data Collection

The study utilized a prospective design with a consecutive recruitment of patients from April, 2017 until February, 2018. Eligible participants were those who were: (a) referred to the CR program in the Robina Cardiac Rehabilitation Centre; (b) not diagnosed with severe neurological impairments; (c) not too ill to volunteer in the study; (d) able to speak and write in English; and (e) consented to participate in the research project. Consenting participants who were recruited were inpatients of the Cardiology Ward at the Gold Coast University Hospital (GCUH), and outpatients of the Robina Cardiac Rehabilitation Centre if they had commenced in CR programs. A minimum of 100 participants was considered adequate for structural equation modelling (SEM), based on the Ding et al.’s rule (Ding, Velicer, & Harlow, 1995). However, the minimum required sample size for the model structure was also calculated using Soper's sample size calculator (Soper, 2018). In this research, with 10 latent constructs and 46 observed variables, a sample size of 88 would satisfy the minimum sample size for model structure and would have the power of 80% to detect a standardized effect size of 0.3 with a significance level of 5% (Soper, 2018). The standardized effect size of 0.3 is considered small in this context (Cohen, Cohen, West, & Aiken, 2003), so that this sample size is somewhat conservative.

Since the MTE addresses the fluctuating and dynamic concept of engagement, it was important to examine the patterns of engagement among participants. It was important to
account for the fact that participants could withdraw from the CR program at different stages. Hence, the final sample included participants who commenced CR as well as those who did not commence the CR program or withdrew during the program. The role of socio-environmental factors was examined in both commencing and non-commencement participants at the first stage of the MTE.

Socio-environmental factors were measured at two time-points for all participants who did or did not commence the CR program. Participants completed the first questionnaire while they were in the hospital. The second questionnaire was mailed to the home addresses of patients, with a stamped return-addressed envelope, at the end of the program. Questionnaires were available in paper or online format through the SoGo Survey website (https://www.sogosurvey.com/) for the convenience of participants, and to improve response rate. In addition, to account for mobility constraints, the researcher accepted requests to collect questionnaires from a participant’s home, and answer participant queries regarding the research project by phone or email. When questionnaires contained unanswered questions, they were returned to participants for completion after first receiving their agreement via telephone.

The National Ethics Application Form (NEAF) was approved by the Gold Coast Health Service District Human Research Ethics Committee (HREC) in April, 2017, prior to study commencement (Reference: HREC/16/QGC/329).
**Study measures**

The MTE constructs were measured by a series of standard questionnaires. The dependent variables corresponded to three stages of individual engagement represented by the MTE: (1) intention to engage in the CR program; (2) CR initiation; and (3) sustained participation in the CR program. In addition, the quality of engagement was assessed, to provide a more nuanced measure of engagement, beyond a simplistic binary of engagement or not. Intention to engage in the CR program was measured by the Short Version of Recovery Intention Questionnaire (6 items) (Blasche & Markl, 2011). CR initiation was reported by a nurse when participants attended a minimum of four sessions out of the first six sessions of the program. At completion of each participant’s CR program, a nurse assessed the quality of engagement in the CR program using the Hopkins Rehabilitation Engagement Rating Scale (5 items) (Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007).

To explain the outcomes at each of these three stages, the MTE proposes five predictors: outcome expectancies, a perceived need for CR, perceived self-efficacy (predictors of intention to engage in CR), CR preparation (predictor of CR initiation) and analysis of CR experience (predictor of maintenance of CR). The construct of outcome expectancies was measured by: a) perceived success and b) value of outcomes. Perceived success was assessed using a sub-scale of Rehabilitation Representations Scale, Treatment Outcome Beliefs (6 items) (Bains, Powell, & Lorenc, 2007), while the value of outcomes was measured using the Outcome Expectancies Questionnaire (5 items) (Sniehotta, Scholz, & Schwarzer, 2005). Two sub-scales were used to measure perceived need for rehabilitation.

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18 The material contained in this section is a duplication of material from the method described in Chapter Four of this thesis. It is repeated here for completeness as it forms part of the submitted/published manuscript.
These were awareness of deficits and perceived general benefits of rehabilitation. To measure an awareness of deficits, a sub-scale of the Motivation for Traumatic Brain Injury Rehabilitation Questionnaire (MOT-Q): Lack of Denial (8 items) was utilised (Chervinsky, Ommaya, Spector, Schwab, & Salazar, 1998). Two sub-scales from the MOT-Q were used to measure perceived general benefits of rehabilitation: a) Interest in Rehabilitation (7 items), and b) Lack of Anger (5 items). A measure of perceived self-efficacy was derived from two subscales: a) awareness of capabilities and b) perceived demands. Awareness of capabilities utilised 6 items of the Control Cognition subscale from the Rehabilitation Representations Scale (RRS), and perceived demands were measured using 7 items from the Perceived Barriers subscale of the RRS (Bains et al., 2007).

Two constructs, Goal Setting and Treatment Planning, were used to measure preparation for Rehabilitation. Goal engagement and goal satisfaction were measured using a single questionnaire which consisted of 1 item with a Likert scale ranging from excellent to none (Turner-Strokes et al., 2015). The Client-Centeredness of Goal Setting construct [C–COGS] (Doig, Prescott, Fleming, Cornwell, & Kuipers, 2015) was used to measure treatment planning (13 items). Two variables, perceived quality of service and perceived achievements, were used to measure analysis of experience. McMurray et al.’s (2015) questionnaire was used to measure the outpatients’ perceptions of the quality of services (10 items). The COPM (Canadian Model of Occupational Performance) questionnaire was applied to measure perceived achievement (13 items) (Law et al., 2014). Attendance at 90% of scheduled CR sessions was required for a patient to be classified as maintaining attendance and was based on a nurse report.

Socio-environmental barriers were measured using the Cardiac Rehabilitation Enrolment Obstacles Scale (CREO), which was validated using an Australian population
with similar demographics to the population in this study (Fernandez, Salamonson, Juergens, Griffiths, & Davidson, 2008). Therefore, this scale was applied to examine the role of barriers in the MTE in this Australian sample. The CREO scale assesses an individual’s perceptions of the degree to which individual-, provider-, and health system-level barriers affect their enrolment and participation in CR. The CREO scale has 15 items (Fernandez et al., 2008). However, personal barriers (personally thought it was unnecessary; did not have time; lack of motivation; fear of sickness) were removed from the CREO as the MTE already addresses individual-level factors. Regardless of whether participants had commenced CR, they were asked to rate their level of agreement with statements in the CREO scale, as a way of detecting socio-environmental barriers related to their intention to engage in the CR program. The CREO scale was also used to measure socio-environmental barriers when participants commenced the program. Statements were rated on a five-point Likert-type scale that ranged from strongly disagree to strongly agree. Higher scores, therefore, indicated greater barriers to individual enrolment or participation in CR. Convergent validity and test-retest reliability were found to be acceptable, with an intra-class correlation coefficient of 0.64 (Fernandez et al., 2008). In the current study, the CREO scale was separately validated for individuals who commenced and who did not commence the program. Participants were divided into two groups as to whether they fell above or below the median level: participants with a higher than the median level of intention to engage in the CR program and those with a lower than the median level of intention to engage in the CR program.

**Statistical analysis**

To investigate the characteristics of the sample, descriptive statistics (mean, and standard deviation for continuous measures and frequency for discrete measures) were applied to
socio-demographic variables using SPSS Version 21.0 (SPSS, Inc., Chicago, IL). SPSS Amos version 21.0 (Arbuckle, 2012) was used for structural equation modelling (SEM) in order to examine (a) the measurement model that defines latent constructs in terms of measured indicators, (b) the structural model specified by the hypothesized relationships among constructs, and (c) multi-group analysis to compare the two groups of patients with low- or high- level socio-environmental barriers. Given that socio-environmental barriers may express differently at each stage of the model, their impact on each of the three stages was examined using separate analyses.

**Measurement model (SEM-Part A)**

The measurement model (refer to lines in the table) was fitted by conducting a confirmatory factor analysis (CFA). The resulting coefficients quantify the contribution of each indicator to each latent construct (like components of a score), allowing the assessment of reliability and validity of each construct (Kline, 2005).

Convergent validity estimates the degree to which the indicators within each construct should be related to each other in order to arrive at the same results if some are missing (Hair, Black, Babin, & Anderson, 2010). Average variance extracted (AVE) for each construct should exceed the recommended threshold of 0.50, to indicate that convergent validity is considered adequate (José Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014). Furthermore, internal consistency reliability of constructs was evaluated using Cronbach’s alpha, with values below 0.5 reflecting unacceptable reliability (George & Mallery, 2003). The Stats Tools Package (Gaskin, 2016) was used to measure convergent validity.
Structural model (SEM-Part B)

Pathway analysis via structural equation modelling (SEM) estimates the magnitude and significance of effects of predictors and their hypothesised causal relationship with outcome variables. This approach could be applied separately to each of the three stages of the MTE, which was possible because each stage was delimited by measured outcomes: (1) individual intention to engage in the CR program, (2) CR initiation, and (3) maintenance of participation in the CR program with barriers to their engagement.

For each SEM, goodness-of-fit to the obtained data was judged using a suite of six indices, recommended to be considered together, in order to evaluate overall goodness-of-fit (Bollen & Long, 1993). A ratio of the chi-squared statistic compared to the degrees of freedom ($\chi^2 / df$) was used to assess whether predictions from the proposed model were aligned with the obtained data, and evaluated against a recommended threshold of 3 (Norušis, 2012). However, these values need to be viewed with caution, as a chi-squared test has a high tendency to indicate significance with increasing sample size (Hair et al., 2010; Wasserstein & Lazar, 2016). The other indices to test the goodness-of-fit of the proposed model were:

- the Parsimony Comparative Fit Index (PCFI) (recommended $> 0.5$; Safarnia, Akbari, & Abbasi, 2011);
- the Comparative Fit Index (CFI) (recommended $\geq 0.90$; Hair et al., 2010);
- the Incremental Fit Index (IFI) (recommended $\geq 0.90$; Arbuckle & Wothke, 1999);
- Tucker-Lewis Index (TLI) (recommended $\geq 0.90$; Arbuckle & Wothke, 1999);
- Root Mean Squared Error of Approximation (RMSEA) (recommended $\leq 0.08$; Browne & Cudeck, 1993).
Cangur and Ercan (2015) conclude that RMSEA is a good indicator of model fit for SEM, and gave similar results to a more complex statistical model. They also found that RMSEA (together with the scaled chi-squared goodness-of-fit statistic and CFI) were robust to sample size, meaning they are appropriate here for application to a sample of minimal size.

In addition, the proposed model was refined to eliminate factors that were found non-significant with this data, ensuring that only those factors with strong evidence for inclusion were retained (Hair et al., 2010). This involved removing indicators with low loadings and/or the largest modification indices (MI). The factors with the largest MI value were omitted only if it made substantive sense; if that was not meaningful, then the factor with the next largest MI value was considered (Hair et al., 2010). A bootstrap procedure based on 2000 bootstrap samples and a 95% bias-corrected two-tailed confidence interval was used to estimate the standard error of the effect of each mediator.

The multi-group analysis tests whether predefined data groups have significant differences in their group-specific parameter estimates (Hayduk, 1987). This was assessed via a Z-score, based on a comparison of these estimates (Marcoulides & Schumacker, 1996), with the associated p-value testing the null hypothesis that the difference was zero. Before running the SEM for multiple group analysis, the proposed models were drawn from data to ensure that each model was well identified and no problems arose during the model fitting process. Separate SEMs were developed across two groups of participants, having either low- or high-level barriers to engaging in the CR program, to examine differences in structural relationships proposed by the MTE. The number of barriers was calculated, based on those experienced by each participant over the course of CR, and then classified as falling above or below the median value, calculated across participants at each of the three stages of CR.
9.4 Results

The findings are presented for two groups: non-commencing participants (Study One) and those commencing in the CR program (Study Two). For each study, the assessments of the measurement and structural models are explained below.

**Study One: The moderating role of socio-environmental factors in the first stage of the MTE for participants who did not commence CR**

Participants for this analysis were 106 individuals from the Gold Coast University Hospital who did not commence the CR program. Most of these patients were male (81%). The mean age of participants was 64 (SD = 11, a range from 38 to 87). Regarding education, almost 33% of participants reported receiving a junior or intermediate certificate (year 10) or less; 25% had completed a senior or leaving certificate (years 11-12); 30% had completed a technical and further education (TAFE) certificate or equivalent; 10% completed an undergraduate degree; and 3% held postgraduate degrees. After conducting confirmatory factor analysis, the median value for the scale of socio-environmental barriers was 12. The participants’ demographic characteristics are summarised in Table 9.1.
Table 9.1 Demographic characteristics for participants who did not commence (n = 106) and commenced (n = 101) the cardiac rehabilitation program

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>Study 1: Participants who did not commence the program (n = 106)</th>
<th>Study 2: Participants who commenced the program (n = 101)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>20 (19)</td>
<td>37 (37)</td>
</tr>
<tr>
<td>Male</td>
<td>86 (81)</td>
<td>64 (63)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-45 years old</td>
<td>7 (7)</td>
<td>7 (7)</td>
</tr>
<tr>
<td>46-61 years old</td>
<td>39 (37)</td>
<td>27 (27)</td>
</tr>
<tr>
<td>62-77 years old</td>
<td>42 (40)</td>
<td>51 (50)</td>
</tr>
<tr>
<td>78-93 years old</td>
<td>18 (17)</td>
<td>16 (16)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/De-facto</td>
<td>71 (67)</td>
<td>69 (68)</td>
</tr>
<tr>
<td>Divorced/Widowed</td>
<td>15 (14)</td>
<td>24 (24)</td>
</tr>
<tr>
<td>Single</td>
<td>20 (19)</td>
<td>8 (8)</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catholic</td>
<td>26 (24)</td>
<td>20 (20)</td>
</tr>
<tr>
<td>Protestant</td>
<td>25 (24)</td>
<td>20 (20)</td>
</tr>
<tr>
<td>Islam</td>
<td>0 (0)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Other</td>
<td>18 (17)</td>
<td>24 (24)</td>
</tr>
<tr>
<td>No religion</td>
<td>30 (28)</td>
<td>29 (29)</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>7 (7)</td>
<td>7 (7)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian</td>
<td>72 (68)</td>
<td>65 (64)</td>
</tr>
<tr>
<td>Asian</td>
<td>3 (3)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Caucasian/ European</td>
<td>11 (10)</td>
<td>20 (20)</td>
</tr>
<tr>
<td>South Sea or other</td>
<td>2 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>8 (7)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Middle East</td>
<td>1 (1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Other</td>
<td>8 (7)</td>
<td>14 (14)</td>
</tr>
<tr>
<td>Work status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>7 (7)</td>
<td>6 (6)</td>
</tr>
<tr>
<td>Pension</td>
<td>20 (18)</td>
<td>36 (36)</td>
</tr>
<tr>
<td>Self-funded</td>
<td>7 (7)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Retiree</td>
<td>15 (14)</td>
<td>17 (17)</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>10 (8)</td>
<td>10 (10)</td>
</tr>
<tr>
<td>Employed full-time</td>
<td>29 (29)</td>
<td>16 (16)</td>
</tr>
<tr>
<td>Pension and employed part-time</td>
<td>1 (1)</td>
<td>6 (6)</td>
</tr>
<tr>
<td>Pension and retiree</td>
<td>12 (11)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Self-funded and retiree</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (4)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>
Assessment of measurement model

Confirmatory Factor Analysis (CFA) was used to estimate the contribution of sub-scales and items to each construct in the first stage of the MTE. These estimates are shown together with measures of validity in Table 9.2. The CFA comprised 27 items and showed an acceptable data fit (Tables 9.3, CFA model row). Cronbach's alpha for each construct varied from 0.64-0.90, indicating that internal consistency fell within an acceptable range. The composite reliability (CR) indices for all constructs exceeded the 0.6 threshold, showing acceptable reliability of each construct. In addition, the average variance extracted (AVE) indices for all sub-scales always fell above 0.5, indicating an adequately high convergent validity for all sub-scales (Table 9.2).
Table 9.2 Instrument reliability and convergent validity for participants not commencing in the cardiac rehabilitation program (n = 106)

<table>
<thead>
<tr>
<th>Std. Loading</th>
<th>Cronbach’s Alpha</th>
<th>Average Variance Extracted</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to Engage in the Programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I intend to make sufficient opportunities for my rehabilitation.</td>
<td>0.88</td>
<td>0.87</td>
<td>0.70</td>
</tr>
<tr>
<td>2. I intend to have enough possibilities for a good recovery.</td>
<td>0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I intend to make rehabilitation as a part of my daily routine.</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Willingness to Consider the Treatment to Reach Outcome Goals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I always follow medical orders because I think they will help me.</td>
<td>0.87</td>
<td>0.70</td>
<td>0.59</td>
</tr>
<tr>
<td>2. Doctors know what I need and I will do what they say.</td>
<td>0.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Need</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Benefits from Rehabilitation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Rehabilitation is useful, but I do not think I need it.</td>
<td>0.67</td>
<td>0.75</td>
<td>0.50</td>
</tr>
<tr>
<td>2. I am very interested in rehabilitation, but it is not for me.</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awareness of Deficits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. If it were recommended, I would see a rehabilitation therapist.</td>
<td>0.80</td>
<td>0.84</td>
<td>0.62</td>
</tr>
<tr>
<td>2. Rehabilitation will probably help me.</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Rehabilitation will be very useful for me.</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table 9.2 Continued</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outcome Expectancies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Success</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Rehabilitation will help me learn new ways of doing things</td>
<td>0.67</td>
<td>0.83</td>
<td>0.50</td>
</tr>
<tr>
<td>2. Rehabilitation will increase my independence.</td>
<td>0.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Value of Outcomes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Rehabilitation will have a positive impact on my health.</td>
<td>0.88</td>
<td>0.91</td>
<td>0.66</td>
</tr>
<tr>
<td>2. I will feel better after rehabilitation.</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I will feel fit after rehabilitation.</td>
<td>0.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Rehabilitation will have a positive impact on my wellbeing.</td>
<td>0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I will get to know other people during rehabilitation.</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Self-efficacy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Demands associated with Rehabilitation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I do not have any difficulties, there is nothing wrong with me so rehabilitation will waste my time.</td>
<td>0.83</td>
<td>0.84</td>
<td>0.59</td>
</tr>
<tr>
<td>2. Rehabilitation involves too much repetition of the same thing.</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I have more important things to get on with than doing rehabilitation.</td>
<td>0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Being around people with disabilities or illnesses makes me feel down.</td>
<td>0.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Awareness of Capabilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I have confidence that I can cope with doing rehabilitation.</td>
<td>0.65</td>
<td>0.70</td>
<td>0.50</td>
</tr>
<tr>
<td>2. It is important that I try to overcome my difficulties.</td>
<td>0.72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 9.2 Continued

<table>
<thead>
<tr>
<th>Socio-environmental barriers</th>
<th>0.75</th>
<th>0.87</th>
<th>0.63</th>
<th>0.87</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Not informed about rehabilitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Long waiting list for rehabilitation</td>
<td>0.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Not contacted by rehabilitation staff</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Lack of recommendation by doctor</td>
<td>0.79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 9.3 Measures of model fit for participants not commencing in the cardiac rehabilitation program (n = 106)

<table>
<thead>
<tr>
<th>The goodness of fit measures</th>
<th>Chi-Squared / df</th>
<th>PCFI</th>
<th>CFI</th>
<th>IFI</th>
<th>TLI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended</td>
<td>≤ 3.00</td>
<td>&gt; 0.5</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≥ 0.90</td>
<td>≤ 0.08</td>
</tr>
<tr>
<td>CFA Model</td>
<td>1.83</td>
<td>0.60</td>
<td>0.90</td>
<td>0.91</td>
<td>0.90</td>
<td>0.08</td>
</tr>
<tr>
<td>Structural Model</td>
<td>1.75</td>
<td>0.75</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
<td>0.08</td>
</tr>
</tbody>
</table>

**Assessment of the structural model**

After ensuring an acceptable measurement model, structural relationships among the proposed variables were specified to demonstrate the causal interrelationships among the constructs (Anderson & Gerbing, 1988) within the MTE. All indices were within the acceptable range for a satisfactory model (Table 9.3, structural model row). Inconsistent with stage one of Lequerica and Kortte’s conceptual model, willingness to comply with treatment was not found to measurably mediate the relationships between perceived self-efficacy, outcome expectancies, perceived need, and intention to engage in the CR program (Table 9.4). Perceived self-efficacy was not measurably associated with outcome expectancies (unstandardised effect $B = -0.02$; standardised effect $\beta = -0.03$; $SE = 0.06$, $p = 0.72$) or intention to engage in CR ($B = 0.12$; $\beta = 0.16$; $SE = 0.8$; $p = 0.10$). No association was found between outcome expectancies and intention to engage in CR ($B = -0.27$; $\beta = -0.24$; $SE = 0.17$; $p = 0.10$). However, consistent with stage one of the MTE, a significant and moderately large positive relationship was found between perceived need and outcome expectancies ($B = 0.51$; $\beta = 0.70$; $SE = 0.10$; $p < 0.001$), and also between perceived need and intention to engage in CR ($B = 0.51$; $\beta = 0.63$; $SE = 0.13$; $p < 0.001$). Figure 9.2 depicts the final results of the SEM path analysis.
Table 9.4 Mediating effect of willingness to consider the treatment, evaluated using bootstrapping for participants not commencing the cardiac rehabilitation program (n = 106)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Indirect effect (standardised regression weight coefficient (p-value))</th>
<th>95% CI</th>
<th>Direct effect (standardised regression weight coefficient (p-value))</th>
<th>95% CI</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN</td>
<td>W 0.18 (0.193)</td>
<td>---</td>
<td>0.19 (0.7)</td>
<td>---</td>
<td>No significant effect</td>
</tr>
<tr>
<td>OE</td>
<td>W – 0.12 (0.172)</td>
<td>---</td>
<td>– 0.13 (0.58)</td>
<td>---</td>
<td>No significant effect</td>
</tr>
<tr>
<td>PSE</td>
<td>W 0.08 (0.219)</td>
<td>---</td>
<td>0.05 (0.43)</td>
<td>[– 0.08 - 0.39]</td>
<td>No significant effect</td>
</tr>
</tbody>
</table>

**Note** IV: Independent Variable; M: Mediator; DV: Dependent Variable; CI: Confidence Interval; I: Intention to Engage in CR; W: Willingness to Consider the Treatment; PN: Perceived Need; OE: Outcome Expectancies; and PSE: Perceived Self-efficacy.
Figure 9.2 SEM path analysis with standardised regression coefficients (p-value, with *** denoting p < 0.001), n = 106

The impact of barriers on the model

Among participants who did not commence the CR program, no significant differences were found on the proposed variables within the MTE between those with high-level socio-environmental barriers and those with low-level socio-environmental barriers. These results are graphically demonstrated in Figure 9.2.

Study Two: The moderating role of socio-environmental barriers in the three stages of the MTE for participants who did commence CR

A sample of 101 participants out of 217 enrolled for CR. Of these, 63 initiated the CR program (i.e. attended 4 of the first 6 sessions). The participants’ demographic profiles are summarised in Table 9.1. About two-thirds of the participants were males, with 63% male. The average age was 65 (SD = 12, range 36-91) and 42% reported receiving a level of education of junior or intermediate certificate (year 10) or less; 17% had completed a senior or leaving certificate (year 11-12); 26% had completed a TAFE certificate or equivalent; 11% had completed an undergraduate degree; and 4% had attained postgraduate degrees. After
conducting confirmatory factor analysis, the median values for the scale of socio-environmental barriers were 9 for the first stage of the MTE and 13 for the second and third stages of the MTE.

Assessment of measurement model

The confirmatory factor analysis was conducted for the first stage of the MTE, and for the second and third stages of the MTE, since socio-environmental barriers were expected to be different across each stage of the MTE. For the first stage of the MTE, the CFA comprised 25 items. For the second and third stages of the MTE, the CFA comprised 27 items. These analyses showed an acceptable fit. Cronbach's alpha for each construct varied from 0.70-0.95, indicating that internal consistency fell within an acceptable range. The composite reliability (CR) indices for all constructs exceeded the 0.7 threshold, showing high reliability of each construct. In addition, the average variance extracted (AVE) indices for all sub-groups always fell above 0.5, indicating an adequately high convergent validity for all sub-groups (Table 9.5).
**Table 9.5** Instrument Reliability and Convergent Validity for participants commencing in the cardiac rehabilitation program (n = 101)

<table>
<thead>
<tr>
<th></th>
<th>Standardised loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intention to Engage in the Programs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I intend to make sufficient opportunities for my rehabilitation.</td>
<td>0.84</td>
<td>0.91</td>
<td>0.78</td>
<td>0.92</td>
</tr>
<tr>
<td>2. I intend to have enough possibilities for a good recovery.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I intend to make rehabilitation as a part of my daily routine.</td>
<td>0.92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Willingness to Comply with Treatment to Reach Outcome Goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I always follow medical orders because I think they will help me.</td>
<td>0.95</td>
<td>0.89</td>
<td>0.82</td>
<td>0.90</td>
</tr>
<tr>
<td>2. Doctors know what I need and I will do what they say.</td>
<td></td>
<td></td>
<td></td>
<td>0.85</td>
</tr>
<tr>
<td><strong>Perceived Need</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Awareness of Deficits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. If I were recommended, I would see a rehabilitation therapist.</td>
<td>0.81</td>
<td>0.80</td>
<td>0.68</td>
<td>0.81</td>
</tr>
<tr>
<td>2. Rehabilitation will be very useful for me.</td>
<td></td>
<td></td>
<td></td>
<td>0.77</td>
</tr>
<tr>
<td><strong>Perceived Benefits from Rehabilitation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Rehabilitation is useful, but I don’t think I need it.</td>
<td>0.92</td>
<td>0.76</td>
<td>0.62</td>
<td>0.77</td>
</tr>
<tr>
<td>2. I am very interested in rehabilitation, but it is not for me.</td>
<td></td>
<td></td>
<td></td>
<td>0.83</td>
</tr>
<tr>
<td>Outcome Expectancies</td>
<td>Value of Outcomes</td>
<td>Standardized loading</td>
<td>Cronbach’s Alpha</td>
<td>Average variance extracted (AVE)</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------</td>
<td>-----------------------</td>
<td>-----------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
<td>1. Rehabilitation will have a positive impact on my health.</td>
<td>0.76</td>
<td>0.87</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>2. I will feel better after rehabilitation.</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Rehabilitation will have a positive impact on my wellbeing.</td>
<td>0.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. I will get to know other people during rehabilitation.</td>
<td>0.61</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Perceived Success**

| 1. Rehabilitation will help me learn new ways of doing things. | 0.61 | 0.78 | 0.50 | 0.80 |
| 2. Rehabilitation will increase my independence.                | 0.80 |     |      |      |
| 3. Rehabilitation will help me to come to terms with my heart disease. | 0.79 |     |      |      |
| 4. Rehabilitation will give me more of a purpose in life.       | 0.61 |     |      |      |
Table 9.5 Continued

<table>
<thead>
<tr>
<th>Perceived Self-efficacy</th>
<th>Standardized loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Demands associated with Rehabilitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Rehabilitation involves too much repetition of the same thing.</td>
<td>0.90</td>
<td>0.77</td>
<td>0.54</td>
<td>0.77</td>
</tr>
<tr>
<td>2. I have more important things to get on with than doing rehabilitation.</td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Being around other people with disabilities or illnesses makes me feel down.</td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awareness of Capabilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I have confidence that I can cope with doing rehabilitation.</td>
<td>0.99</td>
<td>0.71</td>
<td>0.65</td>
<td>0.77</td>
</tr>
<tr>
<td>2. It is important that I try to overcome my difficulties.</td>
<td>0.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-environment barriers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Long waiting list for rehabilitation.</td>
<td>0.65</td>
<td>0.70</td>
<td>0.52</td>
<td>0.76</td>
</tr>
<tr>
<td>2. Not contacted by rehabilitation staff.</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Lack of recommendation by a doctor.</td>
<td>0.65</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 9.5 Continued

<table>
<thead>
<tr>
<th></th>
<th>Standardised loading</th>
<th>Cronbach’s Alpha</th>
<th>Average variance extracted (AVE)</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preparation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I made the final decision about which goals were set.</td>
<td>0.72</td>
<td>0.93</td>
<td>0.74</td>
<td>0.93</td>
</tr>
<tr>
<td>2. My rehabilitation goals are meaningful and important to me and relate to who I am and my future.</td>
<td>0.92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. My rehabilitation goals are relevant to my everyday life and to what I want to do at home, work, or in the community.</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Rehabilitation goals were what I am motivated to work on.</td>
<td>0.94</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. My rehabilitation goals were my own goals.</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Experience Analysis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. My chosen family/friends were given the information they needed about my rehabilitation.</td>
<td>0.87</td>
<td>0.95</td>
<td>0.70</td>
<td>0.95</td>
</tr>
<tr>
<td>2. The place where I received rehabilitation had a positive impact on my experience.</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I always felt safe when taking part in rehabilitation activities.</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. From now on I know what to expect about my rehabilitation.</td>
<td>0.91</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I am likely to recommend this rehabilitation program to friends and family if they need the same care.</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Did you feel that the staff listened to what was important to you?</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>Standardised loading</td>
<td>Cronbach’s Alpha</td>
<td>Average variance extracted (AVE)</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>-----------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>7.</td>
<td>Did you get the opportunity to practice what was recommended?</td>
<td>0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Did you reach the expected result of your treatments?</td>
<td>0.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Are you satisfied with the treatment received?</td>
<td>0.94</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Engagement**

1. The patient regularly attended my therapy/rehabilitation activity. | 0.76 | 0.95 | 0.84 | 0.95 |
2. The patient expressed a positive attitude towards my therapy/rehabilitation activity. | 0.98 | 
3. The patient acknowledged a need for rehabilitation services and the benefit of therapy exercises or rehabilitation activities. | 0.99 | |
4. The patient actively participated in his/her rehabilitation therapy/activity. | 0.92 | 

**Socio-environmental barriers**

1. Not informed about rehabilitation sessions. | 0.71 | 0.81 | 0.60 | 0.86 |
2. Long waiting list for rehabilitation sessions. | 0.62 | |
3. Not contacted by rehabilitation staff. | 0.83 | |
4. Lack of family support. | 0.70 | |
5. Language difficulties. | 0.71 | |
6. Conflict with work. | 0.70 | |
Assessment of structural model

The SEM revealed that the obtained data were consistent with all propositions contained in the MTE. The exceptions were that no relationship was detected between outcome expectancies and intention to engage in the CR program (unstandardised effect B = −0.31; standardised effect β = −0.27; standard error of standardised effect SE = 0.23; p = 0.18). Although a negative relationship was estimated, the variability was too large to reject a null hypothesis that the effect was in fact zero. Perceived self-efficacy was inversely related, in a small though measurable way, to outcome expectancies (B = −0.16; β = −0.18; SE = 0.07; p = 0.02). Results also showed significant although typically positive relationships of moderate size, between: perceived need and intention to engage in CR (B = 0.63; β = 0.43; SE = 0.29; p = 0.03); perceived self-efficacy and intention to engage in CR (B = 0.24; β = 0.23; SE = 0.13; p = 0.05); intention and preparation (β = 0.37; B = 0.28; SE = 0.09; p = 0.001), CR initiation and engagement (B = 0.20; β = 0.68; SE = 0.03; p ≤ 0.001); engagement and analysis of experience (B = 0.38; β = 0.38; SE = 0.08; p ≤ 0.001); and maintenance and engagement (B = 0.56; β = 0.20; SE = 0.29; p = 0.05). A moderate negative relationship was found between analysis of experience and maintenance (B = −0.30; β = −0.58; SE = 0.05; p ≤ 0.001). A large positive relationship was found between preparation and initiation (B = 2.70; β = 0.45; SE = 0.70; p ≤ 0.001).

The impact of barriers on the model

There were significant differences between participants with high-level compared to low-level socio-environmental barriers. Participants with high levels of barriers were a) five times lower on scores of intention to engage in the CR program and preparation (β = 0.08 vs β = 0.42, Z = −1.96; p < 0.05); b) ten times lower on scores of CR initiation and patient
engagement in the CR program ($\beta = 0.04$ vs $\beta = 0.44$, $Z = -5.78$; $p < 0.01$); c) five times lower engagement in the CR program and patient analysis of experience ($\beta = 0.63$ vs $\beta = 0.12$, $Z = -3.77$; $p < 0.01$); and d) three times less in terms of CR maintenance and participant engagement in the CR program ($\beta = 1.85$ vs $\beta = -0.49$, $Z = -3.83$; $p < 0.01$). As these statistics were all negative, the findings indicate that high levels of socio-environmental barriers reduced the effects of these variables on engagement outcomes within the second and third stages of the MTE for participants who commenced CR. Interestingly, although several effects were not significant in the MTE stage two and three for the high-level socio-environmental barriers group, these effects were found to be significantly different between the low- and high-level barrier groups. For the group of participants with low levels of barriers, all of these effects were moderate to large in size. They ranged from ten times to three times larger, compared to the group with high levels of barriers. The full result of the multi-group analysis are presented numerically in Table 9.6 and graphically in Figure 9.2.
Table 9.6 The moderating effect of socio-environmental barriers on the proposed pathways within the MTE in participants who commenced the CR program (n = 101)

<table>
<thead>
<tr>
<th>The proposed relationships within the Model of Therapeutic Engagement</th>
<th>Participants with low-level socio-environmental barriers (n = 54)</th>
<th>Participants with high-level socio-environmental barriers (n = 47)</th>
<th>Group differences z-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to engage in the CR program</td>
<td>0.42</td>
<td>0.00</td>
<td>0.08</td>
</tr>
<tr>
<td>CR initiation</td>
<td>0.44</td>
<td>0.00</td>
<td>0.06</td>
</tr>
<tr>
<td>CR initiation</td>
<td>0.44</td>
<td>0.00</td>
<td>0.06</td>
</tr>
<tr>
<td>Engagement in the CR program</td>
<td>0.63</td>
<td>0.00</td>
<td>0.12</td>
</tr>
<tr>
<td>Analysis of experience</td>
<td>1.85</td>
<td>0.00</td>
<td>−0.49</td>
</tr>
</tbody>
</table>

Note: ** p-value < 0.01; * p-value < 0.05
**Figure 9.3** The moderating effect of the level of socio-environmental barriers to CR attendance on the proposed pathways within the Model of Therapeutic Engagement (Lequerica & Kortte, 2010)
9.5 Discussion

The MTE is a comprehensive conceptual framework for explaining the process of individual engagement in rehabilitation, proposed nearly a decade ago (Lequerica & Kortte, 2010). However, the model is derived from a psychological framework which did not consider the role of socio-environmental factors. The current study aimed to clarify the role of barriers in the process of individual engagement in CR programs. The results demonstrated that high-level socio-environmental barriers did not impact on the relationships between variables within the first stage of the MTE, regardless of whether individuals commenced or did not commence the CR program. This finding makes intuitive sense given that people’s intention to engage in rehabilitation may have little to do with barriers in their lives as they have not yet experienced those situations. For individuals who commenced CR, several positive effects were larger (in terms of effect size) and stronger (in terms of significance) among those with low-level (versus high-level) barriers. These relationships between variables within the MTE which were impacted by socio-environmental barriers were:

- the relationship between intention to engage and preparation for CR: those who intended to engage and demonstrated low-level socio-environmental barriers were more likely to participate in goal setting in preparation for CR;
- initiation of CR and quality of engagement in the CR program: those who initiated CR and demonstrated low-level socio-environmental barriers were more likely to be perceived by nurses as engaging fully in the program;
- quality of engagement and the experience of CR: those who were perceived as engaging fully in the program and demonstrated low-level socio-environmental barriers were more likely to positively rate their experience;
• maintenance of engagement and quality of engagement in the CR program: those who maintained their engagement and demonstrated low-level socio-environmental barriers were more likely to be perceived as engaging fully in the program.

For those who commenced the CR program, several relationships were improved when the level of socio-environmental barriers was low: between intention to engage in the CR program and preparation for CR, CR initiation and quality of engagement, quality of engagement and analysis of experience, analysis of experience and ongoing maintenance, as well as ongoing maintenance and quality of engagement (Table 9.6). These findings suggest that socio-environmental barriers are important to address after individual commencement of the program.

In each stage of the MTE, the most common barriers appeared to be lack of information about and endorsement of CR. However, once participants had enrolled in and initiated the program, barriers associated with convenience of attending were also involved. The cyclical and self-reinforcing nature of rehabilitation was evident in the findings, in that low-level barriers and positive experiences generated a positive spiral of engagement.

This study provides further insights into the complex process of engagement in CR programs, and builds on previous work by Lequerica and Kortte (2010) to conceptualize the MTE. The success of actions aimed at improving individual engagement does not only depend on individual-level cognitive factors. This study has shown that socio-environmental barriers to engaging in CR impact on each stage of the MTE and are key factors for understanding engagement. Socio-environmental barriers had a significant impact on the proposed relationships in the second and third stages of the MTE. Thus, people with high-level socio-environmental barriers deserve additional attention during the CR program.
During the program, it is important to monitor the response of participants to barriers in their environments, particularly those that impact on the convenience of attending CR.

This study provides the first examination of socio-environmental barriers in the MTE. Several researchers have investigated the role of perceived barriers in individual participation in CR programs (de Melo Ghisi, Oh, Benetti, & Grace, 2013; Giuliano et al., 2015; Grace et al., 2009; McCarthy, Vaughan Dickson, & Chyun, 2011). For instance, de Melo Ghisi and colleagues (2013) compared multi-level barriers to participation in outpatient CR programs, including patient, provider, and health system barriers in CR participants from two countries, a middle-income country, Brazil, and a high-income country, Canada. Canadian CR participants surprisingly reported greater barriers in comparison to those in Brazil. Their findings showed that Canadian participants had higher expectations of CR programs. Grace and colleagues (2009) found no differences between men and women in the total number of barriers reported by CR participants. However, the nature of their barriers was different. Women reported more barriers than men for transportation, family responsibilities, lack of CR awareness, experiencing exercise as tiring or painful, and comorbidities. These studies recognize the impact of barriers on CR participation; however, they do not explore the complex mechanism of how they influence the relationship between the variables. Prior to this study, no research has investigated how socio-environmental barriers moderate the process of engagement in CR.

Despite the strength of this study in addressing the role of socio-environmental barriers, it still faced some limitations. As the sample size was the minimum required for structural modelling, care is needed when interpreting the findings. Importantly, although the data did not strongly support some links in the MTE, these relationships may emerge with larger samples and greater power (Wasserstein & Lazar, 2016). Dividing participants into
those with low- or high-level socio-environmental barriers reduced the variance in the sample and may have impacted the findings. Further, participants were recruited from a single hospital that was associated with one CR program. Future research should be conducted to collect data from various CR centres with a larger and more balanced sample. As is ethically required, participation in the study was voluntary, so the results may not represent those who failed to participate or left the study, possibly due to barriers in their social environments. No analysis has yet been conducted to determine the characteristics of this sub-group. Lastly, self-report measures were used which could lead to a social desirability bias in reporting. To manage this potential bias, multiple elements of individual engagement were rated for each individual by a nurse who worked with them at the completion of the program. This study provides a strong basis for future research, which could triangulate these findings via other information sources (therapeutic team, patients, or families) or other methods (e.g. qualitative studies) to understand the process of engagement better.

This study only investigated the role of socio-environmental barriers (or the absence of those barriers) in the process of engagement. However, other positive socio-environmental factors may play a role in facilitating individual engagement in CR. Therefore, further systematic investigation of socio-environmental facilitators is required in order to determine the true value of the MTE applied in the context of CR. A series of qualitative studies combined with quantitative studies could be conducted at different stages of the MTE to gain a clearer understanding of how and which socio-environmental factors interact with the process of engagement in CR programs over time, especially for those who changed their engagement (i.e. either dropped out or re-engaged). Using a mixed method approach would enhance the strength of each approach, while compensating for expected weaknesses and limitations (Creswell & Plano Clark, 2007).
9.6 Conclusion

This study expanded the MTE to clarify the role of socio-environmental barriers in the process of engagement in CR. Findings revealed that socio-environmental barriers altered the extent and strength of the relationships within the MTE. Positive effects on outcomes at the second and third stages of the MTE were more pronounced for those with low-level barriers. Thus, socio-environmental barriers contribute to an extended MTE, and for this reason, could become a major focus of treatment teams in cardiology when outpatients are commencing the program. Socio-environmental barriers could also be considered by CR professionals to ensure that they do not become insurmountable for participants, potentially causing them to drop out of the program. Understanding effectiveness of the MTE in predicting engagement is likely to be enhanced if this understanding of socio-environmental barriers is integrated into the model. In turn, this study suggests that we may improve individual engagement in CR by addressing these socio-environmental barriers.
9.7 References


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Chapter Ten

Conclusions and Discussion

This thesis provides the first holistic, comprehensive and empirical series of studies to progressively examine the process of engagement in cardiac rehabilitation (CR), from intention to maintenance, using the Model of Therapeutic Engagement (MTE). The approach is holistic in that it attempts to cover the combined effect of multiple variables, occurring in each of the three stages of CR engagement. The approach is also comprehensive, since it evaluates the effects of these variables for the same participants, at all three stages of CR, rather than conflating these effects across the very different stages of intention, initiation, and maintenance. Significantly, the MTE can be applied to accurately describe the process of individual engagement from hospital discharge to completion of CR programs.

This work also provides the first set of empirical studies, that systematically considers the MTE in this comprehensive way in order to evaluate existing conceptual models of CR, presented in the seminal work of Lequerica and Kortte (2010). In so doing, this thesis therefore also contributes to extending conceptual understanding of the CR process, by evaluating components of, and proposing expansions for the overall structure of, these earlier theoretical frameworks. In particular, this thesis proposes an expansion of the MTE to include an understanding of how socio-environmental factors have acted as barriers to pathways in the model. It also suggests ways of simplifying the sub-models for each stage of engagement, by identifying items within existing scales that may not be necessary, at least in this context for this population.

By providing empirical evidence within a holistic and comprehensive assessment of factors affecting CR, this research provides a basis for both: prioritising future research, to develop further understanding of CR; and providing a rational argument for justifying
investment into changing important predictors, in an effort to influence engagement in CR. Consequently, this work is significant as the findings can be used to achieve a better understanding of the process of engagement in CR programs and hence improve CR outcomes, and in turn, better leverage initial investments into cardiac interventions. Particularly, by revealing important factors that are specific to each of the three stages of the engagement process, this research suggests potential ‘levers’ that, if manipulated, could potentially enact improvements in CR. In contrast, previous research (as described in section 2.1 of Chapter Two) has focused on the potential impacts of certain variables on each stage of engagement. Those studies also considered the effects of some variables on the process of engagement as a whole, without differentiating the separate stages. This lack of differentiation made it difficult to justify that manipulating such variables would be likely to enact behaviour change. Such findings were conceptually useful in that they confirmed a role for these variables, but this comprehensive approach to the study was required to clarify their role in the CR process and place them into perspective. The thesis consolidates previous conceptual research (on the way in which all variables are hypothesised to influence the various stages of engagement), and additionally provides the first comprehensive empirical evidence that allows a comparative assessment of the roles of these variables, in a more nuanced way, for each distinctive stage of engagement.

In this concluding chapter, the key findings of the research presented in the thesis are discussed, and the clinical contributions and implications of the research are presented. It, therefore, provides a synthesis of the findings from this interlinked sequence of studies. The chapter then discusses the overarching strengths and limitations of this sequence of studies, and also provides recommendations for future research. Finally, an overall conclusion of the research is presented.
10.1 Overview of Key Research Findings

Although the topic of engagement has long been researched within the context of psychotherapy and mental health (Becker, Buckingham, & Brandt, 2015; Kim, Munson, & McKay, 2012; King, Currie, & Petersen, 2014; Staudt, Lodato, & Hickman, 2012), research directly exploring this topic within the context of CR has only recently emerged. Most of the literature on this topic focuses on single variables as predictors of engagement (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018a). However, there is little agreement on the nature of engagement: that is, whether it should be deemed as equivalent to intention to engage, attendance, participation, maintenance, or completion. Further, there is no clear statement of the complex interactions among predictors, nor is there a coherent analysis of the process of engagement in CR. The MTE, proposed by Lequerica and Kortte (2010), is the most comprehensive model of therapeutic engagement that had been developed prior to this thesis, and was the first to place engagement at the centre of successful rehabilitation experiences. The model conceptualises engagement as a process as well as a state of being, which is in line with the most recent definition of engagement provided in the context of healthcare and rehabilitation by Bright and colleagues (2015). Engagement is a significant factor affecting outcomes of rehabilitation. Therefore, transparency in how this process occurs is vital (Bright, Kayes, Worrall, & McPherson, 2015).

The main aim of this research was to advance the understanding of individual engagement in outpatient CR programs by examining, evaluating and expanding the MTE (Lequerica & Kortte, 2010) in the context of CR. In this conceptual model, the process of therapeutic engagement is understood as a series of sub-models that consecutively explain the intention to engage in rehabilitation, initiation of rehabilitation (i.e. attendance at CR), and maintenance of participation in CR programs (i.e. ongoing participation in CR). By
conceptualising engagement in this way, the model provides a stronger foundation to more fully understand this complex process.

The MTE was developed within the lens of psychology, which means its focus is largely on individual-level factors, rather than on those factors that operate beyond and around the individual in their social and physical environment. Thus, a major component of this thesis was to understand the way in which the MTE could be extended to also incorporate socio-environmental barriers. Given that these factors are amenable to manipulation, for instance through educational or management initiatives, their inclusion in the extended MTE greatly enhances its practical potential for enacting change in CR.

To underpin the aims of a holistic and comprehensive empirical consideration of therapeutic engagement, a model-centric systematic review was initially conducted to examine the existing evidence supporting the relationships proposed in the MTE (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018a; Chapter Three). This review contained three systematic literature sub-reviews, one on each of the three stages of the MTE. These reviews methodically examined the extent to which existing evidence supported each of the relationships proposed in the MTE. As a result, it was possible to demonstrate that no previous research had examined the process of engagement using such a comprehensive approach. The majority of previous research had focused on the first stage of the MTE, being the intention to engage in CR programs. In general, this review showed that the literature (including several empirical studies) supported subsets of the proposed relationships within the MTE in the context of CR. However, less is known about the latter stages of the MTE, describing the process of translating intention into actual attendance at CR and then sustaining that participation over time. As evidence about how the engagement process happens and is sustained over time is crucial to improving individual engagement in
CR programs, this review provided the foundation for the next study (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018b; Chapter Five), which was conducted to determine the best way to evaluate the MTE in the CR context.

The literature review crystallised the need for several dependent variables, in order to measure individual engagement by splitting engagement into three stages. Similarly, different predictors were deemed appropriate for explaining each dependent variable. Previous research (Jahandideh et al., 2018a; Chapter Four) had concentrated on conceptual descriptions of these relationships, or had imposed simple linear relationships. This highlighted that a more sophisticated empirical approach should also consider non-linear effects. After reviewing multiple methods, it was concluded that non-linear effects could be captured via artificial neural networks (ANNs) or multivariate adaptive regression splines (MARS). Alternatively, these non-linear effects could also be expressed through mediation or moderation, as afforded by structural equation modelling (SEM).

All three approaches could provide suitable mechanisms for empirically evaluating the MTE. These analytical tools were considered due to their capacity to address both linear and non-linear relationships between dependent and predictor variables in the MTE. However, in order to provide accurate results, MARS and ANN require much larger datasets in comparison with SEM. Realistically, it was determined that sample size would be limited to one or two hundred participants, given that participants dropped out of the CR program and also engaged or re-engaged in different ways during the course of the current study. For this reason, SEM was considered to be the most appropriate method of analysis. Furthermore, as SEM is known to emphasise explanatory over predictive performance, this method would be most useful and most relevant to the current study, given that conceptual understanding of the MTE is still being consolidated. In contrast, although the machine learning methods...
(of ANN and MARS) would provide flexible modelling of the relationships between predictors and engagement outcomes, this would make it much more difficult to interpret the role played by each predictor.

A major challenge for the current study was the fact that engagement is a dynamic concept. As such, those who refused to participate and those who dropped out of CR are in fact relevant to the conclusions being drawn. The majority of people who participated in the research expressed a high level of intention to engage in CR. However, slightly less than half the participants actually enrolled in CR. Of those who chose not to enrol in CR, two-thirds had initially reported a high level of intention to engage in CR programs. Enrolling in the program did not result in initiation (i.e. actual attendance) for one-third of the participants. Of those who sustained their participation in the CR program, one-third had not initially intended to engage in the program (Figure 6.1, p. 155). The current study analyses revealed that there were significant relationships between intention to engage in the CR program and CR initiation, or between intention and CR maintenance. Importantly, the findings suggested that a high level of intention to engage in CR is important, but does not guarantee engagement. Similarly, a low level of intention to engage does not always translate into non-engagement. Conversely, engagement can still occur despite low levels of intention to engage and in the absence of CR initiation (i.e. actual attendance). The pattern of engagement found in this study mirrored other findings (De Vos et al., 2013; Pederson, Egerod, Overgaard, Bastruo, & Anderson, 2018) which revealed, as would be expected, that once people are engaged in CR, the likelihood of maintaining that engagement is increased.

To test the process of engagement for the various groups of participants, three datasets of participants were defined: a) a total of 217 participants who were referred to the CR program (including participants who commenced or did not commence); b) a subset of 106
of these participants who were referred to the program but did not commence; and c) the remaining subset of 101 of these participants who were referred to the program and also commenced. The primary results of the three studies which tested the MTE are summarised below.

In testing the first stage of the MTE, perceived need, which comprises both a perception of the illness characteristics and perceived benefits of CR, was the most significant predictor of intention to engage in the CR program, and was shown to have a large positive association with outcome expectancies. This is consistent with the findings of Broadbent and colleagues (2009) who demonstrated that those CR participants who received an illness perception intervention stated greater intentions to participate in CR programs, than the control group. In addition, a more recent study has also shown that the lack of perceived benefits from CR programs impacts on individual intention to attend (McKee, 2014). Willingness to consider the treatment mediated the relationship between perceived self-efficacy and intention to engage in the CR program. Thus, perceived self-efficacy had a small positive indirect effect on intention to engage, but no measurable direct effect. By considering this mediatory role, the MTE was improved to account for the variability in intention to engage in the CR program. These findings provide evidence in support of designing intervention strategies that focus on increasing awareness of specific post-cardiac deficits that are amenable to recovery, to influence the perception of need. The findings also suggest that it may be helpful to provide evidence or examples about the potential benefits of treatment to promote the sense that one can successfully engage in the demands of treatment and achieve positive outcomes.

Analyses (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018e; Chapter Nine) conducted focusing solely on participants who had not commenced the program (106
participants) revealed that only the perceived need positively impacted on these individuals’ intentions to engage in the CR program. These ‘non-commencers’ were inconsistent with the MTE, in that willingness to consider the treatment did not mediate the relationships between perceived self-efficacy, outcome expectancies, perceived need, and intention to engage in the CR program. Therefore, healthcare providers in the hospital should give priority to improving individuals' awareness of deficits and increasing individuals’ perception of CR benefits when they attend an inpatient CR program in hospital.

Another analysis in the thesis (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018d; Chapter Eight) investigated how the factors proposed by the MTE contributed to engagement, and interacted, through analysis of 101 participants who remained to commence the program. A key finding was that almost all relationships among the proposed factors within the three stages of engagement were found to be significant and consistent in terms of effect sign and size, with the MTE. Also, individuals’ willingness to consider the treatment mediated the relationship between perceived self-efficacy and intention to engage in the program. However, no relationship was discerned between outcome expectancies and intention to engage in the program. This is at odds with the MTE conceptual hypothesis and previous empirical findings that found outcome expectancies as a regular predictor of intention to engage in physical activity (Bennett, Mayfield, Norman, Lowe, & Morgan, 1999; Schwarzer, Lippke, & Luszczynska, 2011). It is possible that this exception could arise because in this study, participants are not being motivated by outcome expectancies, at least not at this stage. Alternatively, it is likely that the exception has arisen because previous empirical studies had not been explicit about what stage of engagement was most strongly related to perceived self-efficacy.
In this analysis of the MTE, self-efficacy is described by both an individual’s capability to engage in the program (task self-efficacy) and an individual’s capability to engage in the program in the context of demands and challenges (barrier self-efficacy). A negative relationship between perceived self-efficacy and outcome expectancies in this study indicates that a higher level of perceived demands (associated with rehabilitation), as a component of perceived self-efficacy, may negatively impact an individual’s outcome expectancies. However, this negative relationship may have arisen because of the nature of the sample which comprised only those individuals who had commenced the program. Therefore, participants perceived that they were capable of carrying out the CR program, but perceived demands related to the rehabilitation were more dominant at this stage.

Despite the known and empirically established importance of willingness in changing risky health behaviour (Kasila et al., 2018), to our knowledge, no empirical research has previously explored the role of willingness in considering the treatment of individual intention to engage in the context of CR. Collectively, this analysis found that the basis for individual intention to engage in the CR program was formed by: perceived need, the most significant predictor of intention to engage; outcome expectancies; perceived self-efficacy; and willingness to consider the treatment. This model provides the first holistic and empirical perspective on how all of these variables interact, building on other studies in CR settings that investigated only some of these links empirically (Dohnke et al., 2010; de Melo Ghisi et al., 2015; Sullivan et al., 2009). The findings generally support, and add nuance to those of other researchers. For instance, Sullivan and colleagues (2009) found that self-efficacy positively predicted general intention to engage in exercise. In the same vein, Dohnke and colleagues (2010) demonstrated that more positive outcome expectancies and higher self-efficacy were found among those who intended to participate in a regular Phase III CR
program than among those who did not intend to participate. De Melo Ghisi and colleagues (2015) defined the notion of risk awareness (equivalent to perceived need), and showed that it was positively correlated with self-efficacy and outcome expectancies, and positively correlated to intention formation. However, in their study, intention to engage in exercise was not found to be directly related to behaviour, suggesting the presence of a mediator. For instance, socio-environmental barriers could have hindered translation of intentions into actions. The current study more clearly shows the importance of socio-environmental barriers in the process of engagement and suggests that improving an individual’s engagement in CR programs can occur if barriers are addressed once individuals commenced CR programs.

In the conceptual MTE, intention to engage in a CR program is followed by CR preparation, which has been confirmed empirically in different populations (Kersten et al., 2015). Involvement in the preparation process had a positive medium impact on the CR initiation stage, confirming the findings of Kjær, Gyrd-Hansen and Willaing (2006). CR initiation was also proposed to be associated with individual engagement in CR. Data analysis in this study revealed the expected positive relationship between CR initiation and individual engagement in CR: the more initiation, the more engagement.

The MTE process then follows a feedback loop where individuals assess the advantages and disadvantages of engagement and make decisions based on their experience, and then decide whether to continue the activity or disengage. This feedback loop had not previously been examined (as shown in the literature review of Jahandideh et al., 2018a). Here, the current study found that participants’ analyses of their experiences in the program were negatively associated with CR maintenance. Reassessment of previous attitudes, beliefs, and expectations appear to detract from an individual’s decision of whether to continue to be involved in the program or not. This confirms other findings (Jahandideh et
al., 2018e) that this reassessment of the individual’s experience is, in fact, a critical regulatory step in the process, in line with previous findings (Banner et al., 2017; Hansen et al., 2018). In contrast, a negative relationship was found in this study between participants’ analyses of experiences and CR maintenance, in line with the findings reported by Gardiner et al. (2018). These findings could be interpreted to suggest that participants simply decided to continue to attend the program if their needs were not yet met and also if their experiences were enjoyable and worthwhile (Lequerica & Kortte, 2010). Furthermore, the collected data showed a positive relationship between CR maintenance and engagement, which indicated that a higher level of CR maintenance was associated with a higher level of engagement in CR. Also, a higher level of engagement may lead to a higher sense of accomplishment among participants (Araya-Ramirez et al., 2010). These results suggest that the therapist and participant might need to adjust goals and treatment plans to take full advantage of any preferred participant outcomes at this stage.

The MTE is a comprehensive model for explaining the process of engagement in rehabilitation. However, the role of socio-environmental factors, as stated, was absent from the original MTE initially proposed by Lequerican and Kortte (2010). The last study presented in this thesis expanded the MTE to assess the role of socio-environmental barriers in the process of individual engagement (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018e; Chapter Nine). In particular, the study examined how the extent of socio-environmental barriers affected the whole process of engagement. This was approached by examining the moderating effect of CR participation barriers, on all of the relationships proposed within the MTE. To explicitly assess how these barriers moderate engagement towards the latter end of the process, the moderation effect was estimated in two groups of participants: those who commenced the program (101 participants); and those who did not
commence the program (106 participants). The evidence from this study suggested that socio-environmental barriers did not impact on the proposed relationships at the first stage of the MTE. Moreover, this result was consistent for both groups of participants, that is, regardless of commencement or not. For those who did commence the program, higher socio-environmental barriers led to lower and weaker effects throughout the process of engagement: CR preparation on intention to engage in the CR program; CR initiation on engagement in the CR program; the participant’s analysis of experience on engagement in the CR program; and the participant’s analysis of experience on CR maintenance. For those who did not commence the program, no significant differences were found for any relationships proposed within the MTE, when comparing between those with high-level socio-environmental barriers and those with low-level socio-environmental barriers. However, socio-environmental factors became significant once participants had commenced the program, compared with when their intention to engage in the CR program was forming in the hospital. Since socio-environmental barriers may reduce and weaken the effect of predictors on actual attendance or maintenance of a CR program, it may be concluded that the predictive utility of the MTE is likely to be enhanced by incorporating socio-environmental barriers into the MTE, which in turn may develop a better understanding of their role in CR engagement.

10.2 Implications of the Research

The research findings have several implications for practice and policy. Cardiovascular disease (CVD) is the primary cause of death among non-communicable diseases in Australia (Australian Bureau of Statistics, 2017). Thus, prevention and reduction of the risk of CVD is vital and can result in decreased numbers of CVD incidents every year. CR is a systematic
program which has been shown to reduce the associated mortality rate and prevent future cardiac events through health behaviour change (Anderson et al., 2016). Despite this demonstrated efficacy, a large number of eligible people in Australia do not participate in CR programs (Clark, Redfern, & Briffa, 2014), and not all who participate are actively involved or engaged in the program to maximise rehabilitation benefits. Therefore, understanding the process of engagement in CR programs could support healthcare providers in developing an individualised care plan for individuals based on the predicted chance of their engagement in outpatient CR programs. In so doing, improving theoretical understanding, and practical achievement of CR engagement could together reap greater returns on the initial investment into CVD treatments as well as CR programs.

Developing a more comprehensive and more multi-faceted Model of Therapeutic Engagement (focusing on the relationships among a range of individual, social, and environmental variables and engagement in CR programs) provides a basis for a systematic, evidence-based approach, yet retains and consolidates strong links with theoretical and conceptual knowledge around each of the factors and relationships involved. Applying this model within a broader socio-environmental context also informs further actions, by providing high-quality evidence on potential levers that are accessible to researchers, healthcare providers, and rehabilitation specialists. In turn, applying this model will also allow stakeholders to continue formulating an evidence-based, better targeted, more holistic and comprehensive perspective on engagement in CR, and hence more effective engagement interventions for long-term engagement in CR programs.

This research provides valid and reliable measures that can be used to rapidly assess individual engagement at each stage of the recovery process following a cardiac event. This is the first time measures have been validated for examining the process of engagement in
CR programs using the conceptual MTE proposed by Lequerica and Kortte (2010), as well as an extended MTE that includes socio-environmental barriers as proposed in Chapter Nine (Jahandideh et al., 2018e). Incorporating these measures into clinical practice could be a next step in improving the uptake and quality of individual engagement. The engagement scale (the Hopkins Rehabilitation Engagement Rating Scale) used in the current study was simple, short and easy to use for clinicians and, combined with a short barrier screening tool (the Cardiac Rehabilitation Enrolment Obstacles Scale), may provide an effective way of identifying individuals who require more assistance to engage with rehabilitation. Further validation of this tool would be required in future research.

The findings from this research contribute to an understanding of the urgent need for interventions and strategies to promote participant engagement in CR programs. Previously, narrow definitions of engagement have limited the use of strategies to improve engagement. This research has shown that engagement is an extensive and complicated process which involves the identification of influential factors at multiple stages. Clinicians may be able to use the findings of this study in outpatient CR programs in order to identify the stage-specific levers to sustain the evolution of individual engagement process. One apparent lever is CR preparation, because of its large loading in relation to other factors, which, if increased, could significantly improve the chance of CR initiation. A study conducted by Fernandez and colleagues (2012) in the CR setting demonstrated that establishing collaborative goals which are clear and achievable, along with considering each individual’s health behaviour, are vital to encourage individuals to achieve their goals. The study showed that there is a shared role between clinicians and individuals to improve individual engagement in CR programs. The current study also demonstrated that individual engagement in goal setting, and the satisfaction derived from such goal setting, positively impact on CR initiation. Clinicians
should take active roles to promote and support individuals in the process of engagement while controlling identified factors that may inadvertently decrease individual engagement.

Perceived need, which includes patient perceived treatment benefits and awareness of deficits, is another potential lever for change. If individuals’ perceived need increases, their intention to engage in CR could significantly strengthen. This identifies a target for improved education, either at the individual or group level. Also, this research shows that it is essential that therapists consider that rehabilitation demands could decrease the level of perceived self-efficacy and outcome expectancies in participants; ultimately reducing participants’ intention to engage in CR.

Socio-environmental barriers to engagement need to be identified for each individual at each stage of engagement in CR programs given the multiple negative impacts they can have on engagement. Socio-environmental barriers may not be apparent early in the referral process and they were not significant predictors of participant intention to engage in the CR. However, participants with high levels of socio-environmental barriers may require a great deal of attention once they have commenced a CR program to ensure continued engagement. The current study suggests that the inclusion of socio-environmental barriers in the MTE could assist health professionals in understanding the process of engagement in CR programs by: informing an individualised care plan based on the predicted likelihood of participant engagement; and also proposing broader strategies to ensure that such planning is more systematically adopted and supported.

In the context of CR, there is evidence that manipulating such levers of change is capable of enacting change. For example, Broadbent and colleagues (2009) found that participants who received an illness perception intervention reported higher intentions to attend outpatient CR programs than participants in the control group. Stone and King (2007)
also reported that collaborative goal setting in the stage of CR preparation increases the likelihood of individual attendance in CR. In addition, previous research implemented a range of different techniques to reduce barriers relating to non-attendance at CR and targeted the intervention at physician endorsement, participants’ spouses, transport difficulties, family commitment and inconvenience timing (Beswick et al., 2004; Daltroy, 1985; Jackson, Leclerc, Erskine, & Linden, 2005). The strategies implemented on the basis of such understanding and planning could encourage individuals to engage effectively in their recovery process.

**Implications for practice**

Effective intervention strategies to promote engagement might include:

- Improving preparation for CR by involving people in goal setting and treatment planning. Clinicians could choose to motivate individuals by involving them in the goal setting and treatment planning stage to design an individualised care plan based on individuals’ needs and preferences.

- Enhancing perceived need for rehabilitation, treatment benefits and awareness of deficits. To accommodate individuals with a low level of perceived need, it could be beneficial to target interventions at improving individual knowledge about their disease and treatment benefits.

- Reducing rehabilitation demands. These demands could decrease the level of perceived self-efficacy and outcome expectancies in individuals, ultimately reducing individuals’ intention to engage in CR. Clinicians could carefully design a flexible treatment plan based on feedback related to individual performance in response to treatment.

- Addressing socio-environmental barriers to engagement. To accommodate individuals with a high level of barriers, clinicians could adopt an individualised approach to barrier management and regularly invest time in exploring individual barriers at each stage of the process of CR engagement.
10.3 Strengths and Limitations of Research

This study has several strengths. The first strength is the examination of a well-defined theory of engagement. The MTE helps achieve a better understanding of the process of engagement. Second, the current study is the first empirical study of its kind, that provides evidence of validity and reliability for all scales used to measure constructs within the MTE. Third, the MTE has been extended from an individual level theory to one that incorporates social and environmental barriers as moderators of engagement in CR programs. The potential role of barriers in attending programs has been widely espoused (Bäck, Öberg, & Krevers, 2017; Grace et al., 2009; McCarthy, Vaughan Dickson, & Chyun, 2011). However, no research has investigated specifically how socio-environmental barriers moderate the proposed relationships within the MTE. Fourth, the advantage of using SEM in the current study was more comprehensive and more holistic in that it enabled the inclusion of all the proposed variables within one model (for each stage of engagement) in order to understand the entire process of engagement over time, as well as to understand relationships between the proposed variables at each stage of the MTE. This type of study has not yet been conducted in rehabilitation, and specifically, not in CR.

There are some limitations that necessitate caution when interpreting the results from this research. First, the findings are limited to data that has been collected from a convenience sample originating from only one centre of CR. As with many studies in the social sciences this is almost unavoidable, since due to ethical considerations, participants must be willing to participate. Accordingly, the generalisability of these findings might be limited (Colombo, Bucher, & Sprenger, 2017). Furthermore, time and resource constraints limited the focus of this first study. The sample size was reasonable, but when participants were categorised according to their levels of intention, attendance, and participation, the cell sizes of
participants within each stage of engagement were considerably reduced. In addition, individuals were included in this study only according to their eligibility for referral to CR programs; it is possible, but not yet considered, that medical diagnoses and reasons for referral can impact the relationships proposed within the MTE. Future research should examine the MTE considering the type of individuals' diagnosis. It is well established that these kinds of studies with limited sample size may lack power, making it difficult to reliably examine the proposed relationships (Wasserstein & Lazar, 2016; Greenland et al., 2016). Thus, this research provides a strong inducement and framework for other similar research, which could consider different populations of CR participants. Another ever-present issue is data quality: the self-reported questionnaires may have produced recall and response biases. This was addressed to some extent by the inclusion of a nurse-rated engagement measure, thus future research could consider observational methods where data can be collected in real-time.

Second, some important background elements of engagement have not been considered in the MTE. For example, the role of socio-environmental barriers is notably absent from the MTE, despite the potential for these factors to modify the relationship between variables such as intention and action. This study expanded the MTE to some degree to examine the impact of socio-environmental barriers on the proposed relationships within the MTE. Each stage of the process of engagement is likely to respond to specific barriers, and the scale used in this study may not cover all types of barriers. Moreover, the role of health professional-related factors such as clinicians’ communicative and relational skills, which are important elements in fostering or hindering the process of individuals’ engagement (Bigi, 2016) throughout the three stages of the MTE, was not covered adequately in the MTE. In addition, evidence shows that negative emotional feelings (e.g. depression,
anger and anxiety about their illness experience after cardiac events) can influence the process of engagement in CR programs (Blakemore et al., 2016). These variables show connections to those outlined by the MTE; nevertheless, they have not been measured in the current study and could contribute to the strength of the model and its explanatory ability. Consequently, integrating these variables into the three stages of the MTE could provide a better understanding of the whole process of engagement.

10.4 Recommendations for Future Research

Given the novelty of this research, replication of the current results is necessary to determine the value of the MTE in CR settings and to provide a standard measurement tool for assessing and monitoring individual engagement in CR program at different stages. Qualitative data should be combined with quantitative studies to both triangulate the empirical findings (Hesse-Biber & Johnson, 2015), and to gain a clearer understanding of how socio-environmental barriers and facilitators, health professional-related factors (e.g. clinicians’ communicative and relational skills), factors associated with family caregivers of individuals, and mental distress factors were associated with engagement in CR programs, especially for those participants who changed their engagement during the process of rehabilitation (i.e. dropped out or re-engaged). Using both quantitative and qualitative analyses would provide a better understanding of the way in which barriers and facilitators were experienced and addressed or not. Using a mixed methods design enhances the strength of each approach, while decreasing the expected weaknesses and limitations of each method alone (Creswell & Plano Clark, 2007; Hesse-Biber & Johnson, 2015). More importantly, qualitative research on individual experience may generate deep insights into the process of engagement and also
lead to extending the MTE to a more comprehensive model. The MTE, even in its extended form, still does not embrace the whole process of engagement from a qualitative perspective.

Based on this research, it would be advisable to design intervention programs that manipulate identified potential levers for change (such as perceived need, CR preparation and socio-environmental barriers) in an effort to improve the level of engagement in those who enrolled but did not sustain their engagement and those who did not enrol at all. Studies will then be needed to examine the effectiveness of such interventions in improving individual engagement in CR programs.

Finally, this study provides a first step towards more extensive studies, with larger samples. With more data available it would be possible to consider machine learning for quantitative analysis, such as artificial neural networks (ANN) and multivariate adaptive regression splines (MARS). The strength of machine learning algorithms is that they could be applied to investigate the predictive performance of factors identified within the socio-environmentally extended MTE. Such approaches would be possible with much larger data, and could also examine how the structure of the relationships within the MTE could be re-arranged, rather than this study’s approach of fixing that structure according to theoretical and previous quantitative findings. Consequently, an effective strategy to improve individual engagement in future studies with larger sample sizes may be facilitated. Structural equation modelling (SEM) satisfied the requirement of explanatory performance in this study by providing a mechanism for evaluating the proposed effects of variables at all three stages of the MTE. The introduction of different analytical techniques and a comparison of their performance will provide important applied statistical advances, in use of complex modelling in rehabilitation settings.
10.5 Conclusion

Individual engagement in CR programs is vital to successfully manage cardiac diseases and minimise their impact on society. Indicators of individual engagement can be observed at the interface between the individual and their environment (Lequerica & Kortte, 2010), and therefore, there are many contributing factors that could influence individual engagement. Theoretically, limited definitions of engagement have been a shortcoming for exploring strategies in previous studies, leading to a limited understanding of the process of engagement. There is a scarcity of research that has examined rehabilitation engagement thoroughly to better understand the process (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018f). No clinical decision support model currently exists to alert healthcare providers to the factors that heighten the risk of non-engagement (Jahandideh, Kendall, Low-Choy, Donald, & Jayasinghe, 2018f). Consequently, the CR sector is not yet maximising its potential impact on cardiac disease in the most efficient manner. This thesis provides a novel empirical contribution that provides a more holistic and more comprehensive view of the process of patient engagement in CR.

Despite being a relatively small study on a single population, this quantitative study offers proof-of-concept, as well as initial evidence that the extended MTE may be useful for guiding CR as it attempts to manage the issue of poor engagement. The study provides the first empirical evidence about the relationships within the three stages of therapeutic engagement, that were proposed in the original MTE. Although some proposed relationships were not fully supported in the current study, the majority of proposed variables were demonstrated as being important to the understanding of engagement. The findings also revealed the importance of socio-environmental barriers at multiple points in the expanded MTE. CR programs need to be tailored to individuals according to the socio-environmental
barriers they experience. These factors are potentially modifiable and may become the most appropriate starting point for interventions that directly target CR engagement. It is also important to acknowledge that intention may not be a good indicator of attendance, ongoing participation and depth of engagement in rehabilitation unless it is understood in the context of socio-environmental barriers. Beyond the barriers, it is important for CR administrators and practitioners to understand the importance of involving people in the planning and goal setting for their rehabilitation and assisting them to evaluate their experiences as they progress through the program.

Although this project examined the whole MTE, it is important to note that examining the whole process of engagement was not an aim of this study. Therefore, further studies are necessary to achieve a more complete understanding of the engagement process by focusing more on the role of CR barriers and facilitators, such as health professional-related factors (e.g. clinicians’ communicative and relational skills); factors associated with family caregivers of individuals; and mental distress factors.
10.6 References


Jahandideh, S., Kendall, E., Low-Choy, S., Donald, K., & Jayasinghe, R. (2018c). Understanding individual intention to engage in outpatient cardiac rehabilitation programs based on the Model of Therapeutic Engagement. Accepted for publication in the Journal *Behaviour Change*.


Appendix A. Ethics approval
Gold Coast Hospital and Health Services (NEAF HREC/16/GQC/115)

Ms Sepideh Jahandideh
4 Everett Drive
SOUTHPORT QLD 4215

Dear Ms Jahandideh

HREC Reference: HREC/16/GQC/329
Project title: Understanding patient engagement in outpatient cardiac rehabilitation programs based on the Model of Therapeutic Engagement

Thank you for submitting the above project for ethical and scientific review, which has been undertaken by the Gold Coast Hospital and Health Service Human Research Ethics Committee (HREC).

This HREC is constituted and operates in accordance with the National Health and Medical Research Council’s (NHMRC) National Statement on Ethical Conduct in Human Research (2007)-Updated May 2015, NHMRC and Universities Australia Australian Code for the Responsible Conduct of Research (2007) and the CPMP/ICH Note for Guidance on Good Clinical Practice. Attached is the HREC Composition with specialty and affiliation with the Hospital and Health Service (HHS) (Attachment I).

This research project meets the requirements of the National Statement on Ethical Conduct in Human Research (2007)-Updated May 2015.

HREC approval is valid for 3 years. Expiry 14 February 2020.

The documents reviewed and approved include:

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<thead>
<tr>
<th>Document</th>
<th>Version</th>
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<tbody>
<tr>
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<td>09 November 2016</td>
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<tr>
<td>Protocol</td>
<td>3</td>
<td>14 November 2017</td>
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<tr>
<td>Participant Information and Consent Form – Clinician</td>
<td>1</td>
<td>09 November 2016</td>
</tr>
<tr>
<td>Participant Information and Consent Form - Patient</td>
<td>3</td>
<td>05 February 2017</td>
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<td>Invitation Letter</td>
<td>2</td>
<td>05 February 2017</td>
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<td>Interview Structure</td>
<td>3</td>
<td>05 February 2017</td>
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<tr>
<td>Questionnaire 1</td>
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<td>05 February 2017</td>
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<td>09 November 2016</td>
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<td>Questionnaire 5 – Clinician’s Questionnaire</td>
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<td>Response to Request for Further Information (1)</td>
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<td>Response to Request for Further Information (2)</td>
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<tr>
<td>Letter of Support from Dr Mark Forbes, Clinical Director, Diagnostic, Emergency and Medical Services</td>
<td></td>
<td>13 February 2017</td>
</tr>
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Please note the following conditions of approval:

1. This letter constitutes ethical approval only. A copy of this approval must be submitted to the HHS Research Governance Officer (RGO) along with a completed Site Specific Assessment (SSA) Form and applicable documents for authorisation from the CE to conduct this research within the HHS.
   a. Once authorisation to conduct the research has been granted, please complete the Commencement Form (Attachment II) and return to the office of the Human Research Ethics Committee OCE@health.qld.gov.au
   b. 

2. Reporting to the HREC: The following reports are required to be submitted to the HREC. Failure to fulfill these reporting requirements may result in withdrawal or suspension of HREC approval.
   a. Progress Reports: The Coordinating/Principal Investigator will provide a progress report annually to the HREC and at completion of the project. Progress reports are due on the anniversary of the HREC approval date.
   b. Safety Reporting: The Coordinating/Principal Investigator will immediately report, in the specified format, anything which might warrant review of ethical approval of the project, including:
      i. Serious Adverse Events which impact on the ethical or scientific validity of the project must be notified to the HREC as soon as possible. In the case of Serious Adverse Events occurring at the local site, a full report is required from the Principal Investigator, including duration of treatment and outcome of event.
      ii. If required, the Investigator must provide a summary of the adverse events, in the specified format, including a comment as to suspected causality and whether changes are required to the Patient Information and Consent Form.
      iii. Unforeseen events that might affect continued ethical acceptability of the project.
   c. Other monitoring: The HHS administration and/or the HREC may inquire into the conduct of any research or purported research, whether approved or not and regardless of the source of funding, being conducted on HHS premises or claiming any association with the HHS; or which the Committee has approved if conducted outside its HHS.

3. Amendments to this project:
   a. Amendments for review by an HREC:
      i. Amendments to the research project which may affect the ongoing ethical acceptability of a project must be submitted to the HREC for review.
      ii. Amendments should be reflected in a cover letter from the Principal Investigator, providing a brief description and rationale for the changes, and their implications for the ongoing conduct of the study. All relevant updated documentation should also be provided. Further advice on submitting amendments is available from http://www.health.qld.gov.au/chmr/documents/researcher_userguide.pdf
   b. Amendments for review by an RGO:
      c. Amendments to the research project which affect only the ongoing site acceptability of the project are not required to be submitted to the HREC for review. These amendment requests should be submitted directly to the Research Governance Office (by-passing the HREC).
Amendments for review by an HREC Coordinator:

d. Amendments which do not affect either the ethical acceptability or site acceptability of the project (e.g., typographical errors) should be submitted in hard copy to the HREC Coordinator. These should include a cover letter from the Principal Investigator providing a brief description of the changes and the rationale for the changes, and accompanied by all relevant updated documents with tracked changes.

4. Early termination or routine completion of the project:
   a. The HREC must be notified if the project is discontinued at a site before the expected date of completion. Notification should be in the form of a cover letter from the Principal Investigator, providing a rationale for the early termination.
   b. For projects that are completed, the HREC must be notified by submission of a progress report, along with a copy of any research summaries or intended publications.

Should you have any queries about the HREC’s consideration of your project please contact the HREC Coordinator on ph. 07 5587 3879. The HREC Terms of Reference, Standard Operating Procedures, membership and standard forms are available from

The HREC wishes you every success in your research.

Yours sincerely

Carine Hoye
Acting HREC Coordinator
On behalf of
Emeritus Professor Drew Nesdale
Chair
Gold Coast Hospital and Health Service
Human Research Ethics Committee (EC00160)

Sites Approved

<table>
<thead>
<tr>
<th>Site</th>
<th>Site Investigator/s</th>
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<tr>
<td>Gold Coast Hospital and Health Service</td>
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</table>

Office
Research Directorate
Level 2, Pathology and Education Building
1 Hospital Boulevard
Southport QLD 4215

Phone
017 5587 3879

Page 3 of 3
Invitation to participate in a research project

Dear participant,

You are invited to participate in a study of engagement in an outpatient cardiac rehabilitation program. The researchers hope to find some strategies to increase engagement in recovery activities. You were selected as a possible participant in this study because you are eligible to attend an outpatient cardiac rehabilitation program.

As a participant in this study, you will be involved in the completion of a maximum of two questionnaires (on discharge from hospital and after discharge). Each questionnaire will take approximately 30 minutes to complete. You can participate in this study whether or not you enrol in rehabilitation following discharge.

By participating in this study, it is anticipated that the findings of the present study will provide improved understanding of the relationships between a range of individual, social and environmental factors and engagement in recovery activities. Your involvement in the study is voluntary. Refusal to participate in the study will not affect your relationship with the care providers and researcher in the centre. Your interest can be indicated by checking the appropriate box below. Please provide your full name and return this form to the responsible nurse. I will be in contact with you during your hospitalisation to provide more information regarding this study.

Your full name:

☐ I agree to participate in this study
☐ I do not agree to participate in this study

The research team are:

Ms. Sepideh Jahandideh (sepideh.jahandideh@griffithuni.edu.au)
Professor Elizabeth Kendall (e.kendall@griffith.edu.au)
Associate Professor Samantha Low-Choy (s.low-choy@griffith.edu.au)
Professor Rohan Jayasinghe (Rohan.Jayasinghe@health.qld.gov.au)
Professor Kenneth Donald (k.donald@griffith.edu.au)

These researchers will provide you with further information about the research, according to National Ethics Application Form.

Thank you so much
Research Participant Information Statement—Patient

Research Study Title | Understanding patient engagement in outpatient cardiac rehabilitation programs based on the model of therapeutic engagement
---|---
Researcher’s Name | Sepideh Jahandideh

(1) What is the study about?
You are invited to participate in a study of patient engagement in outpatient cardiac rehabilitation programs. The researchers hope to find strategies to increase patient engagement in such programs. You were selected as a possible participant in this study due to your eligibility to attend an outpatient cardiac rehabilitation program.

If you decide to take part in the program, you will be asked to participate in two surveys at two-time points. Questions will be related to factors attributed to your engagement in the outpatient cardiac rehabilitation program. In addition, a researcher may make phone contact with you after discharge from the hospital. It is necessary to mention that your decision to participate in this research is unrelated to your decision to participate in cardiac rehabilitation. Neither decision will influence the other.

By participating in this study, it is anticipated that the findings will provide an improved understanding of the relationships between a range of individual, social and environmental variables and patients’ engagement in outpatient cardiac rehabilitation programs. The study will provide important information to guide the development of intervention strategies to improve the quality of medical services in these programs. Apart from the time required to complete the questionnaires, no further inconvenience or risks for you are foreseen. Your involvement in the study is voluntary. Refusal to participate in the study will not affect your relationship with the care providers and researcher in the centre.

Please note:
- This study will be conducted during the process of your treatment. Therefore, there is no extra burden on you to attend a specific place.

(2) Who is carrying out the study?
The research is being conducted by Sepideh Jahandideh, a PhD student, under the supervision of Professor Elizabeth Kendall, Dr. Samantha Low-Choy, Professor Rohan Jayasinghe, and Professor Kenneth Donald.

(3) What does the study involve?
As a participant in this study, you will be involved in the completion of a maximum of two questionnaires (on discharge from hospital and after discharge from hospital).
(4) How much time will the study take?
The questionnaires would need to be completed 1) on discharge from hospital and 2) after discharge from hospital. Each questionnaire will take a maximum of 30 minutes to complete. You can participate in this study whether or not you enrol in rehabilitation following discharge.

(5) Will I incur any costs by participating in the study?
There is no cost for you to participate in this study, just your time.

(6) Can I tell other people about the study?
As the success of the study is reliant on honest responses from each participant, it is important that participants do not share their knowledge/experience with others so that opinions are not influenced by anything other than the program itself. Therefore, confidentiality is important to the study’s success.

(7) Will I receive the results of the study?
The researchers will be more than happy to inform you about the results of the study once data collection is complete. If you are interested, you can contact them at: Telephone: 0469304419 and email sepideh.jahandideh@griffithuni.edu.au

(8) Confidentiality and disclosure of information
Any information that is obtained in connection with this study and able to be identified as in connection with you will remain confidential and will be disclosed only with your permission. If you consent to participate in this study, the data collected will be part of the published results. In any publication, information will be provided in such a way that you cannot be identified and after at least five years of the publication of results, the results will be destroyed unless participants have agreed otherwise.

(9) Can I withdraw from the study?
Participation in this study is voluntary - you are not under any obligation to consent and - if you do consent - you can withdraw at any stage without affecting your relationship with the care providers and researcher in the centre. You can withdraw your consent by advising the researcher either verbally, via email, or by completing and returning the ‘Participant Withdrawal of Consent Form’ that is supplied herein. If a patient chooses to withdraw participation, all efforts will be taken to remove their records from digital and electronic storage.

(10) How can I obtain further information?
When you have read this information, Sepideh will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact either the researcher, Sepideh Jahandideh (PhD student, Telephone: 0469304419, Contact Email: Sepideh.jahandideh@griffithuni.edu.au) or the research supervisor, Professor Elizabeth Kendall (Telephone: 61 7 3382 1202, Contact Email: e.kendall@griffith.edu.au).
(11) What can I do if I have a complaint or a concern?
Any concerns or complaints about the conduct of this study should be directed to the:
HREC Secretary
Gold Coast University Hospital
1 Hospital Boulevard
SOUTHPORT QLD 4215
Email: GCHEthics@health.qld.gov.au

Any complaint will be investigated promptly and you will be informed of the outcome.

This information sheet is for you to keep.
Research Participant Consent Form

Research Study Title: Understanding patient engagement in outpatient cardiac rehabilitation programs based on the model of therapeutic engagement

Researcher’s Name: Sepideh Jahandideh

Participant Consent

I __________________________, agree to participate in this research. I have read the Research Participant Information Statement and had any question I have about the research answered for me by the researcher.

Please complete, placing a ✓ in applicable boxes

Name of Research Participant (First name and Surname)/[Print]

Are you 18 years of age or older? □ Yes □ No - A parental consent form is required to be completed.

Research Participant Signature __________________________ Date __________

Name of Witness __________________________ Relationship of Witness to Research Participant (e.g., friend, sibling, parent, partner)

Witness Signature __________________________ Date __________

Researcher’s Signature __________________________ Date __________
Research Participant Withdrawal of Consent Form

You can withdraw your participation consent by advising the researcher verbally, via email to Sepideh.jahandideh@griffithuni.edu.au or by returning this completed form to Griffith University, Gold Coast Campus, School of Human Services and Social Work, Room 3.16 Building G01.

<table>
<thead>
<tr>
<th>Research Study Title</th>
<th>Understanding patient engagement in outpatient cardiac rehabilitation programs based on the model of therapeutic engagement</th>
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<tr>
<td>Researcher’s Name</td>
<td>Sepideh Jahandideh</td>
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</table>

I hereby wish to **WITHDRAW** my consent to participate in the research proposal described above and understand that such withdrawal **WILL NOT** jeopardise any treatment or my relationship with the Gold Coast Hospital and Health Service, *other participating organisation/s or other professional/s*.

__________________________________________________________________________

Research Participant Name (Print)

__________________________________________________________________________

__________________________________________________________________________

Research Participant Signature                                      Date
Appendix B. Copyright permission for the Model of Therapeutic Engagement (Lequerica & Kortte, 2010)

Wolters Kluwer

Thank you for your order!

Dear Mrs. Sepideh Jahandiceh,

Thank you for placing your order through Copyright Clearance Center’s RightsLink® service.

Order Summary

Licensee: Griffith University
Order Date: Jan 9, 2016
Order Number: 4264530355238
Publication: American Journal of Physical Medicine & Rehabilitation
Title: Therapeutic Engagement: A Proposed Model of Engagement in Medical Rehabilitation
Type of Use: Dissertation/Thesis
Order Total: 0.00 USD

View or print complete details of your order and the publisher’s terms and conditions.

Sincerely,

Copyright Clearance Center

How was your experience? Fill out this survey to let us know.

Tel: +1-855-239-3415 / +1-978-846-2777
customercare@copyright.com
https://myaccount.copyright.com

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Appendix C. Questionnaires 1 and 2 (Patient questionnaire)

Questionnaire 1

Date: ...........................................

ID: .............................................

Instructions:

The following questions enquire about the personal and environmental factors that have influenced you to engage in the cardiac rehabilitation program. There are no right or wrong answers. Please answer all questions and choose only the most appropriate answer for each question. Your contribution to the project is greatly appreciated.

Thank you very much

Sepideh Jahandideh
Mobile: +61469304419
Email: sepideh.jahandideh@griffithuni.edu.au
The set of questions pertain to information about you: Please tick or write the appropriate response.

1. What is your date of birth? ..........................

2. Gender:
   □ Male  □ Female

3. Marital status:
   □ Married/De-facto □ Divorced/Widowed □ Single

4. Religion:
   □ Catholic □ Protestant □ Islam □ Other □ No religion □ Prefer not to say

5. Ethnicity:
   □ Hispanic □ Native American □ Asian □ Middle Eastern □ Caucasian/European
   □ African □ South Sea or other Pacific Islander □ Aboriginal/Torres Strait Islander
   □ Other ..............................

6. What is your current employment status?
   □ Unemployed □ Pension □ Self-funded Retiree □ Employed part-time
   □ Employed Full-time □ Other ..............................

7. What is your highest completed level of education?
   □ Junior/Intermediate certificate (year 10) or before
   □ Senior/Leaving certificate (years 11 - 12)
   □ TAFE certificate or equivalent
   □ Undergraduate degree
   □ Postgraduate degree
8. What is your annual combined household income?

- □ Less than $19,999
- □ $20,000-$39,999
- □ $40,000-$59,999
- □ $60,000-$79,999
- □ More than $80,000
- □ Prefer not to say

9. Discharge diagnosis: ..............

Perceived self-efficacy

*Awareness of capabilities*

These statements refer to your *confidence about rehabilitation*. Please indicate how much you agree with each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
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<tbody>
<tr>
<td>1. I have confidence that I can cope with doing rehabilitation.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>2. I am afraid that the therapists will want me to do too much.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>3. In time my condition will improve so I should just wait.</td>
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<td>□</td>
<td>□</td>
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<td>4. It is important that I try to overcome my difficulties.</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>5. I cannot do anything to improve my condition.</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>6. Rehabilitation is about me doing things not having things done to me.</td>
<td>□</td>
<td>□</td>
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</table>
**Perceived demands associated with rehabilitation**

These statements relate to the demands of rehabilitation on you. Please indicate how much you agree.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
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<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. I am likely to get angry with myself when I cannot do things in rehabilitation.
2. Travelling to rehabilitation is going to be a problem.
3. Rehabilitation will emphasise what I cannot do.
4. I do not have any difficulties, there is nothing wrong with me so rehabilitation will waste my time.
5. Rehabilitation involves too much repetition of the same thing.
6. I have more important things to do than rehabilitation.
7. Being around other people with disabilities or illnesses makes me feel down.
**Outcome expectancies**

*Perceived success*

For the following questions please place X in a square that best corresponds to your views.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rehabilitation will help me learn new ways of doing things.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Rehabilitation will increase my independence.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Rehabilitation will help me to come to terms with my disease.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Rehabilitation will make me feel more hopeless.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Rehabilitation will give me more of a purpose in life.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Rehabilitation will reduce my confidence.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
**Value of outcomes**

Please read each statement and decide to what degree each one describes your expectation of undertaking cardiac rehabilitation.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rehabilitation will have a positive impact on my health.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. I will feel better after rehabilitation.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. I will feel fit after rehabilitation.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Rehabilitation will have a positive impact on my wellbeing.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. I will get to know other people during rehabilitation.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
### Perceived need

*Awareness of deficits*

The statements below relate to perceived benefits of rehabilitation. Please place X in an appropriate square to show your feelings about each statement. Please respond to every statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. If recommended, I would see a rehabilitation therapist.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2. Given a choice, I would spend more time in therapy.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3. Rehabilitation will probably help me.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4. Rehabilitation will be very useful for me.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5. At first, I had some problems, but I’m fine now.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6. I’m better now than I ever was so I don’t need rehabilitation.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>7. Rehabilitation therapists can’t help me with my problems.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>8. Rehabilitation has nothing to do with my needs.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
### Perceived treatment benefits

The next set of items asks you to rate your agreement with the following statements.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The heart disease had minimal effect on my abilities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Rehabilitation is useful, but I don’t think I need it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I do not have any problems worth mentioning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I’m very interested in rehabilitation, but it’s not for me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I don’t have time for rehabilitation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Willingness to consider the treatment**

The questions in this scale ask you about your willingness to follow prescribed treatment recommendations. How true is each statement for you?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I rely on doctors to help me with my problems.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. I’d ask my therapists to do extra therapy tasks.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. I always follow medical orders because I think they’ll help me.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Doctors know what I need and I’ll do what they say.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. I’d do what a therapist tells me even if it does not make sense.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. It’s fine to see rehabilitation therapist.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Intention to engage in cardiac rehabilitation programs

These statements focus on your intentions regarding rehabilitation. Please indicate how much you agree with each.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I intend to make sufficient opportunities for my rehabilitation</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2. I intend to have enough possibilities for a good recovery</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3. I intend to make rehabilitation a part of my daily routine</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4. It is up to me whether I recover well or poorly.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5. I am likely to postpone rehabilitation.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6. I am likely to avoid rehabilitation because of other demands.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
Barriers to participation in cardiac rehabilitation programs

How much do you agree that each of the following factors will interfere with your ability to attend rehabilitation?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>7.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>8.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>9.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>10.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>11.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
Questionnaire 2

Date:……………………………
ID:……………………………..

Instructions:

The following questions enquire about the personal and environmental factors that have influenced you to engage in the cardiac rehabilitation program. There are no right or wrong answers. Please answer all questions and choose only the most appropriate answer for each question. Your contribution to the project is greatly appreciated.

Thank you very much

Sepideh Jahandideh
Mobile: +61469304419
Email: sepideh.jahandideh@griffithuni.edu.au
Did you attend cardiac rehabilitation program?

☐ Yes (How many sessions did you attend? .............). If yes, please answer all the following questions.

☐ No. If no, please do not answer any more questions. Thank you for participating.

**Cardiac rehabilitation preparation**

*Goal setting*

Select the box below that best represents how the goals developed in the rehabilitation program matched your priorities?

☐ **Excellent:** The goals matched all my key priorities and were entirely my own choice

☐ **Very good:** The goals matched my main priorities and I was pretty happy with my agreed goal-set

☐ **Moderate:** The goals met some of my priorities and I agreed with some of them

☐ **Poor:** The goals were largely irrelevant to me and I disagreed with most of them

☐ **None:** The goals were completely irrelevant and I did not agree with any them or, I was not aware of my goal.
Treatment planning

These statements focus on the goals that were the focus of your rehabilitation program.

To what extent do you agree with each statement?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>13.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
**Analysis of Experience**

*Perceived quality of services*

Please think about the services you received during your cardiac rehabilitation. Indicate how much you agree with each statement.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Seldom</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I was always treated with courtesy in rehabilitation.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. I participated as much as I wanted in decisions about my rehabilitation.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. My chosen family/friends were given the information they needed about my rehabilitation.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. The place where I received rehabilitation had a positive impact on my experience.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. I achieved my treatment goals.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. My physical condition was controlled as well as possible</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. My rehabilitation providers had the information they needed to help me without delay</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. I always felt safe when taking part in rehabilitation activities</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. From now on I know what to expect about my rehabilitation</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. I am likely to recommend this rehabilitation program to friends and family if they need the same care</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
**Perceived achievement**

These questions relate to your rehabilitation experience. To what extent do you agree with each statement.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mainly No</th>
<th>Undecided</th>
<th>Mainly Yes</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did you get an opportunity to describe/explain your problems during the rehabilitation sessions?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Did you get an opportunity to describe/explain your problems after the rehabilitation sessions were completed?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Did you experience that the staff listened to what was important to you?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Do you feel that there were goals formulated for your treatment?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Can you recall these goals?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Did you have the opportunity to participate in the goal-formulation process?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Did you get the opportunity to practice what was recommended?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Do you think that you recovered during the rehabilitation period?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. Do you think that you can do more than you did during rehabilitation?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. Can you manage more now than earlier because of rehabilitation?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11. Did you reach the expected result of your treatments?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12. Are you satisfied with the treatment received?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>13. Do you think that changes need to be made concerning patients’ opportunity to influence their treatment?</td>
<td>☐</td>
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<td>☐</td>
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</tbody>
</table>
Barriers to participation in cardiac rehabilitation programs

To what extent do you agree that each of the following factors will interfere with your ability to attend rehabilitation?

<table>
<thead>
<tr>
<th>1. Not being informed about rehabilitation.</th>
<th>Strongly Disagree</th>
<th>Disagree Somewhat</th>
<th>Undecided</th>
<th>Agree Somewhat</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Long waiting lists for rehabilitation.</td>
<td></td>
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<td>3. Not contacted by rehabilitation staff.</td>
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<td>4. Lack of recommendation by doctor.</td>
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<td>5. Doctor said it was unnecessary.</td>
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<td>6. Too far from home.</td>
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<td>7. Rehabilitation class time is not suitable.</td>
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<td>8. Lack of family support.</td>
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<td>9. Language difficulties.</td>
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<td>10. Conflict with work.</td>
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<tr>
<td>11. Do not like group activities.</td>
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</tbody>
</table>
Appendix D. Clinician Questionnaire

Patient’s name: ..........................................................

Did the patient initiate the rehabilitation program, i.e. attended a minimum of four out of the first six exercise sessions? □ Yes □ No

Number of scheduled sessions: .....................
Number of attended sessions: .......................

This set of questions asks you to rate the patient engagement at the last session of the cardiac rehabilitation program.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Seldom</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>Nearly always</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>2.</td>
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<td>3.</td>
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<td>4.</td>
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<td>5.</td>
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</tbody>
</table>

1. The patient regularly attended my rehabilitation activity.
2. The patient required verbal or physical prompts to actively participate in my rehabilitation activity.
3. The patient expressed a positive attitude towards my rehabilitation activity.
4. The patient acknowledged a need for rehabilitation services and the benefits of therapy exercises or rehabilitation activities.
5. The patient actively participated in his/her rehabilitation activity.
### Supplemental Table 1. Methodology assessment summary and score of studies included in systematic review

| Authors (References) | Was the research question or objective in this paper clearly stated? | Was the study population clearly specified and defined? | Was the participation rate of eligible persons at least 50%? | Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study pre-specified and applied uniformly to all participants? | Was a sample size justification, power description, or variance and effect estimates provided? | For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured? | Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed? | For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)? | Were the exposure measures (predictor variables) clearly defined, valid, reliable, and implemented consistently across all study participants? | Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? | Were the outcome assessors blinded to the exposure status of participants? | Was loss to follow-up after baseline 20% or less? | Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)? | Percent score |
|----------------------|---------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-------------|
| Alexander & Wagner (2006) | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0.86% |
| Araya-Ramirez et al. (2010) | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | N/A | 1 | 1 | N/A | 0 | 0.83% |
| Bakker et al. (2015) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | N/A | 1 | 1 | N/A | N/A | 100% |
| Bennett et al. (1999) | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | N/A | 1 | 1 | N/A | N/A | 0.92% |
| Blanchard et al. (2009) | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | N/A | 1 | 1 | 1 | 0 | 0.85% |
| Broadbent et al. (2009) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | N/A | 1 | 1 | 1 | 0 | 0.92% |
| Chan, Chau, & Chang (2005) | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | N/A | 1 | 1 | 1 | 0 | 0.85% |
| Dohnke et al. (2010) | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | N/A | 1 | 1 | 1 | N/A | 0.92% |
| Gardiner et al. (2018) | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | N/A | 1 | 1 | N/A | N/A | 0.91% |
### Supplemental Table 31 Continued

| Authors (References)             | Was the research question or objective in this paper clearly stated? | Was the study population clearly specified and defined? | Was the participation rate of eligible persons at least 50%? | Were all the subjects selected or recruited from the same or similar populations (including the same time period)? | Were inclusion and exclusion criteria for being in the study pre-specified and applied uniformly to all participants? | For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured? | Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed? | For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)? | Were the exposure measures (predictor variables) clearly defined, valid, reliably and implemented consistently across all study participants? | Were the outcome measures (dependent variables) clearly defined, valid, reliably, and implemented consistently across all study participants? | Were the outcome assessors blinded to the exposure status of participants? | Was loss to follow-up after baseline 20% or less? | Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)? | Percent score |
|----------------------------------|---------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| de Melo Ghisi et al. (2015)      | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 1                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 100%                                                                                                                                  |
| Hutchinson, Meyer, & Marshall (2015) | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 0                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                               | 0                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                               | 0                                                                                                                                  | 0.75%                                                                                                                                  |
| Johnson & Heller (1998)          | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 0                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                               | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 0.92%                                                                                                                                  |
| Jolly et al. (2007)              | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 1                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                               | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 0.92%                                                                                                                                  |
| Marzolini, Mertens, Oh, & Pleye (2010) | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 0                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                               | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 0.92%                                                                                                                                  |
| Sniehotta et al. (2005)          | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 0                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                               | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                                  | 0.92%                                                                                                                                  |
| Sullivan et al. (2009)           | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 0                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 0                                                                                                                                  | 0.86%                                                                                                                                  |
| Scane, Alter, Oh, & Brooks (2012) | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 0                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                               | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 0                                                                                                                                  | 0.85%                                                                                                                                  |
| Sniehotta, Gorski, & Araújo-Soares (2010) | 1                                                             | 1                                                     | 1                                                         | 1                                                               | 0                                                                                                                                | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | N/A                                                                                                                               | 1                                                                                                                                  | 1                                                                                                                                  | 1                                                                                                                                  | 0                                                                                                                                  | 0.85%                                                                                                                                  |
Supplemental Figure 1. Structural equation modelling standardised factor loading for the first stage of the Model of Therapeutic Engagement (n = 217)
Supplemental Figure 2. Structural equation modelling standardised factor loading for the entire Model of Therapeutic Engagement (n = 101)

Note. PN: Perceived Need; PB: Perceived General Benefits of Treatment; AD: Awareness of Deficits; PS: Perceived Self-efficacy; PD: Perceived Treatment Demands; AC: Awareness of Capabilities; OE: Outcome Expectancies; VO: Perceived Value of Outcomes on Quality of Life; PS: Perceived Likelihood of a Successful Outcome; I: Intention; P: CR Preparation; GP: Goal setting; TP: Treatment Planning; E: Engagement; AE: Analysis of Experience; M: Maintenance.