A Self-Determination Theory Approach to Embedding Physical Activity Behaviour Change in Cardiac & Pulmonary Rehabilitation

Intervention Development and Optimisation

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A thesis submitted in partial fulfilment of the
requirements of Edge Hill University,
in conjunction with Liverpool Heart and Chest Hospital
NHS Foundation Trust, for the award of Doctor of
Philosophy.

June 2021

Word Count: 77,869

Declaration

I hereby declare that the work presented in this thesis has not been submitted for any other degree or professional qualification, and that it is the result of my own independent work.

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29.06.2021

Date

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Glossary of Terms

BACPR	British Association of Cardiac Prevention and Rehabilitation
BCW	Behaviour Change Wheel
BPNT	Basic Psychological Needs Theory
BTS	British Thoracic Society
CBT	Cognitive Behavioural Therapy
CET	Cognitive Evaluation Theory
CHD	Coronary Heart Disease
COPD	Chronic Obstructive Pulmonary Disease
COT	Causality Orientations Theory
CR	Cardiac Rehabilitation
CVD	Cardiovascular Disease
EHU	Edge Hill University
GAPPA	Global Action Plan on Physical Activity
GCT	Goal Contents Theory
HCP	Healthcare Professional
IM	Intervention Mapping
INDEX Study	IdentifyiNg and assessing different approaches to Developing complEX interventions
IRAS	Integrated Research Application System
Knowsley CCG	Knowsley Clinical Commissioning Group
LHCH	Liverpool Heart & Chest Hospital NHS Foundation Trust
LSOA	Lower Super Output Area
MI	Motivational Interviewing
MRC	Medical Research Council
NACR	National Audit of Cardiac Rehabilitation
NHS	National Health Service
NICE	National Institute of Health and Care Excellence
NIHR	National Institute of Health Research
OIT	Organismic Integration Theory
PA	Physical Activity
PPI	Patient and Public Involvement
PR	Pulmonary Rehabilitation
RCT	Randomised Control Trial
REC	Research Ethics Committee
SDT	Self-Determination Theory
SURE Group	Service Users Research Endeavour Group (based at LHCH)
TCS	Theory Coding Scheme
UK	United Kingdom
WHO	World Health Organisation

Abstract

Every year in the UK, 82,000 people die from heart disease, and approximately 25,000 will die from Chronic Obstructive Pulmonary Disease. Clearly, combatting the burden of cardiac and respiratory disease is a considerable public health concern. Individuals who participate in cardiac rehabilitation or pulmonary rehabilitation enjoy a better quality of life and a reduced risk of secondary cardiac events or acute exacerbations of COPD relative to those who do not complete cardiac or pulmonary rehabilitation.

Although only 15% of cardiac rehabilitation services have access to a psychologist, behaviour change is highlighted as a core component of an effective programme, and to date has been poorly integrated into chronic disease interventions. This PhD thesis describes the development of a physical activity behaviour change intervention, informed by self-determination theory that will operate within an existing cardiac and rehabilitation programme. The intervention aims to increase the ability of healthcare professionals to deliver behaviour change interventions within their current practice.

This thesis contains several key components. Firstly, a literature review was conducted, covering a number of topics that are central to the thesis, such as physical activity, behaviour change, intervention development, current arguments within applied health research, an analysis of relevant health policy, and self-determination theory, which served as the theoretical framework of the thesis. Second, a systematic review was used to understand the development process underpinning interventions using self-determination theory to affect uptake and adherence to physical activity amongst clinical populations. Third, a qualitative needs analysis was conducted with healthcare professionals and patients to explore factors influencing programme uptake and adherence, behaviour change, and how self-determination theory could explain these phenomena. A development phase was used to triangulate the findings of the three previous steps, with a commentary provided to explain how the intervention's logic model and course materials were developed.

The Theory Coding Scheme was used to demonstrate that the intervention is strongly theory-based. The intervention was then delivered to healthcare professionals to assess its prospective acceptability and elucidate how it could be improved. This study revealed that healthcare professionals perceived the intervention to be highly acceptable: it filled a significant knowledge gap, clearly aligned with their current practice, and did not constitute a significant additional burden within their standard clinical practice.

This thesis addresses gaps in knowledge regarding how behaviour change interventions can be co-developed alongside healthcare professionals, how such interventions can be incorporated into standard clinical practice, and how healthcare professionals can be supported to deliver behaviour change interventions. Recommendations and implications for future research and practice are also reported.

Dissemination associated with this thesis

Publications:

- **Whittaker, E.M.**, Levy, A.R., Matata, B., Kinnafick, F.E., & Midgley, A.W. (In Prep). *How can self-determination theory explain patients' uptake and adherence of physical activity-based cardiac and pulmonary rehabilitation?*. In preparation for submission to British Journal of Health Psychology

- **Whittaker, E.M.**, Levy, A.R., Matata, B., Kinnafick, F.E., & Midgley, A.W. (In Prep). *How is Self-Determination Theory Used to Develop Interventions Aiming to Increase Physical Activity in Clinical Populations? A Systematic Review*. In preparation for submission to PLOS One.

- **Whittaker, E.M.**, Levy, A.R., Matata, B., Kinnafick, F.E., & Midgley, A.W. (In Prep). *A qualitative investigation into cardiac and pulmonary rehabilitation healthcare professionals' level of understanding of behaviour change*. In preparation for submission to Qualitative Health Research.
- **Whittaker, E.M.**, Levy, A.R., Matata, B., Kinnafick, F.E., & Midgley, A.W. (In Prep). *Improving Physical Activity in Cardiac and Pulmonary Rehabilitation (IPAiR Trial): Rationale and protocol.* In preparation for submission to European Health Psychologist.
- **Whittaker, E.M.**, Levy, A.R., Matata, B., Kinnafick, F.E., & Midgley, A.W. (In Prep). *Healthcare professionals' perceptions of the acceptability and feasibility of a behaviour change intervention within cardiac and pulmonary rehabilitation*. In preparation for submission to Applied Social Psychology: Health & Wellbeing.

Peer Reviewed Conference Poster Presentations:

- **Whittaker, E.M.,** Midgley, A.W., Matata, B., McIntosh, Z., & Levy, A.R. (2017). *"Show me the process!!!": A real-world perspective for training rehabilitation staff to motivate rehabilitation patients to exercise.* Poster presented at British Association of Cardiac Prevention and Rehabilitation (BACPR) Annual Conference, London, 4-6th October 2017.
- **Whittaker, E.M.,** Midgley, A.W., Matata, B., McIntosh, Z., & Levy, A.R. (2017). *The development, optimization and implementation of a motivational-based intervention to improve physical activity in rehabilitation (IPAiR Trial).* Poster presented at British Association of Cardiac Prevention and Rehabilitation (BACPR) Annual Conference, Glasgow, 4-5th October 2018.
- **Whittaker, E.M.,** Midgley, A.W., Matata, B., & Levy, A.R. (2018). *What lurks behind the curtain? A critical review of the process of developing self-determination theory-based interventions to promote physical activity in clinical populations.* ePoster presented at the 7th International Society for Physical Activity and Health (ISPAH) Congress, London, 15th-17th October 2018.
- **Whittaker, E.M.**, Midgley, A.W., Matata, B., Kinnafick, F.E., & Levy, A.R. (2020). *"Getting to the heart of the problem": How can we develop behaviour change interventions that embed into existing cardiac and pulmonary rehabilitation services? (IPAiR Trial).* Poster presented at the NHS Health Checks Cardiovascular Disease Prevention Conference 2020, London, 6th February 2020.

Conference Oral Presentations:

- **Whittaker, E.M**, Midgley, A.W, Matata, B., & Levy, A.R. (2017). *"If we can't change, how can we expect our patients to?": How can behaviour change research really impact upon the NHS?.* Paper presented at Cutting Edge Postgraduate Research Conference, Ormskirk, 27th April 2017.
- **Whittaker, E.M.**, Midgley, A.W., Matata, B., & Levy, A.R. (2018).*"They took me this far but I've gotta do it on my own now": How can self-determination theory explain patients' uptake and adherence of physical activity-based cardiac and pulmonary rehabilitation?*. Oral ePoster presented at the 7th International Society for Physical Activity and Health (ISPAH) Congress, London, 15th-17th October 2018.
- **Whittaker, E.M.**, Midgley, A.W., Matata, B., Kinnafick, F.E., & Levy, A.R. (2019).*" "Getting to the heart of the problem": How can we develop behaviour change interventions that embed into existing cardiac and pulmonary rehabilitation services? (IPAiR Trial).* Paper presented at the Liverpool John Moores University Public Health Institute Symposium 2019, Liverpool, 26th July 2019.
- **Whittaker, E**.M. (2020) *Pulmonary rehabilitation and supporting behaviour change in the post-COVID era: An overview of IPAiR.* Invited speaker at the Primary Care Respiratory Society Annual Conference, 25-26th September 2020.

Invited Speaker:

- Cheshire & Merseyside Strategic Transformation Plan: Cardiovascular Disease Board Meeting, held at Liverpool Heart & Chest Hospital
  Role: To present the IPAiR Trial findings, outlining the implications of the findings for Cardiac Rehabilitation practice across Cheshire and Merseyside, and to contribute to the development of the behaviour change component of CR across Cheshire and Merseyside.
- Wrexham Maelor Cardiac Rehabilitation Service Staff Training Day
  Role: To present the IPAiR Trial findings, outlining the research project, key findings, and provide a taster session on behaviour change.

- Public Health England: Yorkshire & Humber NHS Health Check and Cardiovascular Disease Community of Improvers
  Role: To present the IPAiR Trial findings, outlining the implications of the findings for Cardiac Rehabilitation and Cardiovascular Disease services across Yorkshire and the Humber, and to provide an overview of behaviour change to commissioners and service leads.

Other Relevant Peer Reviewed Publications

- Epton, A., Ghio, D., Keysworth, C., **Whittaker, E.**, Armitage, C.J., Hart, J., O'Connor, D., Shorter, G., Perriard-Abdoh, S., Lewis, L., Drury, J., Kamal., A., Arden, M.A., Byrne-Davis, L., McBridge, E., Chadwick, P., Swanson, V., & Chater, A. (2021). Delivering effective public health campaigns during COVID-19. London: British Psychological Society.
- Arden, M. A., Armitage, C. J., Byrne-Davis, L., Hart, J., O'Connor, D. B., Chadwick, P., Drury J., Lewis, L., McBride, E., Perriard-Abdoh, S., Shorter, G. W., Swanson V., Thompson, S., **Whittaker, E.** & Chater, A. (2020). *Behavioural science and success of the proposed UK digital contact tracing application for COVID-19.* London: British Psychological Society.
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Acknowledgements

This project would not have been possible without a number of different people and organisations. A huge thank you to Liverpool Heart and Chest Hospital and Knowsley Community services for adopting me and letting me ask about 872 questions, to my supervisory team Dr Andy Levy, Prof Adrian Midgley and Dr Bashir Matata, and (pretty much supervisor) Dr Flo Kinnafick for all of their constant support and putting up with me for 4 years. To my PhD partner in crime, Holly, there's no one else I'd have wanted to share these mad few years with! Finally, a huge thank you to the Public Health Team at North Yorkshire County Council for constantly supporting me whilst attempting to write this thesis up whilst working in public health in the madness of the COVID-19 pandemic!

Tragically, as I was preparing to submit this thesis my Dad very suddenly collapsed and died as the result of previously undiagnosed ischaemic heart disease on 31st January 2020, aged 70. Much like how this project changed focus and evolved as it progressed, and because my Dad was extremely excited to see his daughter become Dr Whittaker, this thesis is now totally dedicated to him. I hope that this work and the career I seem to embarking on in cardiovascular disease may help to prevent others experiencing what my family and I have recently been through.

In memory of Philip Andrew Whittaker (1949-2020)

Chapter 1: Thesis Overview

1.1 Preface

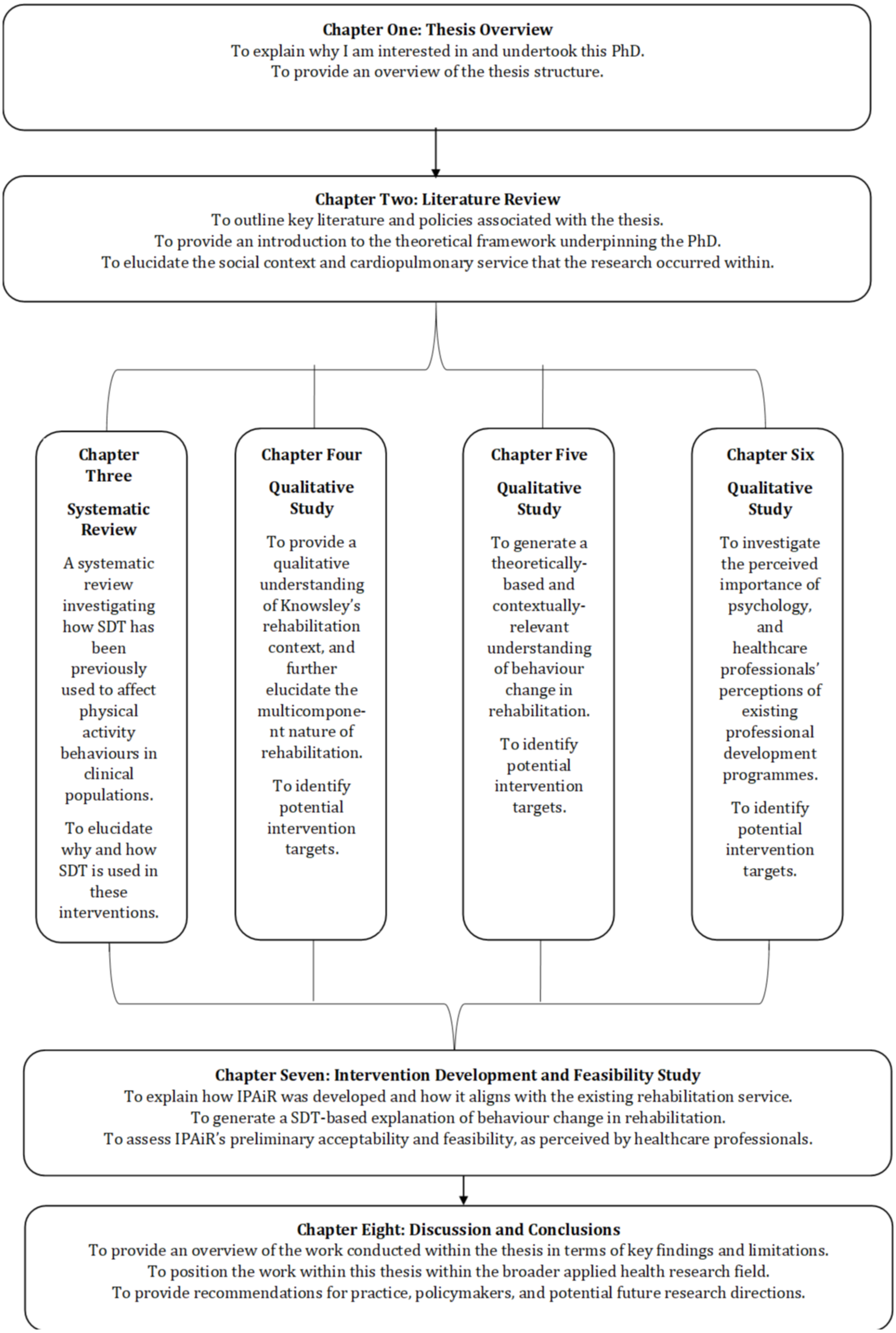
Ensuring that research has a tangible impact upon the lives of others is extremely important to me. I have always been the student who questions why a piece of research is important or exerts a tangible influence on everyday life. Why should the population we are researching agree to participate in the research, and most importantly, how can it help them? My prior experiences caused me to realise that if we cannot explain what the implication of our research is in lay terms, or how it can be used in practice, it may not be as useful or as impactful as we want it to be. Personal experiences led me away from lab-based academic research that I had become accustomed to whilst an undergraduate student, and into a discipline that pursues the implication and translation of research into practice.

In the autumn of 2006, I lost my Grandad to COPD, and I struggle to remember a time when he was not perpetually breathless, and reliant on oxygen to walk across the room. This sparked my interest in a career in health psychology: how can we help people such as my Grandad have a better quality of life? Eight years later, I lost three family members to cancer within a horrific four-month period. Having to attend two family funerals within the space of five days was an experience I would not wish upon anybody. But what was it about my Mum who seemed to be holding it together, when I was totally falling apart? How do we cope after a bereavement? Is palliative care actually good enough? How do you explain to children and teenagers that their family member is dying, or has died? At the time, I was working as a researcher in psycholinguistics research at the University of York. I quickly realised that although I found this work interesting, I wanted to conduct more real-world research, but I am still extremely grateful to the Professors and previous supervisors who believed in me and allowed me to become a considerably better researcher. However, I wanted to try and answer some of these questions that had arisen during this horrendous time for my family, and I wanted to design and conduct research that could help others who might find themselves in similar situations to myself.

All these experiences, alongside a lifelong interest in being active, set me in the direction of sport/exercise/health psychology, and upon registering for MSc Sport Psychology at Liverpool John Moores University, I immediately felt at home. LJMU School of Sport and Exercise Sciences' philosophy of actively involving participants in research was the abiding memory of my MSc, and has shaped the underpinning philosophy of this PhD thesis to a large extent. Upon completion of my MSc, this studentship was advertised in conjunction with Liverpool Heart & Chest Hospital NHS Foundation Trust, allowing me to conduct applied health research in one of the most research active NHS trusts in the UK. Upon reflection, this PhD has taught me more than I could have ever anticipated, both about myself and the setting I am working within, and I could not ask for a better hospital to spend three years in. I am extremely lucky to have found myself in a situation where I have been able to unite my personal experiences, passions and interests, with designing and conducting research with the aim of trying to improve everyday clinical practice.

Sadly, this project became even more personal when my Dad collapsed and died because of previously undiagnosed ischaemic heart disease in January 2020. In his memory, I hope that this project prevents other families having to share these experiences in the future. I hope that throughout this thesis the reader will be able to share my passion for my subject, my research, and attempting to use psychology to make a tangible difference to peoples' lives.

1.2 Thesis structure



Chapter One: Thesis Overview
To explain why I am interested in and undertook this PhD.
To provide an overview of the thesis structure.

Chapter Two: Literature Review
To outline key literature and policies associated with the thesis.
To provide an introduction to the theoretical framework underpinning the PhD.
To elucidate the social context and cardiopulmonary service that the research occurred within.

Chapter Three

Systematic Review

A systematic review investigating how SDT has been previously used to affect physical activity behaviours in clinical populations.

To elucidate why and how SDT is used in these interventions.

Chapter Four

Qualitative Study

To provide a qualitative understanding of Knowsley's rehabilitation context, and further elucidate the multicomponent nature of rehabilitation.

To identify potential intervention targets.

Chapter Five

Qualitative Study

To generate a theoretically-based and contextually-relevant understanding of behaviour change in rehabilitation.

To identify potential intervention targets.

Chapter Six

Qualitative Study

To investigate the perceived importance of psychology, and healthcare professionals' perceptions of existing professional development programmes.

To identify potential intervention targets.

Chapter Seven: Intervention Development and Feasibility Study
To explain how IPAiR was developed and how it aligns with the existing rehabilitation service.
To generate a SDT-based explanation of behaviour change in rehabilitation.
To assess IPAiR's preliminary acceptability and feasibility, as perceived by healthcare professionals.

Chapter Eight: Discussion and Conclusions
To provide an overview of the work conducted within the thesis in terms of key findings and limitations.
To position the work within this thesis within the broader applied health research field.
To provide recommendations for practice, policymakers, and potential future research directions.

Figure 1 A diagrammatic representation of the thesis structure and aims of each chapter.

Chapter 1, the present chapter, provides an outline of the PhD. Specifically, the thesis structure will be outlined by describing the aims, methods and key findings evident in each chapter.

Chapter 2 considers important topics that are central to the thesis, including physical activity (PA) behaviour change, intervention development, important applied health research discourses such as *evidence-based practice* and *practice-based evidence*, and an overview of how self-determination theory (SDT), which acts as the theoretical framework of the thesis, has previously been applied to the health domain. As previous health intervention research has been criticised for being too focused on the individual level, chapter 2 also analyses relevant health policies, such as those from the World Health Organisation (WHO), as well as in relation to National Institute of Clinical Excellence (NICE) guidelines to help to position the thesis within the broader health domain.

Chapter 3 describes the development, execution and findings of a systematic review and meta-synthesis of interventions that have utilised SDT to improve PA behaviour amongst clinical populations. This review uses traditional topic-based search processes alongside a CLUSTER search strategy (Booth et al., 2003) to investigate how previous interventions using SDT to increase PA levels amongst clinical populations have been developed. By doing so, using the MRC (2008) guidelines for developing and evaluating complex interventions as a framework, the chapter will identify examples of good practice during the intervention development phase, and where there may be gaps in the literature. Chapter 3 identified that SDT-based PA interventions in clinical populations do not exhaustively investigate the health context prior to intervention development. This means that the rationale and logic underpinning the inclusion of different active ingredients within each intervention is typically based upon correlational investigations conducted within non-clinical samples. Consequently, this chapter highlights that there is a need for future SDT-based intervention research to consider the needs of the health care setting, such as those of the healthcare professionals, patients and the constraints of standard clinical practice during the intervention development process. This will facilitate the development of interventions that are both contextually-relevant, as well as theoretically-driven. Recommendations for future intervention development are provided, and suggestions for future iterations of the intervention are highlighted.

Chapters 4, 5 and 6 outline a needs analysis in which semi-structured interviews were conducted with 19 CR and PR healthcare professionals and patients. Chapter 4 provides a descriptive account of Knowsley's cardiac and pulmonary rehabilitation (CR/PR) context, hence aiming to remediate aforementioned critiques of health intervention research that the intervention development process rarely features an extensive investigation of the service it will operate within. Specifically, it highlights the perceived aims and objectives of CR/PR and healthcare professionals' perceived importance of the different components within CR/PR, such as PA, the educational component, and the social aspects of the programme. Finally, the intervention targets arising from this chapter will be highlighted and will be revisited in the intervention development study discussed in chapter 7.

Chapter 5 analyses interview data through a SDT lens to facilitate a discussion of how SDT can explain barriers and facilitators of PA uptake and adherence within CR/PR. This approach provides a starting point for developing the intervention as it allows potential intervention targets to be identified, alongside providing a theoretically-based and contextually-relevant starting point for the intervention's logic model, underpinned by SDT.

Chapter 6 outlines logistical and contextual considerations that should be considered within the intervention development process. This chapter builds on the finding within chapter 4 that CR/PR provides more than simply an opportunity for patients to be active. Specifically, chapter 6 aims to highlight knowledge gaps evident within healthcare professionals' knowledge of the psychological aspects of rehabilitation such as behaviour change, as well as their perceived importance of psychology within CR/PR. To understand how an intervention tailored to CR/PR healthcare professionals should be delivered, chapter 6 outlines healthcare professionals' experience of participating in previous professional development courses as well as logistical considerations that need to be made during the intervention development phase. A key finding of chapter 6 is that healthcare professionals perceive existing professional development courses to fail to adequately explain how the course content can be incorporated into standard practice, meaning that the extent to which this new knowledge is utilised is perceived to be low.

The first section of **chapter 7** reports on how the intervention was developed, explaining how the findings of the literature review (chapter 2), systematic review (chapter 3), interview analysis from a SDT perspective (chapter 5), and service-level and logistical considerations (chapters 4 and 6) were triangulated. This development study aimed to identify potential intervention targets (evident in chapters 4, 5 and 6), ensure the intervention content was theory-based (chapter 3), and aligns with existing health policy (chapter 2). By doing so, chapter 7 discusses an approach to intervention design that embraces a simultaneous *evidence-based practice* (Greenhalgh et al., 2014) and *practice-based evidence* (Ammerman et al., 2014). Doing so ensures that the intervention is theory-based whilst also considering the demands of standard clinical practice, hence developing an intervention that is simultaneously theory-based and bespoke to the needs of Knowsley's CR and PR services.

Chapter 7 aims to remediate the aforementioned finding that the intervention development process is poorly explained within previous studies, and aims to provide an in-depth explanation of how the findings of previous chapters were synthesised. Within chapter 7, a discussion is also provided regarding how the intervention and the resources to deliver it were developed. The materials can be found in this chapter, with a commentary of why each component was selected and developed. The second half of chapter 7 highlights healthcare professionals' perceived prospective acceptability of the intervention, providing an opportunity to understand how the intervention could be further developed prior to a more extensive implementation or evaluation phase.

Chapter 8 is a general discussion, concluding the work undertaken as part of this thesis and aiming to position the findings within the wider context of intervention development, applied health research, and SDT. Chapter 8 provides a commentary of the practicalities, perceived utility and challenges associated with working in *a practice-based evidence* manner. The thesis concludes with recommendations for future research and summarises the implications of the findings on existing CR/PR practice.

1.3 Background and Original Contribution to Knowledge

This thesis' original contribution to knowledge spans research and practice. In terms of research, this PhD addresses gaps in knowledge regarding how to develop behaviour change interventions that can be integrated into routine clinical practice. In terms of theory, this thesis aims to understand how SDT can be used to understand uptake and adherence of PA within a specific cardiac and pulmonary rehabilitation service, before utilising this insight to form the basis of a psychosocial intervention. By doing so, the thesis provides a more nuanced understanding of how SDT can be operationalised in a manner that is cognisant of the context that it is aiming to influence. This approach is timely given the lack of consensus regarding how SDT should be translated into practice, alongside the ever-growing acceptance that healthcare professionals and patients should be involved during all stages of the intervention development, implementation and evaluation process.

Given the bottom-up approach taken in this thesis, there was initially only a vague idea of what the project should look like, and I was given a blank slate to go and do 'something relevant in psychology'. To facilitate this bottom-up and inductive approach, and in addition to the studies discussed throughout this thesis, I have spent time in team meetings, shadowed healthcare professionals and clinics, spoken to patients and their families and been cried on, taught myself how to use IRAS, taken the project through NHS Ethics, registered the project as a clinical trial, and developed more skills than I ever thought possible in three years. Although discussions and experiences of this sort do not constitute *'formal'* PhD studies, the learning curve I have negotiated over the course of these three years has been steep, and immersing myself in the context as much as possible has been central to this project's development and execution. I believe this immersion within the service and the drive to conduct a piece of research that has a high degree of practical utility for healthcare professionals is what sets it apart from other theses.

When my studentship commenced in September 2016, the anticipated plan was to design an intervention and investigate its effectiveness through a pilot randomised trial, which historically was perceived to be gold standard in health research. However, upon immersing myself in the literature, I quickly found that there has been a paradigm shift away from RCTs, reflected by the suggestion that too much trust is placed in RCTs over other methods of investigation (Deaton & Cartwright, 2018). In addition, the guidelines for intervention development paradoxically do not provide extensive guidance in how a research team should go about designing an intervention. This means that *"researchers exhibit a tendency to move straight to implementation, skipping the critical working out of the theory of change or are not clear about the specifics of the desired behaviours, the social processes they seek to alter, or the means by which the proposed interventions might achieve their hoped-for* *effects in practice"* (Davidoff et al., 2015, p. 231). This indicates that the process and contribution of intervention development is currently poorly understood, relative to subsequent stages of health intervention research.

In response to this claim, there has been a recent shift towards ensuring that patient and clinician involvement is mandatory when attempting to establish meaningful research questions and effective research design. This collaborative perspective underpins the approach adopted within this thesis: I knew that if I wanted to do a PhD that would hopefully make a difference and be sustainable once the research project has finished, key stakeholders such as healthcare professionals and patients needed to be on-board and involved with the whole process. Doing otherwise would immaturely assume that I could predict what they wanted or needed despite my lack of experience of working as a healthcare professional.

To embrace this notion of collaboration, I wholeheartedly believe it is important to understand the people who an intervention is aiming to influence, in order to better empathise with their situation, understand the challenges they are facing, and conduct research that will be of high practical utility. To achieve this, the thesis simultaneously embraces the *evidence-based practice* (Greenhalgh et al., 2014) and *practice-based evidence* approaches, by ensuring that the thesis is theoretically based, but closely attends to the needs of those who might use it (Ammerman et al., 2014). This approach assumes that aligning with current practice mitigates the risk of experiencing *wash out* of the context, where the principles and active ingredients of the intervention are not used following the conclusion of the research process. This makes any intervention practically redundant and means there has been only limited translation of research into practice. Therefore, rather than the intervention revolutionising the rehabilitation service and starting from a blank slate, it will act as an adjunct to standard practice, aiming to remediate identified knowledge gaps and complement an already strong CR/PR programme.

By simultaneously embracing the *evidence-based practice* and *practice-based evidence* approaches, this thesis advances the intervention development field by developing and evaluating a way of designing and implementing interventions in a manner that engenders collaboration between patients, healthcare professionals and academia. This led to the development of a theoretically-driven yet contextually-relevant intervention that is useful for the healthcare professionals but is also an example of rigorously conducted research, an approach advocated by MRC (2008). By focusing on the development, and prospective acceptability of the intervention, this thesis intends to ensure that healthcare professionals can use it after the research project has concluded. Practically, the PhD aims to elucidate how behaviour change interventions can be developed so that they can be incorporated into standard clinical practice, and how healthcare professionals can be supported to deliver behaviour change interventions in standard clinical practice. This overcomes the suggestions that behaviour change is not readily incorporated into standard healthcare practice (Glasgow et al., 2003) and is not evident within medical education curricula (Chisholm et al., 2012).

The project will be a success if healthcare professionals have access to a behaviour change intervention that they can use in the long-term, and not simply for the lifespan of the research project. By simultaneously aligning with the *evidence-based practice* and *practice-based evidence* approaches, this thesis will challenge the view that many researchers do not see it as their responsibility to think through the policy implications of their work (Brownson et al., 2006). By doing so, this approach aims to address the frighteningly long lag between research and practice that currently exists in health research, hypothesised to currently be around two decades. If successful, the thesis will demonstrate and evaluate the process of developing an evidence-based, contextually relevant intervention in approximately three years. In turn, this will remediate the claim that behaviour change research is currently not readily translated into standard clinical practice (Chisholm et al., 2012). The final chapter within this thesis will reflect upon precisely how successfully the project has been able to achieve these aims and provide recommendations for research teams aiming to develop interventions that influence everyday clinical practice.

1.4 Methods

This thesis comprises several methods. Firstly, the Medical Research Council (MRC, 2008) guidelines for developing and evaluating complex interventions acted as a starting point. Although the MRC guidelines advocate the use of theory during the development phase, they contain scant guidance pertaining to how to select and apply said theories (Michie, van Stralen, et al., 2011). Therefore, this thesis utilises a range of information sources, which is as follows:

(i) Relevant bodies of literature, including behaviour change, intervention development, and the practice-based evidence approach, and how each of these topics are evident within the health research domain.

(ii) The existing body of literature into how SDT can explain uptake and adherence of PA behaviours.

(iii) A systematic review investigating how SDT has been operationalised and used to develop interventions aiming to increase PA levels amongst clinical populations.

(iv) A qualitative needs analysis with rehabilitation staff and patients considering:

    a. How SDT is already evident in the Knowsley rehabilitation context.
    b. How SDT can be used to explain uptake and adherence of PA within CR/PR.
    c. Healthcare Professionals' (HCPs) levels of understanding of behaviour change and the psychological elements of CR/PR.
    d. Potential intervention targets that the intervention could aim to address.
    e. Once developed, the extent to which the intervention is perceived to be acceptable and feasible to incorporate into the existing CR/PR service.

(v) A study aiming to investigate the intervention's prospective acceptability to healthcare professionals working within CR/PR.

(vi) Documentary analysis of health policies and guidelines such as:

a. World Health Organisation (WHO) Global action plan on physical activity 2018-2030
b. British Association for Cardiovascular Prevention & Rehabilitation (BACPR) Standards and Core Components for Cardiovascular Disease Prevention & Rehabilitation (2017)
c. British Thoracic Society Guideline on Pulmonary Rehabilitation in Adults (2013)
d. American Thoracic Society/European Respiratory Society Statement: Key Concepts & Advances in Pulmonary Rehabilitation (2013)
e. National Institute for Health and Clinical Excellence (NICE) Guidance:
    i. Behaviour change: general approaches (2007)
    ii. Behaviour change: individual approaches (2014)

1.5 Ethical Approval

The research was given favourable ethical opinion by the North West - Greater Manchester West Research Ethics Committee (REC reference: 17/NW/0332; IRAS project ID: 226025) on the 9th June 2017.

Prior to gaining favourable opinion from the NHS REC, Liverpool Heart and Chest Hospital NHS Foundation Trust Research and Innovation Committee and the Service User's Research Endeavour (SURE) Group (A public, patient participation research support group) provided full approval. All research materials such as participant information sheets, consent forms and interview guides were evaluated to ensure they were fit for purpose and comprehensible for the SURE group. Additionally, the purposes and aims of the research process were discussed in the SURE meeting to ensure that it was acceptable and had clear patient benefits. No changes were required because of this meeting, demonstrating that patients and former service users perceived the research to be a worthwhile and valuable undertaking. The documents associated with the ethical approval process can be found in the documentation accompanying this thesis.

1.6 Epistemological Stance

The thesis is underpinned by a pragmatic epistemological stance, which it has been previously argued *"avoids the problems of realism and relativism and enables both critique and action"* (Cornish & Gillespie, 2009, p. 801). Such an epistemological stance is mindful of the different sources of knowledge within the health domain, such as the biological discourses, governmentality of health policy, and the 'traditional' approaches in health research where randomised controlled trials (RCTs) are considered the gold-standard. Practically, the adoption of pragmatism throughout the thesis facilitates a focus upon the purposes, consequences and implications of these different sources of knowledge within this healthcare context. Doing so offers an approach to research that goes beyond the realism-constructionism divide and allows action to be taken.

As well as focusing on *'research informed practice'*, which is commonplace throughout the NHS and health and social care settings, the adoption of pragmatism reflects my belief that any intervention developed during the PhD should align with the current practice. The practice informed research approach assumes that aligning with current practice mitigates the risk of experiencing *'wash out'* of the context, which is once the intervention ends, the principles and active ingredients of the intervention are not used, therefore making any intervention practically redundant and meaning there has been only limited translation of research into practice. Pragmatically, the adoption of this philosophy means that rather than the work within this thesis attempting to revolutionise the CR/PR service, it will act as an adjunct to standard practice, aiming to remediate identified knowledge gaps and complementing an already strong programme.

Chapter 2: Literature Review

2.1 Chapter Overview

In recent years, behaviour change has emerged as an important agenda across healthcare practice, medical education, public health and applied health research (Chisholm et al., 2012). This is reflected by an exponential growth of research aiming to change patients' health-related behaviours, and improve healthcare professionals' level of competence in delivering behaviour change as part of existing healthcare services (Public Health England, 2018). Chapter 2 considers important facets that are central to the programme of research within this thesis: behaviour change, intervention development, the tension of evidence-based practice and practice-based evidence, and a health policy analysis. Chapter 2 will also discuss how self-determination theory (SDT) can relate to these fields.

2.2 Cardiac and Pulmonary Rehabilitation

Cardiac Rehabilitation (CR) and Pulmonary Rehabilitation (PR) are multidisciplinary programmes of rehabilitation, typically lasting between eight and twelve weeks, incorporating physical activity, counselling, behaviour change and health education (British Thoracic Society, 2013; British Association of Cardiac Prevention and Rehabilitation, 2017). In 2019, the average duration of a CR programme across the UK was 76 days, with a range between 8 and 16 weeks. Across the 11 CR programmes in Cheshire and Merseyside, the average programme duration was 75 days (British Heart Foundation, 2019).

The aim of CR and PR is not only to prolong life, but to improve physical functioning, symptoms, wellbeing and health-related quality of life (Ski & Thompson, 2011). Research has demonstrated that CR is proven to be clinically and cost effective for improving physical and health related quality of life outcomes following a cardiac events such as myocardial infarction, percutaneous coronary intervention, coronary artery bypass graft, valve surgery, or following a diagnosis of heart failure (British Heart Foundation, 2019; Shields et al., 2018). CR has repeatedly demonstrated a range of physiological (Bjarnason-Wehrens et al., 2007) and psychological (Yohannes et al., 2010) benefits for patients, as well as reducing mortality and morbidity, reducing healthcare costs and enhancing the quality and productivity of people's lives (Cowie et al., 2019). CR/PR typically comprises four phases:

- Phase 1 – the period in hospital following the patient's acute event or surgery, where information on the patient's condition and recovery is provided;
- Phase 2 – an outpatient visit to review the patient's progress and decide their next steps for recovery;

- Phase 3 – structured and supervised PA training, together with continued education and psychological support in an outpatient setting;
- Phase 4 – the facilitation of long-term maintenance of lifestyle changes, occurring in community settings.

Similarly, PR is one of the most effective interventions for people suffering with COPD (Royal College of Physicians of London, 2018), with a Cochrane editorial stating that no further systematic reviews are required to show that PR improves patient-centred outcomes (McCarthy et al., 2015). Patients who complete PR have significantly improved quality of life, functional capacity, dyspnoea, activities of daily living, muscle strength, self-efficacy, and fewer days in hospital relative to participants who do not participate in PR (British Thoracic Society, 2013; Moore, 2017). Despite the benefits of CR and PR, uptake of and adherence to the programmes remain problematic. The 2019 National Audit of Cardiac Rehabilitation (NACR) demonstrated that although 135,861 patients within the UK were eligible for CR, only 68,074 participated in CR. These levels of uptake have remained constant at approximately 50% of the eligible population over the last decade (British Heart Foundation, 2019).

International clinical practice guidelines routinely recommend that cardiac patients participate in rehabilitation programmes for comprehensive secondary prevention, such as CR. However, data show that only a small proportion of these patients utilise CR, with a Cochrane review suggesting that more research is needed to discover the best ways to increase programme completion (Santiago De Araújo Pio et al., 2019). In the UK, the annual NACR, last conducted in 2019, investigated factors underpinning patients' lack of engagement with CR. This found that *"service-related factors"* (such as no referral, CR not being appropriate, a patient not attending when invited, or ongoing clinical investigations) constitutes 64.6% of the reasons given for non-attendance. *"Patient factors"* (such as patient refusal to uptake, their physical/mental incapacity, the patient dying or being too ill to enrol) was responsible for 27.5% of the population not attending, with work or social factors (return to work, language barrier or no transport) responsible for 7.9% of non-uptake. In relation to non-completion of CR, NACR 2019 proposes that the highest proportion for not completing is *"unknown reason"* (35.7%), and *"other"* constituting 31.2% of the population who did not complete CR (British Heart Foundation, 2019). Clearly, research is needed to further investigate behaviours that may be implicated in the currently problematic levels of uptake, adherence and engagement within CR.

The *British Association of Cardiac Prevention and Rehabilitation Standards and Core Components* (BACPR, 2017) outlines the core standards that patients, healthcare professionals and commissioners should expect from a CR programme. However, a reason for these poor rates of uptake and adherence may stem from the fact that there is much geographical variation in the mode of delivery and content of CR programmes. Consequently, patients face a postcode lottery, as their chances of being referred to a CR/PR programme and the quality of the programme will depend upon where they live (British Heart Foundation, 2017). Similarly, British Thoracic Society PR guidelines suggest that poor uptake and adherence remain significant problems (BTS, 2013). Of the 69,089 patients eligible for PR in 2015, less than

10% of those eligible were actually referred, and only 62% of those referred completed the programme (Moore et al., 2017).

As such, there is a need to better understand how these *real-world* rehabilitation programmes operate, how they have interpreted the current UK cardiac and pulmonary rehabilitation guidelines, and how the psychosocial aspects of the programme such as behaviour change are delivered. Doing so may help to elucidate the factors that give rise to these poor rates of uptake and adherence, as well as optimising the use of behaviour change, and will mean that research potentially has more value in informing translation. This is important as an effective intervention must be able to operate within the contextual constraints that characterise the *real-world* setting (Michie, 2008; Quested et al., 2017).

2.3 Physical Activity Behaviour Change

More people than ever are living longer with non-communicable diseases such as obesity, type two diabetes, and cardiovascular disease (Araújo-Soares et al., 2019). Non-communicable diseases are preventable due to their close association with health-related behaviours, such as PA, diet, smoking, and alcohol consumption (Public Health England, 2018). Although they are preventable, an estimated 41 million people worldwide died of non-communicable diseases in 2016, equivalent to 71% of all deaths. Four non-communicable diseases caused most of those deaths: cardiovascular disease (17.9 million deaths), cancer (9.0 million deaths), chronic respiratory diseases (3.8 million deaths), and diabetes (1.6 million deaths). Such is the sheer scale of these losses of life, the World Health Organisation (WHO) have suggested that compared with the advances against communicable diseases, there has been inadequate progress in preventing and controlling death from non-communicable diseases, and countries need more comprehensive strategies to reduce these causes of death more effectively if they are to achieve the global targets by 2030 (World Health Organization, 2020).

To reflect WHO's claims, a 2009 editorial in the *British Journal of Sports Medicine* suggested that *"physical inactivity has become the greatest public health problem of our time and finding a way to get patients more active is absolutely critical to improving health and longevity in the 21st century"* (Salis, 2009, p. 3). Physical inactivity is now perceived to be a global pandemic requiring immediate global action, with over 40% of adults failing to reach the minimum recommended level of 30 minutes of moderately intense PA five times per week, and half of all adults spending more than five hours sedentary every day (Ding et al., 2016; The Academy of Medical Royal Colleges, 2015). There are an estimated 5.3 million deaths per year due to conditions associated with inactivity, and a staggering $67.5 billion economic cost of physical inactivity worldwide through health-care expenditure and productivity losses. Even more worryingly, PA engagement levels have failed to significantly improve despite an increased number of countries formulating a national policy or plan that aims to remediate physical inactivity (Das & Horton, 2016; Ding et al., 2016).

Regular PA engagement reduces all-cause mortality by 30%, and can help to manage over 20 chronic conditions, including coronary heart disease, stroke, type 2 diabetes, cancer, obesity, mental health problems and musculoskeletal conditions (The Academy of Medical Royal Colleges, 2015). In relation to cardiac and pulmonary rehabilitation (CR/PR), Chronic Obstructive

Pulmonary Disease (COPD) patients' engagement in low-to-moderate intensity daily PA has been shown to enhance cardiorespiratory health and ability for exertion, and reduce dyspnoea symptoms (Hospes et al., 2009). Similarly, physical inactivity is an important independent risk factor for coronary heart disease, with PA reducing cardiac mortality by 31%, lowering blood pressure, and increasing levels of LDL cholesterol in cardiac patients. These effects occur through engagement in relatively low levels of activity: 150 minutes of moderate to vigorous PA per week (Yates et al., 2017).

Despite these health benefits, patients are less likely than non-symptomatic individuals to engage with PA (World Health Organization, 2018). Patients' adoption of a sedentary lifestyle is implicated in a cycle of less activity and worsening health, which in turn may exacerbate their existing symptoms (The Academy of Medical Royal Colleges, 2015). During a single day, COPD patients spend more time sitting and lying down and less standing and walking than age-matched non-symptomatic controls (Hospes et al., 2009). Similarly, a 2017 study assessed PA levels subjectively (using self-report methods), and objectively (using accelerometry), reporting that stable cardiovascular patients who were either diagnosed with heart failure or were post-coronary artery bypass graft did not engage in a sufficient level of PA, on average, to reduce their risk of cardiovascular disease. Particularly worryingly, none of the heart failure patients met the PA recommendations of 150 min/week of moderate to vigorous PA based upon the accelerometry data (Yates et al., 2017). Clearly, given the role that PA can play in primary and secondary prevention of non-communicable diseases such as COPD and cardiovascular disease, there is a need to better understand barriers and facilitators to PA behaviours amongst patient groups, with a view to intervene and increase their levels of PA.

Given the global societal and financial burden of non-communicable diseases and the pervasive problem of engaging patients in adaptive health behaviours such as physical activity, health care services and professionals are increasingly focusing upon behaviour change as a method of preventing and rehabilitating non-communicable disease (Chisholm et al., 2012; Public Health England, 2018). Evidence suggests that embedding behaviour change within primary and secondary care can lead to positive outcomes in terms of weight loss, smoking, alcohol consumption, and physical activity (Swann et al., 2009). Perhaps the most influential framework of behaviour change is the *Behaviour Change Wheel* (BCW) displayed in Figure 2 which suggests that the three essential conditions of capability, opportunity and motivation are all necessary to change behaviour (Michie, van Stralen, et al., 2011).

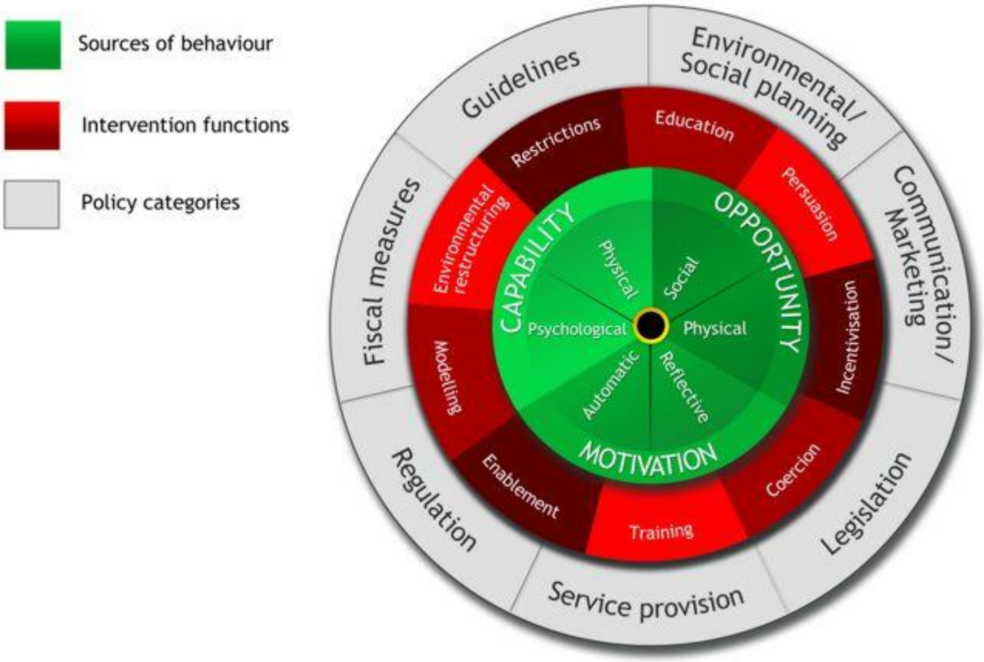


Figure 2 The Behaviour Change Wheel (Source: Michie, Van Stralen & West, 2011)

The BCW framework was developed by synthesising 19 existing behaviour change frameworks and can be used to explain behaviour change by outlining three essential conditions: capability, opportunity and motivation (Michie, van Stralen, et al., 2011). With these three essential conditions at the centre, the BCW provides a means to understand a target behaviour in a specific context. By doing so, this facilitates the development of interventions that change that behaviour by targeting these context-specific barriers. This model posits that there are three inter-related components, namely:

- Capability: the physical (e.g. strength) and psychological skills (e.g. knowledge) needed to perform the behaviour.
- Opportunity: the physical and social environment are such that the person feels they are able to undertake the behaviour.

- Motivation: the basic drives and automatic processes (e.g. habit and impulses) as well as reflective processes (e.g. intention and choice) (Coulson et al., 2016; Michie, van Stralen, et al., 2011).

The BCW links the three essential conditions to nine intervention functions explaining how an intervention can change behaviour (coercion, education, enablement, environmental restructuring, incentivisation, modelling, persuasion, restriction, training), and seven policy categories describing the decisions organisations and policymakers can take to facilitate the development and delivery of interventions (communication/marketing, environmental/social planning, fiscal measures, guidelines, legislation, regulation, service provision) (Michie and West, 2014).

Since its inception, an evidence base has accumulated in support of the BCW and the COM-B model becoming a frequently adopted approach within health psychology and public health (Public Health England, 2018). Despite this, alongside the fact that behaviour change is increasingly recognised as a core aspect of medical practice and education across a range of healthcare disciplines, medical professionals remain unprepared to discuss health-related behaviour change with their patients and are unclear of their behaviour change roles within contemporary health care (Chisholm et al., 2012). Therefore, despite the evidence base in support of the BCW and behaviour change more broadly, there is currently limited translation of this body of evidence into routine healthcare practice. To remediate this, behaviour change interventions need to be developed that better align with routine medical practice and can be readily incorporated into existing healthcare services.

2.3.1 Do we need theory to create interventions?

Behaviour change interventions are defined as *"coordinated sets of activities designed to change behaviour patterns"* (Michie, van Stralen, et al., 2011, p. 1), and generally, it is accepted that utilising theory to design and implement such interventions to promote health behaviour is good practice but seriously under recognised (Davidoff et al., 2015; Medical Research Council, 2008; Prestwich et al., 2015). Potential benefits of using theory to develop interventions include identifying contextual influences on quality improvement, supporting the generalisability of findings, anticipating how future phenomena might unfold, and providing robust explanations for understanding how, why and in what circumstances interventions work (Kislov, 2019).

However, the extent to which researchers use the theory to understand and act upon pervasive public health problems such as physical inactivity, smoking and poor diet is unclear (Glanz et al., 2015) as the use of theory as a basis for intervention design or development is little understood (Prestwich et al., 2014). Instead, Davidoff et al. (2015) argues that researchers exhibit a tendency to move straight to implementation. This means that they frequently skip the critical working out of the theory of change or are not clear about the specifics of the desired behaviours, the social processes they seek to alter, or how the proposed interventions might achieve their hoped-for effects in practice. In turn, this manifests as *"remarkably poor"* descriptions of what the intervention consists of, and reduces the potential of the intervention being replicated in other settings (Davidoff et al., 2015, p. 231).

In recognition of a lack of guidance relating to how interventions should be developed, Hoddinott (2015) provides the following working definition of an intervention development study; "*a study that describes the rationale, decision making processes, methods and findings which occur between the idea or inception of an intervention until it is ready for formal feasibility, pilot or efficacy testing prior to a full trial or evaluation*" (p. 36). To date, the decision-making behind the *'what', 'why'* and *'how'* of intervention development is seldom reported in the health literature, perhaps reflecting the lack of explanation of how to triangulate the sources of information the MRC outline within the development phase (O'Cathain, Croot, Duncan, et al., 2019).

Michie and colleagues suggest that because most intervention designers do not use an intervention design framework as a basis for developing new interventions, even when interventions are said to be guided by theory, in practice they are often not or do so only minimally (Michie, van Stralen, et al., 2011). Kislov (2019) corroborates Michie's claims, suggesting that a theoretically informed approach is currently dominant in improvement and implementation research, meaning that theory is applied to design an intervention or to systematise and explain evaluation findings, but may not be applied as extensively in the development phase. Such an approach, Kislov argues, means that although theory shapes data collection and analysis, little effort is made to explain what the resulting empirical findings mean for theory. Rather than taking this *theoretically-informed* approach, Kislov advocates the use of *theoretically-informative* research which, although guided by existing theory, could yield new theoretical insights that allows researchers to demonstrate what is already known, identify gaps in the theoretical knowledge, and subsequently focus on addressing them (Kislov, 2019).

Although it is possible to achieve quality research on the basis of intuition and experience with little help from formal theory, an approach where theory is sub optimally used will not help develop a science (Davidoff et al., 2015). Therefore, the lacklustre use of theory within intervention development is not only likely to result in limited changes for the better or no meaningful changes at all in terms of an intervention's success, but may be stagnating the progression of science and ultimately limiting our understanding of human behaviour.

It is evident that behaviour change intervention development research needs to utilise theory flexibly so that gaps in our current level of theoretical knowledge can be identified and remediated. In turn, this would facilitate the development of better quality behaviour change interventions that can demonstrate contextual relevance, and can more adequately translate into routine healthcare practice (Dixon-Woods et al., 2013). Taking a theoretically-informative approach aims to remediate the claims that interventions are only loosely based on theory, and may be able to assist with more effective translation of the extensive behaviour change evidence base into practice to remediate pervasive public health challenges such as physical inactivity.

2.3.2 Intervention Development Frameworks

When developing interventions, researchers have access to a range of frameworks, with the MRC's (2008) *developing and implementing complex interventions* guidance one of the most heavily cited. In 2000, the Medical

Research Council (MRC) produced a framework for the development and evaluation of complex interventions to improve health. The essence of the MRC framework was to standardise the processes for the development and evaluation of complex interventions in order to provide researchers and funders with consistent guidance (MRC, 2000).

In 2008, Craig and colleagues updated the MRC framework and in doing so provided a less linear and more flexible and equal account of the processes for developing and evaluating complex health interventions (Medical Research Council, 2008). The updated MRC guidance argues that *"too strong a focus on the main evaluation, to the neglect of adequate development and piloting work, or proper consideration of the practical issues of implementation, will result in weaker interventions, that are harder to evaluate, less likely to be implemented and less likely to be worth implementing"* (p.4). This demonstrates that it is no longer acceptable to simply focus on the outcomes that interventions produce. Instead, investigations offering a detailed understanding of how an intervention generates its effect, as well as a more rigorous development, optimisation and implementation process are necessary.

Despite the utility of the MRC (2008) guidelines within the later stages of implementing and evaluating complex interventions, a clear definition for the development phase was not provided, which may have contributed to the dearth of published intervention development studies or insight into how interventions are developed.

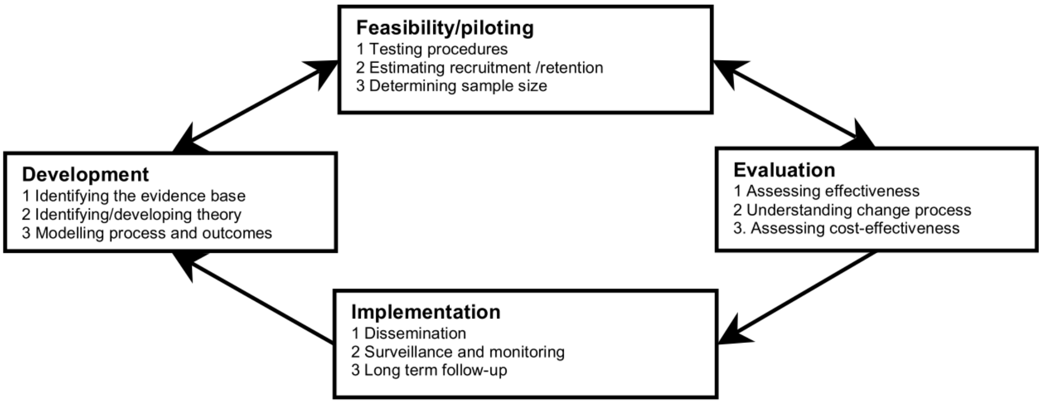
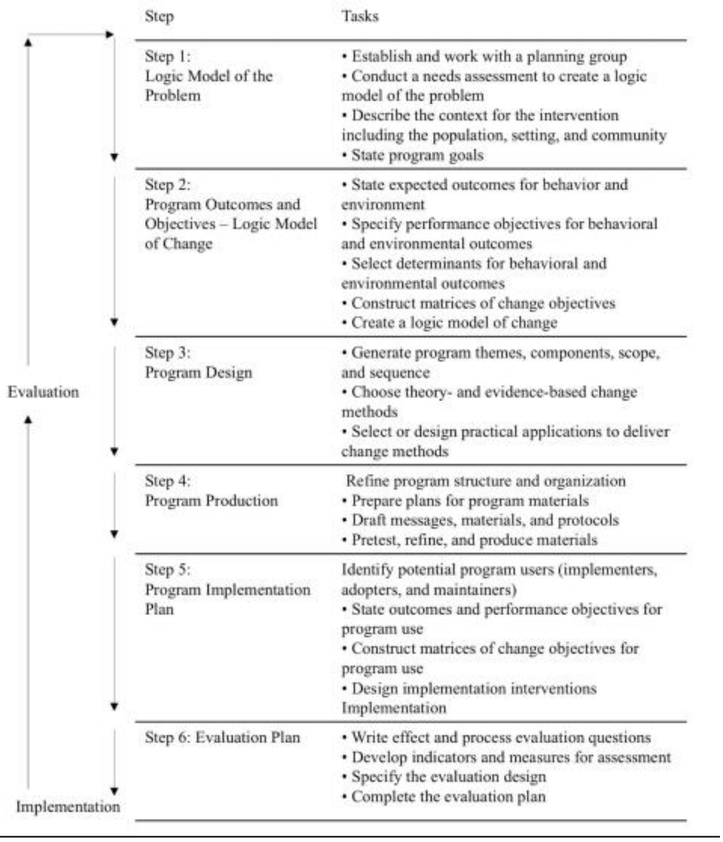


***Figure 3* Key elements of the intervention development and evaluation process (Source: MRC, 2008)**

Three key elements of the development and evaluation processes are outlined by Figure 3, these are; 1) identifying an evidence base (for example by conducting a systematic review), 2) identifying/developing appropriate theory (by developing a theoretical understanding of the likely process of change, supplemented if necessary by new primary research), and 3) modelling process and outcomes via a series of pilot studies, prior to an exploratory evaluation in the form of a feasibility study. However, MRC (2008) does not extensively elucidate the specific processes relating to precisely how a research team should triangulate and utilise these sources of information to develop an intervention.

Since its publication in 2008, the MRC guidance has been criticised for failing to pay adequate attention to the process of intervention development. This means that to date, the decision-making behind the *'what', 'why'* and *'how'* of intervention development is seldom reported in the health literature, perhaps reflecting the lack of explanation of how to triangulate the sources of information the MRC outline within the development phase. To acquire this information, intervention mapping (IM) is proposed as an alternative framework for intervention development. The IM approach includes key stakeholders at the heart of developing, implementing and evaluating interventions, which is increasingly perceived to constitute best practice (Greaves et al., 2016). IM's six-step approach is outlined by figure 4.



Step	Tasks
Step 1: Logic Model of the Problem	• Establish and work with a planning group • Conduct a needs assessment to create a logic model of the problem • Describe the context for the intervention including the population, setting, and community • State program goals
Step 2: Program Outcomes and Objectives – Logic Model of Change	• State expected outcomes for behavior and environment • Specify performance objectives for behavioral and environmental outcomes • Select determinants for behavioral and environmental outcomes • Construct matrices of change objectives • Create a logic model of change
Step 3: Program Design	• Generate program themes, components, scope, and sequence • Choose theory- and evidence-based change methods • Select or design practical applications to deliver change methods
Step 4: Program Production	Refine program structure and organization • Prepare plans for program materials • Draft messages, materials, and protocols • Pretest, refine, and produce materials
Step 5: Program Implementation Plan	Identify potential program users (implementers, adopters, and maintainers) • State outcomes and performance objectives for program use • Construct matrices of change objectives for program use • Design implementation interventions Implementation
Step 6: Evaluation Plan	• Write effect and process evaluation questions • Develop indicators and measures for assessment • Specify the evaluation design • Complete the evaluation plan

Figure 4 Intervention Mapping Approach (Source: Fernandez et al., 2019).

IM is a cumulative and iterative process, providing a blueprint for designing, implementing and evaluating an intervention based on a foundation of theoretical, empirical and practical information (Bartholomew-Eldrigde, Markham, Ruiter, Fernàndez, Kok, & Parcel, 2016, p13). As demonstrated by figure 4, IM comprises six stages and suggests that broad participation of community members is essential to effective program development. In contrast to the MRC's guidance, IM necessitates a focus on four key processes: (1) involving representatives from the target population, stakeholders, and implementers in brainstorming in the planning group; (2) searching through empirical literature for determinants of behaviour or environmental conditions; (3) identifying and applying pertinent theories on determinants that influence these; and (4) conducting qualitative and quantitative research to explore unanswered questions. These processes demonstrate how IM can facilitate the development of interventions that are theoretically based, as advocated by the MRC (2008).

IM's focus on inclusive community participation helps ensure that the intervention's focus reflects concerns from the local community who the intervention aims to influence. Such an approach is posited to improve external validity of interventions by recognising the local knowledge, skills and expertise of community members and practitioners. Additionally, community participation has been suggested to make evidence-based health promotion interventions more acceptable to potential participants when the research that has produced the evidence *"does not originate under special circumstances in distant places"* (Green & Mercer, 2001, p. 1928). Similarly, organisational interventions have been demonstrated to be most effective when they are compatible with the culture, so it is important to understand the culture of the organisation in which an intervention is being developed and implemented.

2.4 Evidence-Based Practice or Practice-Based Evidence?

The previous section highlighted that the use of theory is currently under-reported during the intervention development process (Davidoff et al., 2015; Kislov, 2019; Kislov, Pope, et al., 2019). Second, it demonstrated that the development phase should allow features of the intervention context to map onto specific intervention components, aiming to facilitate greater and quicker integration into routine clinical practice. Without these considerations, clarity about the specifics of the desired behaviour, the processes the intervention seeks to alter, and the means by which the intervention will achieve its effect will not be elucidated (Davidoff et al., 2015). To build on these points, section 2.4 investigates the broader applied health research domain and the concepts of evidence-based practice and practice-based evidence, before highlighting the implications of these complementary approaches (Ammerman et al., 2014) for this thesis.

The term evidence-based practice was first coined in 1991, and is synonymous with a shift away from clinical practice being underpinned by expert opinion, experience and authoritarian judgement (Sur & Dahm, 2011). Instead, largely drawing on evidence from high-quality randomised control trials (RCTs) and observational studies, evidence-based practice has contributed to making clinical practice more scientific and empirically grounded, safer, more consistent and more cost effective. However, critics have expressed concerns that the emphasis on experimental evidence devalues basic science and the tacit knowledge that accumulates with clinical experience (Greenhalgh et al., 2014).

Despite the suggestion that RCTs constitute gold-standard research in comparison to non-experimental approaches, many investigators have argued that proponents of the evidence-based practice approach have an overreliance on the RCT (Sur & Dahm, 2011). This is problematic as RCTs may be less useful for investigating chronic diseases, which may arise through an interaction of biological, social, behavioural and environmental risk factors. This complexity of the antecedents of chronic disease calls for innovative approaches to research design that can facilitate a deeper understanding of these risk factors, rather than simply demonstrating whether an intervention is effective or not (Ammerman et al., 2014). The shift away from solely conducting RCTs is also evident within MRC (2008), where non-randomised studies are recommended as a method of collecting information that allows an intervention to be refined and piloted prior to an RCT being conducted. Through a primary focus on RCTs, the evidence-based medicine approach has been criticised for failing to incorporate the soft data that clinicians use to formulate treatments (Sur & Dahm, 2011). Therefore, although evidence-based medicine should not be completely rejected as it has undoubtedly advanced health research and saved lives (Greenhalgh et al., 2014), alternative approaches should be considered. Doing so aims to build on the evidence-based practice approach whilst achieving this contextual depth that successful intervention development is predicated upon (Bartholomew Eldrigde et al., 2016; Fernandez et al., 2019).

To attempt to remediate these concerns associated with the evidence-based practice approach, implementation science, defined as *"the scientific study of methods to promote the systematic uptake of research findings and other evidence based practiced into routine practice"* (Nilsen, 2015, p. 2), has emanated from the evidence-based practice movement. It is underpinned by a sequential, structured, and often top-down method of improving healthcare services (Greenhalgh et al., 2014; Greenhalgh & Papoutsi, 2019). However, it could be argued that such a top-down approach may not deliver the depth of understanding that effective intervention development requires. For example, an intervention within an intensive care unit in the UK that took a top-down approach was perceived to be too driven by government, rather than professionally led and collaborative. Consequently, the effectiveness of the intervention was limited, in that it received little support from healthcare professionals meaning it was not extensively incorporated into routine clinical practice (Dixon-Woods et al., 2013).

Given the current estimates that there is a 17-year time lag of research evidence to be translated into practice, (Green, 2009), alternative approaches to the top-down evidence-based practice approach need to be considered that will allow the ever-expanding body of behaviour change research to be readily incorporated into practice. Ammerman et al. (2014) suggest that the current dominance of evidence-based practice means that when attempting to translate research into practice, clinicians and healthcare professionals are faced with implementing interventions that were designed by researchers with limited knowledge or understanding of the environment in which interventions will be used. To corroborate Dixon-Woods et al. (2013), evidence-based interventions are perceived to be highly resource dependent, meaning they fail to be adopted and are seldom maintained over time. Consequently, the original reason for adopting an evidence-based practice approach, to assure that the intervention will have an impact when implemented, is thwarted because the interventions are designed to achieve evidence of impact alone rather than to promote implementation at the practice level (Ammerman et al., 2014). This corroborates previously made claims that contextual considerations are rarely made within the intervention development phase, meaning that logistical considerations that may influence how the intervention should be designed so that it can align with standard clinical practice are not typically incorporated into the intervention development phase.

To remediate the concerns about the evidence-based practice approach, Greenhalgh et al. (2014) suggest that those who produce research evidence should attend more closely to the needs of those who might use it. To achieve this, practice-based evidence is advocated as a complementary approach to evidence-based medicine (Lemoncello & Ness, 2013). Practice-based evidence first requires a deep understanding of the challenges faced by both those who deliver and those who receive the intervention, in this instance CR/PR. This method generally requires work in the community or setting, where the research strategy is informed by the experience of patients, healthcare professionals and researchers (Ammerman et al., 2014).

The importance of this formative work within the practice-based evidence approach is similar to the principles outlined by IM. Within this thesis, this rationalises the qualitative needs analysis that was conducted to understand the CR/PR context and what a psychosocial intervention within this context should aim to achieve. Collaboratively, sections 2.3 and 2.4 demonstrate how IM extends the MRC (2008) guidance to intervention development, which has previously been criticised for its inability to explicate how interventions should be developed (Hoddinott, 2015). Based on the recommendations of the MRC (2008), IM, evidence-based practice and practice-based evidence, this thesis contains a systematic review that aims to understand how self-determination theory has previously been operationalised to affect PA behaviours within clinical settings. This aims to facilitate understanding of how and why SDT is used, and will allow closer mapping between theory and context. Additionally, a literature review will be conducted to ensure that policy guidance or other empirical research that may fall outside the scope of this systematic review but is still important to the intervention is considered within intervention development.

Within IM and the practice-based evidence approaches, the importance placed upon formative research remediates the evidence and practice gap where the process of development appears to be dependent upon researchers' assumed understanding of the context and potential antecedents of the target behaviour. In conjunction with an in-depth understanding of the intervention context, formative research provides a starting point from which contextually-relevant and theoretically-driven intervention development can occur (Fernandez et al., 2019). In this thesis, an inductive approach will be taken to understand what a psychosocial intervention within CR/PR should aim to achieve. Formative research will take the form of semi-structured interviews with patients and healthcare professionals, with the aim of developing a deep understanding of the CR/PR context and issues that a psychosocial intervention could attempt to remediate. Doing so will also engender closer mapping between the intervention and experiences of key stakeholders. This may also help to overcome issues with knowledge translation that is currently hypothesised to span two decades (Brownson et al., 2006) by aiming to develop an intervention that is cognisant of and able to align with standard clinical practice.

2.5 Health Policy analysis

This section aims to address the criticism commonly levelled at psychosocial health interventions that they often do not extend beyond the individual level. By doing so, critics argue that such interventions generally ignore the wider contextual determinants of health that may also influence health behaviours (Hagger & Weed, 2019). Furthermore, the incorporation of health policy into intervention development ensures that the intervention is not simply underpinned by a theoretical explanation of behaviour, evident in chapter 5. Instead, the inclusion of policy ensures that the intervention is evidence-based in that it draws on extant literature and a contextually based understanding of behaviour.

Accordingly, this section will analyse all health policies that are relevant to the intervention, spanning cardiac rehabilitation (BACPR), pulmonary rehabilitation (BTS), and the broader public health discourses (NICE & WHO). Specifically, these policies will be evaluated based on their discussions of behaviour change, clinical physical activity, and recommendations and suggestions that should be made during the intervention development process. Finally, this section will discuss the implications of each of these policies for the development of the intervention.

The following policies will be analysed:

- NICE Behaviour change: general approaches (2007)
- NICE Behaviour change: individual approaches (2014)
- BACPR Standards and core components (2017)
- BTS guidelines on pulmonary rehabilitation in adults

- American Thoracic Society/European Respiratory Society Statement: Key Concepts & Advances in Pulmonary Rehabilitation (2013)
- WHO Global Action Plan on Physical Activity 2018-2030: More active people for a healthier world (2018)

2.5.1 NICE Behaviour Change: General Approaches PH6 (2007)

National Institute for Health and Care Excellence (NICE) guidelines are evidence-based recommendations for health and care in England, setting out the care and services suitable for most people with a specific condition or need, and people in particular circumstances or settings. The guidelines help health and social care professionals to prevent ill health, promote and protect good health, improve the quality of care and services, and adapt and provide health and social care services (NICE, 2020).

Behaviour change: general approaches (PH6) provides the most extensive guidance for intervention developers. For example, a framework for development is provided that highlights ten concepts that should be considered during the development phase, such as "*participants' outcome expectancies, self-efficacy, and relapse prevention*" (p.12).

This guideline also draws upon principles of realist evaluation (Pawson, 2004) to outline considerations that need to be made during the intervention development stage: *"Firstly, be specific as possible about its content. Second, spell out what is done, to whom, in what social and economic context, and in what way. Third, make it clear which underlying theories will help make explicit the key causal links between actions and outcomes"* (p.14). The authors concede that at the time of writing in 2007, evidence of this sort was often very weak and therefore intervention developers are encouraged to attend to these principles to enhance the science of intervention development.

The need for clarity about target behaviours is also frequently discussed within this guideline, with several considerations to be made during intervention development. These include: *"What behaviour are you seeking to change?"* and *"What contextual factors need to be taken into account (what are the barriers to and opportunities for change and what are the strengths/potential of the people you are working with)?"* (p.14) are highlighted as key considerations of the intervention development phase. The notion of context is extensively discussed, with the suggestion that interventions should *"take into account the local and national context and working in partnership with recipients. Interventions and programmes should be based on a sound knowledge of community needs and should build upon the existing skills and resources within a community"* (p.20). Context is also perceived to be important during the intervention evaluation stage, with intervention developers encouraged to *"consider in detail to socio-environmental context and how it could impact on the effectiveness of the intervention or programme"* (p.21). In relation to this thesis, an in-depth investigation into Knowsley's CR/PR context is discussed in Chapters 4-6.

This guideline also discusses the need for evidence-based tools for practitioners to support behaviour change, suggesting that interventions should be based on *"theoretically-informed, evidence-based best practice"* (p.20). With reference to individual-level interventions, the guideline makes four recommendations, demonstrating the perceived need for individuals to ‘*understand the consequences of behaviour, plan their changes in terms of easy steps over time, formulate relapse prevention strategies, and make a personal commitment to adopting health-enhancing behaviours by setting clearly defined goals, which they should then share with other people’* (p.23).

2.5.2 NICE Behaviour Change: Individual Approaches PH49 (2014)

This guideline is particularly useful for intervention development, providing recommendations for developing behaviour change interventions that are *“acceptable, practical and sustainable”* (p.12). This aims to ensure they are evidence-based and have objectives that have been developed and agreed with stakeholders who will utilise the intervention, highlighting how co-development of interventions between researchers and key stakeholders is perceived to be important. Additionally, the intervention’s mechanism of action and how the intervention is hypothesised to operate should be clearly articulated. As is evident in NICE’s general approaches guidance, a framework for describing interventions is provided and extended by suggesting all behaviour change techniques should be clearly defined and rationalised.

In terms of delivering training on behaviour change interventions, the guidance recommends that behaviour change knowledge, skills and delivery techniques should constitute a formal element of healthcare professionals’ training and continuing professional development for healthcare professionals (p.20). Additionally, the guidance articulates the need for interventions that can assess people’s needs using validated assessment tools and measures (p.22). This allows healthcare professionals to select appropriate evidence-based interventions that can be tailored to suit patients’ specific needs, such as their cultural, social and economic needs (p.19). Clearly, this guidance highlights the need for behaviour change interventions that are co-developed between researchers and stakeholders and are aligned with existing practice, so they can be readily integrated into services, rather than constituting stand-alone projects or pieces of research.

2.5.3 BACPR Standards and Core Components (2017)

The *BACPR standards and core components* provide a set of minimum quality standards for CR services across the UK to adhere to. In terms of psychological provision, a practitioner psychologist is included in a list of specialists that an accredited CR programme may include. Although BACPR recommend holistically assessing patients' psychosocial health, and equipping CR teams with the skills to alleviate *"the normal range of emotional distress associated with a patient's precipitating cardiac event"* (p.16), there is no mandate for support to be available within a service from a chartered psychologist unless the patient requires a referral to a clinical psychologist for reasons such as clinical levels of anxiety or depression. Currently within the UK, 22.4% of CR service have a practitioner psychologist, and 9% of CR services have a counsellor as part of their multidisciplinary team (British Heart Foundation, 2019). Despite this, the BACPR recommend adopting a *"biopsychosocial evidence-based approach which is culturally appropriate and sensitive to individual needs and preferences"* (p.11), hence demonstrating the importance of integrating psychological and psychosocial content within an effective CR service.

Within the guidelines there is extensive guidance pertaining to the kinds of psychological content that should be included within CR. For example, Standard 3 (early initial assessment of individual patient needs) suggests that there should be early assessment of individual patient needs, which informs the identification of, agreed personalised goals that are reviewed regularly.

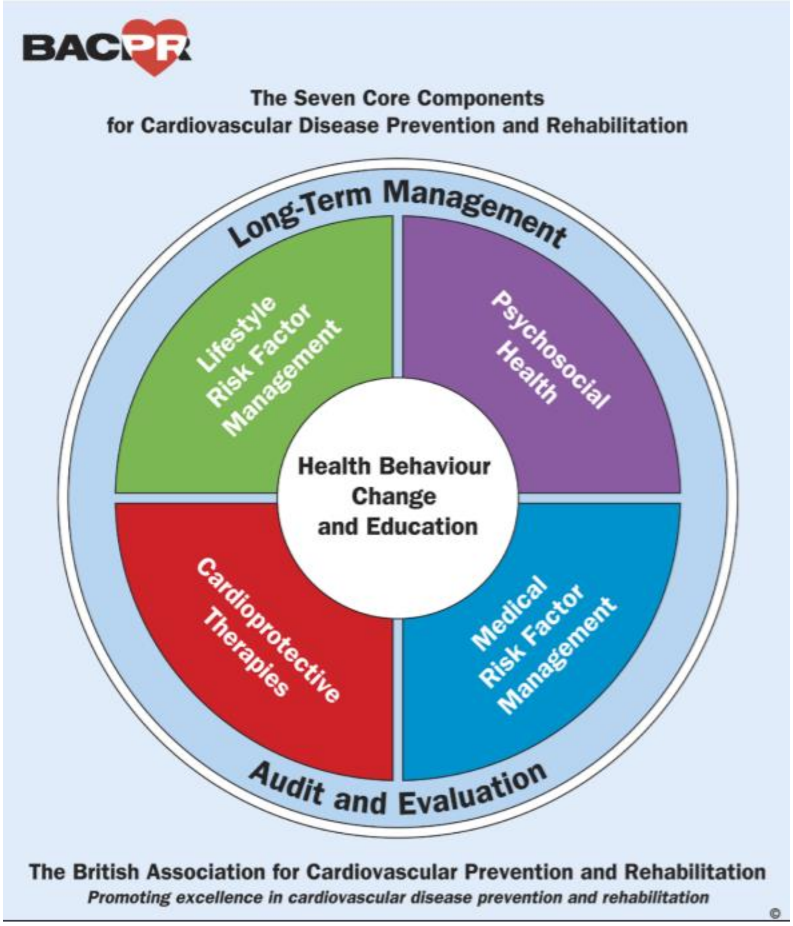


Figure 5: BACPR Seven Core Components of Cardiovascular Disease Prevention and Rehabilitation (Source: BACPR, 2017).

As demonstrated by Figure 5, health behaviour change and education is portrayed as integral to all other components of rehabilitation and is one of the BACPR's seven core components of CR, highlighting its importance and central role within a successful CR programme. Additionally, this standard suggests that physical, psychological or behavioural barriers and facilitators of behaviour change should be identified within the patient's initial assessment, and that the defined pathway of care should meet the individual patient needs, preferences and choices, with regular reviews of goals conducted. In a subsequent publication, one of the authors of the BACPR guidance suggested that the *"adoption of healthy behaviours and the development of self-management skills remains the foundation of long-term CVD prevention and rehabilitation, and health behaviour change and education remains fundamental to all other components of CVD prevention and rehabilitation"* (Cowie et al., 2019, p. 4). This demonstrates the integrity of behaviour change at the heart of a successful CR service.

BACPR suggest that health behaviour change interventions and key behaviour change techniques underpinned by an up-to-date evidence base are required, and staff should receive training in communication skills that may include motivational interviewing and relapse prevention strategies. In terms of specific behaviour change techniques, goal-setting, pacing skills, and exploring problem-solving skills are suggested to improve long-term self-management, along with regular follow-up sessions to assess feedback and advice on further goal setting.

2.5.4 BTS Guidelines on Pulmonary Rehabilitation in Adults (2013)

In a similar vein to the BACPR core components, the British Thoracic Society (BTS) published guidelines on pulmonary rehabilitation (PR) in adults. The guidelines define PR as *"an interdisciplinary programme of care for patients with chronic respiratory impairment that is individually tailored and* *designed to optimise each patient's physical and social performance and autonomy"* (p4). PR aims to provide a clinically significant increase in exercise capacity, dyspnoea and health status amongst patients with Chronic Obstructive Pulmonary Disease (COPD). Further, PR should be offered to COPD patients with a view to improving psychological wellbeing, with coexistent symptoms of anxiety and/or depression not precluding referral to PR.

In comparison to the BACPR CR guidelines, BTS is more limited in psychosocial content. Guidelines suggest the use of goal setting within PR, to *"address specific hurdles"* (p.2). However, the guidance suggests, *"given the personalised nature of this intervention to a patient's needs, evidence is difficult to quantify"* (p.7). The use of cognitive-behavioural therapy (CBT) is also discussed, suggesting that pre-PR interventions using such techniques may improve PR completion (p.8).

2.5.5 American Thoracic Society/European Respiratory Society Statement: Key Concepts & Advances in Pulmonary Rehabilitation

(Spruit et al., 2013)

As the British guidelines fail to provide extensive guidance regarding psychology or behaviour change, the European guidelines were analysed. As is the case in the BTS guidance, CBT is discussed as an effective method of inducing behaviour change in COPD patients, offering *"relatively simple and structured techniques that can be incorporated by the members of the multidisciplinary team"* (p.28). Operant conditioning, changing cognitions, enhancement of self-efficacy, and addressing motivational issues are outlined as potential facilitators of behaviour change, however, practical guidance for how healthcare professionals can incorporate these factors into their practice is not provided.

2.5.6 **WHO Global Action Plan on Physical Activity 2018-2030: More Active People for a Healthier World (2018)** (World Health Organization, 2018b)

The World Health Organisation's (WHO) Global Action Plan on PA (GAPPA) aims to deliver a 15% relative reduction in the global prevalence of physical inactivity in adults and adolescents by 2030. By doing so, it utilises a systems-based approach, rather than a single policy solution. Previous versions of similar documents have been criticised by scholars for describing goals of reductions in inactivity that they wish to achieve within the lifespan of the document, without outlining how they intend to achieve these targets. To further elucidate this concern, a review of progress towards the World Health Assembly's 2013 aim to deliver a 10% relative reduction in the prevalence of insufficient PA by 2025 demonstrated that progress has been slow and uneven across high-, medium- and low-income countries. Instead, the 2018 GAPPA *"responds to the requests by countries for updated guidelines, and a framework of effective and feasible policy actions to increase PA at all levels"* (World Health Organization, 2018, p.6), therefore aiming to provide more prescriptive guidance of how to reduce physical inactivity.

GAPPA outlines four strategic objectives, with twenty evidence-based policy actions that collaboratively aim to increase PA. These four strategic objectives are to *create active societies, create active environments, create active people,* and *create active systems.* With respect to the focus of this thesis, strategic objectives one (*create active societies*) and three (*create active* *people*) were perceived to be particularly important. WHO suggest that member states should aim to create active societies by *"developing a national communication strategy for PA as part of, or aligned with, a national action plan on PA to raise awareness and knowledge of the health benefits of PA, promote behaviour change an increase health and physical literacy"* (p.63), demonstrating the need to provide educational components of interventions in order to better explain the health benefits of PA and why individuals should engage.

As is evident in the previously discussed NICE guidance, WHO suggest that healthcare professionals should be educated about the importance of physical activity, with providers encouraged to *"strengthen the preservice and in-service curricula of all medical and allied health professionals to ensure effective integration of the health benefits of physical inactivity into the formal training"* (p.67). This demonstrates that behaviour change interventions focused around affecting physical activity levels should also consider how well healthcare professionals, who are tasked with helping to increase activity amongst patient groups, understand the benefits of an active lifestyle so they are able to express this to patients and encourage them to change their lifestyle behaviours.

The second strategic objective within GAPPA that is important to this thesis is '*create active people*'. This objective reflects content highlighted in the BACPR guidance by suggesting that that steps should be taken to *"implement and strengthen systems of patient assessment and counselling on increasing PA and reducing sedentary behaviour in primary and secondary health care"* (p.36), demonstrating the need for interventions that equip healthcare professionals with these sorts of skills and allow psychology to be more effectively embedded within existing healthcare services. Guidance for researchers is also provided: *"researchers should support and conduct research to identify barriers facing those communities identified as least active, to inform the development and implementation of programmes and approaches, to increase participation in PA in these subpopulations, including conducting equity analysis of current sport and other related policies, particularly in LMICs"* (p.84). This suggestion highlights the need for preliminary exploratory research to be conducted that will elucidate context-specific barriers and facilitators of PA engagement, and subsequently inform intervention development.

2.5.7 Implications of the Health Policy Analysis

Collectively, these policies and guidelines exert an influence over how CR/PR is conducted, and will therefore influence the intervention's development, content and execution. A commonality across a number of guidelines is the perceived importance of engaging healthcare professionals and patients who will utilise such interventions during the intervention development phase. This is perceived to ensure that interventions are contextually relevant, in that they are aligned with the features of standard clinical practice.

A second recommendation from the policy analysis is the importance of considering the local and national context during intervention development. For example, GAPPA suggests that researchers should conduct exploratory research during the intervention development phase to investigate barriers that may prevent the target population engaging in PA. From here, an intervention should be developed that will allow these barriers to be alleviated and underpinned by a sound knowledge of community, demonstrating the importance of stakeholder engagement within intervention development. This sentiment is shared by a number of policies, particularly the three previously discussed NICE guidelines.

NICE's guidelines provide several recommendations for the intervention development phase. For example, researchers are encouraged to clearly define an intervention's mechanisms of action and provide a definition and rationale of the objectives and behaviour change techniques that are evident within an intervention. BACPR and BTS guidelines highlight specific behaviour change techniques that healthcare professionals are encouraged to use within CR/PR: goal setting, motivational interviewing and communication skill training for healthcare professionals, relapse prevention strategies, problem solving, and the opportunity to discuss their success at implementing these techniques through the inclusion of follow-up sessions (BTS, 2013; BACPR, 2017). To make the intervention relevant to policies that dictate how CR/PR should operate within the UK, these techniques should be considered during intervention development to provide a tangible link between the intervention and the policies that influence CR/PR practice.

In terms of intervention content, the health policy analysis highlights that interventions should equip healthcare professionals with the skills to deliver behaviour change counselling to their patients, further highlighting the need for interventions that can be integrated into existing services.

Additionally, interventions should be evidence-based and theoretically informed, and ideally should form a core component of healthcare professionals' continuing professional development and formal training. In terms of the psychological elements of rehabilitation, BACPR suggest a biopsychosocial approach should be taken to rehabilitation, demonstrating that the complex system approach to behaviour change that is increasingly popular across public health is also evident within CR/PR. Further, BACPR suggest that healthcare professionals working within CR should be able to *"alleviate the normal range of emotional distress"* (p.16) evident after a cardiac event, suggesting counselling-based approaches could be incorporated into interventions to allow healthcare professionals to remediate psychological issues that are not clinically significant. The recommendations made within section 2.3 will be discussed in the development phase in chapter 7.

2.6 Theoretical Framework: Self-Determination Theory

Within the field of health behaviour change research, there has been a shift in focus from simply examining predictors of behavioural adoption to examining the determinants of long-term behavioural change (Ng et al., 2012). This has been explicated by the finding that interventions based on the Health Belief model, Theory of Planned Behaviour, or the Transtheoretical Model achieved only small to moderate effects on health behaviours (Barkoukis et al., 2010). Additionally, and perhaps more importantly, there was very limited evidence that these effects could be explained by changes in the relevant theoretical constructs. Consequently, the theories that are often used to inform the development of behaviour change interventions may not be particularly suitable or fit for purpose (Prestwich et al., 2015). This claim is also reflected by the suggestion that it is unclear whether interventions that are believed to be based on empirical evidence are *evidence-based* or *evidence-inspired* (Michie & Abraham, 2004).

Models such as the Health Belief Model typically fail to consider the motivational aspect of behaviour change, which the BCW portrays as a particularly pervasive component of effective behaviour change interventions (Michie, van Stralen, et al., 2011). With approximately over half of the population failing to engage with sufficient levels of PA, large numbers of individuals may be either in a state of amotivation or may be extrinsically motivated, which has been demonstrated to not lead to sustained PA engagement (Teixeira, Carraça, et al., 2012). Therefore, more effective investigations into how patients with chronic disease can become more intrinsically motivated to engage in PA are needed, with the aim of such findings influencing healthcare provision so that healthcare professionals' practice can better reflect these research developments.

Self-Determination Theory (SDT) is a meta-theory composed of five sub-theories that considers the interaction of personal and environmental characteristics as determinants of behaviour. SDT provides a broad framework within which human motivation, personality and behaviour can be studied, and argues that humans are inherently active, self-motivated and eager to succeed (Deci & Ryan, 2000; Ryan & Deci, 2000). It is the only theory of motivation that explicitly identifies autonomy as a human need that, when supported, facilitates more autonomous forms of behavioural regulation. SDT has previously been applied to a number of different areas, such as parenting, health, education, work, psychotherapy and sport (Deci & Ryan, 2008; Ng et al., 2012). Figure 6 depicts the interaction of the meta-theories within SDT (source; Hagger & Chatzisarantis, 2007), which will then be explained over the proceeding section.

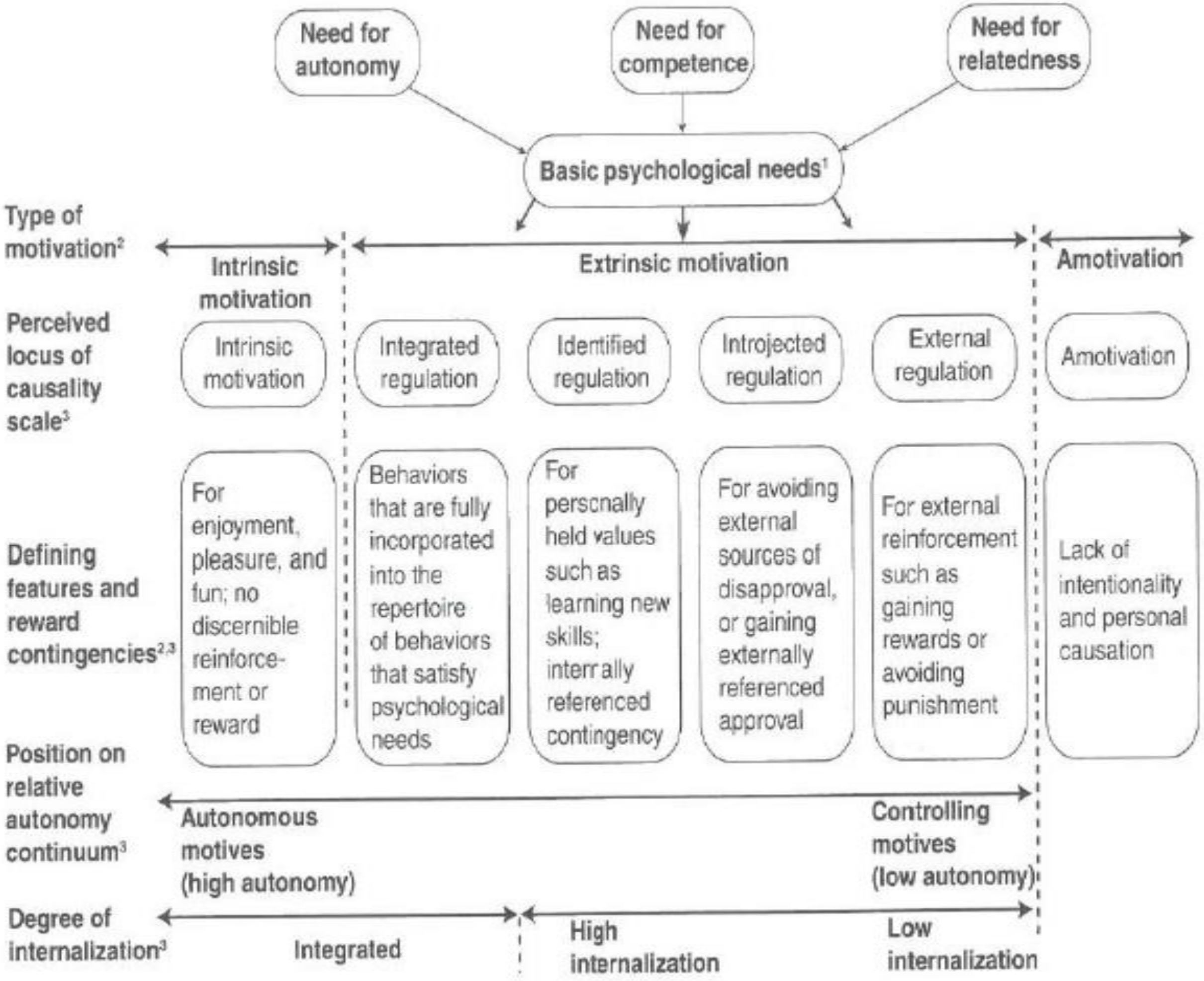


Figure 6 **Self-Determination Theory (Source: Hagger & Chatzisarantis, 2007)**

Within SDT, the five meta-theories collectively explain different facets of human motivation. The first of these is *Basic Psychological Needs Theory (BPNT).* BPNT suggests that humans have three fundamental psychological needs: competence, autonomy and relatedness, the satisfaction of which leads to increased well-being. Competence can be defined as the individual feeling effective when they are participating in an optimally challenging task. Autonomy can be defined as the individual feeling as though they have personal agency and volition. Relatedness is described as the individual feeling as if they have a meaningful connection or sense of belonging with important others (Deci & Ryan, 2008; Gunnell, Crocker, Mack, Wilson, & Zumbo, 2014; Ryan & Deci, 2000). Collaboratively, the three components of BPNT have been hypothesised to predict behavioural engagement and in turn are linked to well-being outcomes.

Cognitive Evaluation Theory (CET) describes how social context and interpersonal interaction can influence autonomous regulation. It stresses the importance of autonomy and competence for autonomous regulation. CET contextualises and operationalises the features of SDT that may manifest in increasing engagement with PA through the four propositions it makes:

1. Events that promote a more external perceived locus of causality for a behaviour will undermine autonomous regulationtowards that behaviour.
2. Events that increase perceived competence will bolster self-determined regulation whilst external events that decrease perceived competence will undermine autonomous regulation.
3. External events that are relevant to a behaviour can have three aspects: an informational aspect, a controlling aspect and an amotivating aspect.

4. Intrapersonal events may also be informational, controlling or amotivating, and may have similar effects on autonomous regulation as when they occur in external events.

Organismic Integration Theory (OIT), portrayed by Figure 6 as the perceived locus of causality scale, hypothesises that motivation exists along a continuum, from extrinsic to intrinsic motivation. Within this continuum, there are several stages, from amotivation to intrinsic motivation. SDT suggests that when the fundamental needs outlined by BPNT are satisfied, this manifests as the development of more autonomous forms of behavioural regulation towards engaging in health-related behaviours.

The portrayal of motivation along a continuum demonstrates that individuals are not dichotomously motivated or not motivated to engage in a behaviour, but instead they can be motivated autonomously or extrinsically to varying degrees. The conceptualisation of motivation on a continuum is evident when the individual is in the introjected, identified or integrated forms of regulation. Introjected regulation is defined by when an individual has internalised a behaviour but does not accept it as their own, meaning they still feel pressurised into engaging with the behaviour. Identified regulation is defined by how an individual has accepted the justification for a behaviour and accept responsibility for regulating the behaviour. Finally, integrated regulation explains how an identification has been integrated with other aspects with an individual's 'true self', meaning that extrinsically motivated behaviour becomes fully self-determined and autonomous (Ryan & Deci, 2000). These variations in the autonomous regulation of extrinsic forms of behavioural motivation act as the framework for the integration of BPNT and CET. In turn, this explains how the process of internalisation, achieved through the satisfaction of the basic psychological needs within an autonomy-supportive social context, can lead to the development of increasingly autonomous forms of behavioural regulation.

Internalisation is centred on the continuum of motivational regulations outlined in OIT and explains the process by which behaviours initially adopted for non-self-determined reasons can be taken in or internalised by an individual and become increasingly guided by self-determination. Internalisation suggests that because people demonstrate a tendency towards growth and wellbeing, they can move from less internalised, non-self-determined forms of motivation towards more self-determined forms of motivation. This process is dependent on features of the social environment. When the social environment affords opportunities for people to direct the course of their behaviours by doing what is most personally interesting or meaningful to them, they can internalise their health behaviours and integrate them with their other core life goals and values. By doing so, a more autonomous form of self-regulation is created (La Guardia, 2017).

The three basic psychological needs act as a vehicle that facilitates the process of internalisation. Previous research has sought to differentiate the roles of the three basic psychological needs in facilitating internalisation, with autonomy need satisfaction deemed essential for internalisation. Deci and Ryan (2000) suggest that whereas autonomy is essential for full internalisation, relatedness is less relevant in predicting the development of intrinsic motivation, which is more likely to develop in the latter stages of the behaviour change process (Williams et al., 2006). Similarly, Rahman et al. (2011) suggest that whereas autonomy need satisfaction in particular is important throughout the behaviour change process, relatedness is most pertinent in the early adoption stage of behaviour change. Previous research in the physical activity research domain has demonstrated how internalisation of physical activity behaviours were key to adherence to physical activity programmes (Kinnafick et al., 2014; Rahman et al., 2011). La Guardia (2017) suggests that autonomy and competence are synergistic in behaviour change. Although behaviours tend not to be intrinsically motivated, over the course of engagement some find that they are exposed to new experiences and acquire new skills they develop an interest in, and find that they enjoy participating in these behaviours for their inherent reward, for example because they are enjoyable, challenging, and stretch them. This synergy between autonomy and competence is complemented by relatedness, which La Guardia (2017) suggests is the gateway for initial and sustained engagement in health behaviours. To satisfy the need for relatedness, healthcare professionals and providers can show genuine care, leading to patients and clients being more likely to trust them and invest in their treatment. The differential roles of the three basic psychological needs demonstrates a potentially phased approach to need satisfaction that in turn facilitates the process of internalisation. There is currently no research investigating the process of internalisation of PA behaviour change in cardiopulmonary rehabilitation, and therefore this will be investigated in chapter 5.

Within the wider health domain, internalisation has been investigated in relation to adherence to healthcare routines. For example, Sebire et al. (2018) investigated motivation for lifestyle change among people who had been newly diagnosed with type two diabetes mellitus. By analysing interview data through a SDT lens, participants reported relatively dominant controlled motivation to comply with lifestyle recommendations, avoid their non-compliance being “found out” or suppress guilt following lapses in behaviour change attempts. More autonomous motivation was expressed as something achieved over a long time period. Internalisation was evidenced through some participants integrating their behaviour change to a new way of life which they found resilient to barriers. Most importantly, Sebire et al. (2018) demonstrated that motivation based on personal pressures such as avoiding guilt were commonly rooted in partially-internalised lifestyle advice. This suggests that if participants can be supported to internalise their motivation to the point of identifying a personal benefit, or integrating changes as a way of life, such changes may be more sustainable and resilient to challenge.

The two final sub-theories that SDT is composed of are *Causality Orientations Theory (COT),* which aims to describe individual differences in how people's behavioural regulation is influenced by the environment, and *Goal Contents Theory (GCT)* which is concerned with people's goals or desired outcomes, and the extent to which they are intrinsic or extrinsic. However, these sub-theories are not as relevant to this research project as the other aforementioned sub-theories of SDT so will not be discussed in further detail.

2.6.1 Socio-Environmental Context: Trans-Contextual Model

In addition to SDT's sub-theories, SDT stipulates assumptions about the nature of social contexts that can satisfy or thwart basic psychological needs (i.e., competence, autonomy, relatedness). According to Deci and Ryan (2008), autonomy-supportive social contexts facilitate the development of autonomous motives in the form of autonomous regulation as they satisfy the three basic psychological needs and behaviours are increasingly internalised. In contrast, coercive social contexts facilitate controlling motives in the form of amotivation and can thwart basic psychological needs. It should be noted that autonomy-supportive contexts refer to situations in which individuals regard themselves to be the origin of their behaviour (e.g., enjoyment, pleasure). Conversely, controlling contexts refer to situations in which individuals perceive themselves to be pawns of external forces (e.g., rewards, avoid punishment). Furthermore, SDT recognises that motives in one social context can affect motivation in a related context. That is, individuals are able to draw from their motives in one context as a basis for motivation in similar contexts. For example, previous research has supported the transfer of autonomous motivation across contexts from physical education to leisure time activity (Hagger & Chatzisarantis, 2007), and across sport to anti-doping contexts (Chan et al., 2015). This demonstrates the need for interventions that can develop autonomous forms of motivation in a PA setting with the aim of this motivation transcending different PA contexts.

This notion of autonomous forms of motivation in one PA context leading to motivation towards similar behaviours and activities in different PA contexts is best elucidated by Hagger's Trans-Contextual Model of Motivation (Hagger, 2014; Hagger & Chatzisarantis, 2016). The Trans-Contextual Model was originally developed in a physical education context, and focused on the transfer of students' autonomous motivation towards activities in their PE lessons to motivation to engage in PA outside school. The Trans-Contextual Model is a multi-theory approach to understanding motivation, and aligns with seminal SDT research that suggested that autonomous motivation affects cognition and plans to engage in behaviours that will be consistent with the satisfaction of psychological needs. The same seminal research also demonstrated that autonomous motivation in one context leads of concomitant cognitive, affective and behavioural responses in another (Deci & Ryan, 1985, 2000). The process of internalisation, previously discussed within this chapter, is used within the Trans-Contextual Model to demonstrate how motivation towards PA can become increasingly autonomously regulated, and how this form of motivation can in turn translate to different PA contexts (Hagger & Chatzisarantis, 2016). Clearly, for cardiopulmonary rehabilitation services, behaviour change achieved within a CR/PR service needs to transcend the relatively short period of time a patient may spend within a service, and therefore demonstrates how SDT, the process of internalisation, and the Trans-Contextual Model, warrant further investigation within this type of setting and service.

Despite its potential merits in relation to understanding PA behaviour change across contexts, the Trans-Contextual Model has been criticised. Typically, self-report methods are used to investigate the psychological and behavioural constructs of the theory, as well as PA behaviours. Such methods reflect static perceptions given by perceptions at a specific time point, and therefore may not reflect the fluid and dynamic nature of behaviour change. Additionally, there may be issues with the validity of such measures given people's propensity to exhibit socially-desirable behaviours, or their limitations in relation to accurately recording behaviour. Additionally, systematic review evidence has suggested that there is substantial heterogeneity in the hypothesised relationships across studies that are unrelated to sampling and measurement errors. Ogden (2015) suggests that through the contextualisation of models such as the Trans-Contextual Model as a series of interrelated constructs, and the propensity of researchers to evaluate the theories using omnibus tests, it may be difficult for researchers to actually collect data that would lead to the model being rejected (Barkoukis et al., 2010; Hagger, 2014; Hagger et al., 2003; Hagger & Chatzisarantis, 2016; Ogden, 2015).

Fundamentally, SDT demonstrates how the social context can be manipulated to facilitate the development of more intrinsic behavioural regulation (Hagger & Chatzisarantis, 2007). The propositions outlined by CET can help to define the features of a social context that make it autonomy-supportive. For example, proposition one demonstrates that the individual should have choice in their social environment over what they engage in, and proposition two demonstrates that they should enjoy success and receive positive feedback in such environments. In addition, CET can be used to inform the development of social contexts that provide the best opportunity to translate motivation across different contexts. For example, by satisfying the individual's basic psychological needs towards PA in a rehabilitation context, this is likely to develop intrinsic forms of behavioural regulation, which can manifest as increased autonomous motivation to engage with PA in the individual's leisure-time context.

To achieve satisfaction of all three basic needs and the facilitation of autonomous forms of cross-contextual motivation, consultations should be delivered by healthcare practitioners in an autonomy-supportive manner (Hancox et al., 2017; Ng et al., 2012). The satisfaction of all three needs has been shown to be universal, in that they have a functional impact whether or not they are valued or sought after by the individual. Further, even if the individual does not value a need, they will show negative effects in terms of their motivation and wellness if their needs are not satisfied, and enhanced motivation if their needs are satisfied (Hagger & Chatzisarantis, 2007). Developing an autonomy-supportive climate has previously been shown to predict individuals' perceptions of need satisfaction (Ng et al., 2012), hence highlighting the importance of the development of an adaptive motivational climate when attempting to increase the prevalence of outcomes associated with increasing autonomous motivation.

2.6.2 Self-Determination Theory in Physical Activity

Several behaviour change theories that have been used to develop interventions assume that a patient's lack of engagement with PA is a skill/behavioural deficit (Kelly & Barker, 2016). This suggestion leads to the assumption that providing patients with information about PA and how to be active is sufficient to increase their PA levels, which is problematic as interventions providing information and education around PA failed to significantly increase PA behaviours (Buck & Frostini, 2012). As PA is a process and practice embedded in social life, instead of one off events triggered by information and prevented by information deficits (Kelly & Barker, 2016), patients' problematic levels of compliance during a long period of rehabilitation cannot be explained by this assumption. Therefore it has been suggested that the motivational component of behaviour change should be further investigated (Prestwich et al., 2015).

With this focus on the motivational aspects of behaviour change in mind, SDT has become an increasingly commonly used theory to investigate PA behaviours in a range of contexts and populations (Gillison et al., 2019; Ntoumanis et al., 2020). A benefit of a behaviour change approach underpinned by SDT is that the theory can differentiate different types of motivation through organismic integration theory (OIT) and can outline concepts that need to be satisfied to develop more intrinsic forms of motivation through BPNT and CET, meaning that SDT can generate an explanation of how behaviour change may occur. Research underpinned by SDT argues that a major factor contributing towards the high attrition rate amongst exercise programmes may be that the exercise initiates do not develop stronger self-determined forms of regulation and are instead motivated primarily by extrinsic factors, meaning they are unlikely to adhere to the programme in the long-term (Hagger & Chatzisarantis, 2007; Rodgers et al., 2010).

Behaviour change models such as the Transtheoretical model and the theory of planned behaviour are unable to explain this pattern of behaviour. Instead, they can only provide a descriptive account of the process an individual has to go through to develop habitual behaviour, rather than elucidating the underlying mechanisms that may facilitate this change. SDT can offer both a description and potential explanation of behaviour, in addition to explaining the features of the social context that need to be apparent to develop more intrinsic forms of motivation. Therefore, SDT may be more appealing than other behaviour change models as it can be used to track the changing motivational profile of individuals, and to help inform the development of an autonomy-supportive social context that is able to produce such changes in behavioural regulation, in turn manifesting as increased levels of participation in the desired behaviour (Hagger & Chatzisarantis, 2007).

By grounding itself in SDT, previous research has demonstrated that a patient's autonomous motivation towards their treatment is positively associated with adherence to medical regimes among people with chronic illnesses, attendance/involvement in an addiction treatment program, and long-term maintenance of weight loss among morbidly obese patients (Chan, Lonsdale, Ho, Yung, & Chan, 2009). Within PA research, more self-determined behavioural regulations have been found to be strongly associated with PA engagement (Silva et al., 2010). Similarly, increases in self-determined motivation from pre- to post-scheme significantly predicted greater adherence to the scheme as well as greater sports-related PA (Rahman et al., 2011). This finding highlights the importance of an autonomy-supportive environment in fostering autonomous forms of motivation. This demonstrates that an intervention underpinned by SDT, that aims to manipulate participants' motivation towards PA in an autonomy-supportive educational context can translate into the development of more intrinsic forms of motivation towards PA outside the educational context, which in turn manifests as increased engagement with PA that is of the participant's own volition.

Research attempting to explain the relationship between SDT and PA behaviours has gained momentum in recent years and generally provides strong evidence for the value of SDT in understanding PA behaviour (Deci & Ryan, 2012). However, the majority of research has been correlational (Teixeira, Carraça, et al., 2012). Typically, such research identifies a positive relationship between more autonomous forms of motivation and level of engagement with PA, with identified regulation the best predictor of initial adoption of PA, and intrinsic motivation more predictive of long-term adherence (Teixeira, Carraça, et al., 2012).

In relation to BPNT, feelings of competence have been demonstrated to predict PA participation across a range of samples and settings, including exercise referral (Deci & Ryan, 2008; Dugdill et al., 2005; Morton et al., 2008). Although such insights are useful, qualitative studies can be used to elucidate the differing roles of SDT's tenets in driving PA behaviour. For example, a semi-structured interview study conducted with current and previous participants of a netball intervention, all of whom were mothers, demonstrated how perceived relatedness amongst team mates was a key factor in developing PA engagement, as well as elucidating how PA interventions can cater for a traditionally hard to reach group (Walsh et al., 2018). Although autonomy is traditionally associated with independence, the same research team demonstrated the importance of a symbiotic relationship between autonomy and care. When the intervention was successful, participants perceived themselves to be autonomous, with coaches using their expertise for the beneficence of participants, and engaging in caring acts, such as demonstrating empathy (Cronin et al., 2018). Qualitative studies such as these extend the traditional correlational research paradigms by providing deeper insight into what constitutes psychological need satisfaction across different contexts, elucidating features of interventions that may help satisfy or thwart the basic psychological needs. In turn, such insight helps to facilitate the development of interventions that can change health-related behaviours by generating more autonomous forms of motivation and greater behavioural persistence.

With research continuing to accumulate in support of the use of SDT in understanding PA behaviour, there are a slowly increasing number of intervention studies that have been designed to promote PA behaviour by increasing PA autonomous motivation in adults. A systematic review of these studies demonstrated that 86% of interventions found significant differences favouring the SDT-based intervention group for perceived autonomy support, need satisfaction, and autonomous and introjected regulations towards PA (Teixeira, Carraça, et al., 2012). Most importantly, greater levels of self-reported PA were found within post-intervention within the intervention groups (Edmunds, Ntoumanis, & Duda, 2006; Fortier et al., 2012; Teixeira, Carraça, et al., 2012), highlighting how SDT is an acceptable theory from which to develop interventions that aim to combat the pandemic levels of physical inactivity. SDT-derived interventions in PA settings frequently teach group leaders and healthcare professionals how to communicate with attendees in an autonomy-promoting way, and have been found to increase autonomous self-regulation, need satisfaction and attendance (Edmunds et al., 2006). Similarly, an autonomy-promoting counselling protocol for promoting PA in sedentary patients, delivered via a 13-week randomised control trial in a primary care setting successfully increased participants' autonomous motivation to reach activity goals, and demonstrated that higher levels of autonomous regulation for exercise after six weeks predict higher levels of PA at the end of the intervention (Fortier, Duda, Guerin, & Teixeira, 2012).

2.6.3 SDT in Clinical Settings

Within healthcare settings, research has examined the relationship between clinicians' autonomy support and patients' quality of motivation to engage in health-related behaviour and in turn, their actual health behaviour change. In an outpatient setting, patients with a variety of diseases who perceived their clinicians to be more autonomy supportive were more autonomously motivated towards taking their medications and showed greater adherence to their prescriptions (Williams, Rodin, Ryan, Grolnick, & Deci, 1998). Similar results have been demonstrated in HIV-positive patients (Kennedy et al., 2004); diabetes patients smoking cessation and cholesterol improvement (Williams et al., 2006); oral health (Halvari & Halvari, 2006); and patients with depression (Zuroff et al., 2007).

As previously discussed, uptake and adherence of CR/PR programmes is problematic, with uptake of CR remaining constant at around 50% for the last decade (British Heart Foundation, 2019), and 80% of CR patients failing to maintain regular habitual PA within the first year following completion of a course of CR (Moore et al., 2006). Currently, there is limited research investigating SDT to study PA behaviour in the CR population. Although one study showed that self-determination correlated with the patients' intention to engage in PA, they failed to record measures of PA engagement (D'Angelo et al., 2007). Similarly, Russell & Bray (2010) demonstrated correlational relationships of autonomy support, self-determined motivation and a patient's behaviour in CR sessions. Although intervention research utilising SDT is emerging within typically highly controlled research contexts and randomised control trials, there are currently limited investigations into how it could be incorporated within rehabilitation programmes to influence real-world practice.

An attempt to integrate an SDT-based intervention into an existing CR programme failed to demonstrate significant differences in perceived autonomy support and exercise behaviour between the autonomy support group and controls (Mildestvedt et al., 2007; Teixeira, Carraça, et al., 2012). This was hypothesised to be because the 4-week intervention provided an insufficient number of sessions to achieve significant between-group differences. Rather than attempting to intervene, one study utilised a mixed method approach to investigate factors that may predict non-attendance of CR. This study demonstrated that attendance at CR was often viewed by non-attenders as an unnecessary and ineffective intervention, with patients frequently commenting that they had been made to feel worthless. In contrast, those who attended described it as the sensible thing to do (Tolmie et al., 2009).

Although limited, such findings indicate that patients are typically in a state of amotivation, perceive extrinsic forms of motivation as the reasons behind their non-attendance or perceive such programmes as failing to adequately satisfy their need for relatedness. This finding is promising when an SDT-derived intervention is considered, as interventions have been found to be more successful when physical activity behaviours are non-voluntary or have yet to be internalised by the individual (Hagger & Chatzisarantis, 2007). Therefore, the external regulation of behaviour or relatedness need satisfaction may act as a starting point for the development of interventions that seek to increase autonomous behavioural regulation amongst patients, rather than relying on extrinsic regulation, which is well documented for its failure to support long-term adherence to PA and healthcare treatments.

There are currently only a handful of SDT-based investigations within CR, and none in PR. Of these interventions, only small changes in measured outcomes have been produced. Additionally, such research was associated with intensive requirements on staff and participants, meaning that the implementation of such strategies on a large scale may not yet be feasible (Clark et al., 2015). Clearly, a defined protocol for implementing SDT into rehabilitation environments does not yet exist, suggesting that research is needed to better explain how SDT can explain health behaviour across different health contexts, as well as how it can be utilised to develop interventions that can be readily incorporated within healthcare professionals' practice. Currently research of this sort is scarce; with Quested et al. (2017), identifying that less than 5% of published physical activity interventions, underpinned by a range of theories of motivation, considered intervention implementation and its fidelity. SDT-derived physical activity interventions that do not demonstrate implementation fidelity have the potential to demonstrate limited effectiveness, and theoretical and practical utility through the reporting of null findings.

Therefore, alongside thorough development work that will demonstrate why intervention components have been selected, it is recommended that given the complexity nature of promoting PA behaviour, evaluating the processes of implementation is important for informing a larger RCT in order to determine intervention effectiveness (Quested et al., 2017). This recommendation is evident in MRC (2008), and can be achieved by conducting pilot and feasibility studies, as well as process evaluations, in order to better understand how an intervention is able to exert an influence over behaviour, how it fails to exert an influence, and identifying any changes that should be made to the intervention prior to further evaluation being conducted.

A prime example of conducting preliminary evaluation prior to conducting an RCT is evident within a 2017 study, which sought to feasibly examine a 10-week SDT-based communication intervention for exercise instructors (Hancox et al., 2017). By doing so, this study was able to ascertain knowledge on the capacity to recruit and retain exercise instructors to the intervention itself. In addition, this research judged the acceptability of the intervention that combined SDT theoretical principles and behaviour change techniques, among fitness instructors, into a communication resource package to promote exercise engagement. Within the same trial, exercise instructors' perceptions for implementing the SDT-derived communication intervention were considered after the intervention was completed. To complement the robustness of implementation data, ascertaining fitness instructors' perceptions regarding the development of the SDT-informed communication training programme would have been beneficial. Variations in training development can potentially lead to inconsistencies in the implementation of interventions that may have implications for the quality and consistency for its delivery (Quested et al., 2017). Accordingly, SDT intervention tools, such as manuals or training guides, require robust assessment and evaluation during their development, prior to their implementation. Providing empirical developmental evidence of this kind will ensure fidelity and replication for interventions aiming to apply SDT for promoting physical activity.

2.7 Implications of Chapter 2

To remediate the concerns expressed within this chapter, this thesis integrates features of intervention development frameworks within MRC (2008) and IM and, as well as the practice-based evidence agenda. Given the strong focus on intervention development, the scope of this thesis spans intervention development through to a preliminary assessment of healthcare professionals' prospective acceptability of the intervention. Therefore, this approach aligns with MRC (2008) which advocates for research of this sort to allow the intervention to be refined and properly piloted prior to a randomised study of any kind taking place.

A commonality across MRC (2008), intervention mapping, and the practice-based evidence approach is the suggestion that the target behaviour, as well as potential determinants of the behaviour, need to be properly investigated and theorised prior to the development of an intervention (Ammerman et al., 2014;

Bartholomew Eldrigde et al., 2016; Fernandez et al., 2019). Doing so ensures that there is logic and a strong rationale underpinning the intervention development process, and attempts to avoid the situation where intervention design is perceived as *"a range of approaches based on nothing much more than anecdote, gut feeling, and above else, common sense"* rather than utilising what science shows to be effective (Kelly & Barker, 2016, p2). This rationalises the inductive approach taken within this thesis, where semi-structured interviews will be utilised to understand which behaviours a psychosocial intervention within CR/PR should aim to affect, and to take a *theoretically-informative* (Kislov, 2019) approach that means that theory will be used to generate an explanation of PA behaviour within CR/PR.

This inductive approach aims to enable a close match between intervention and context, with the aim of increasing the likelihood being acceptable and feasible to utilise within standard CR/PR practice. In terms of theory, the qualitative aspect of the thesis aims to rationalise the use of SDT in a *"theoretically-informative"* manner (Kislov, 2019, p. 177). This aims to yield new theoretical insights that can elucidate how the theory can be used to explain PA behaviours specific to the CR/PR context, as well as identifying gaps in the theoretical knowledge by highlighting aspects of the behaviour that SDT alone cannot explain, and subsequently focus on addressing them in the form of an intervention (Kislov, 2019). To incorporate the evidence-based practice approach and further ensure that the intervention is theory-based, a systematic review will also be conducted to investigate how SDT has previously been operationalised to affect PA behaviours in clinical settings. Triangulating the findings of this systematic review and the qualitative insight will facilitate the generation of a theoretically based but contextually relevant understanding of how health-related behaviour change may occur within CR/PR.

The benefits of this approach transcend the thesis. Given the abundance of research supporting SDT as a theory that can explain a range of health-related behaviours such as PA (Gillison et al., 2019; Ntoumanis et al., 2020), alongside the consensus that theory should be used to develop interventions (Kislov, Pope, et al., 2019; Prestwich et al., 2014), the implementation of motivational theory, such as SDT, for promoting health-related behaviour change has emerged as an important research agenda (Quested et al., 2017).

Despite the exponential growth in the research fields of SDT and behaviour change, there remains a time lag of some 17 years for research evidence to be translated into practice (Ammerman et al., 2014; Green, 2009). Arguably, research needs to change focus, paying increased attention to specifically how theories of motivation can explain PA behaviours across different health contexts. Doing so aims to elucidate how these insights can be used to develop better quality interventions that can be incorporated into standard clinical practice.

Chapter 3: How is Self-Determination Theory Used to Develop Interventions Aiming to Increase Physical Activity in Clinical Populations? A Systematic Review

3.1 Chapter Overview

A substantial evidence base has indicated the global health, societal and economic cost of physical inactivity. Similarly, several long-term conditions can be managed by habitually engaging in PA, as can the risk of developing such conditions. The finding that interventions aiming to increase levels of activity are more successful if they are theoretically based has led to an exponential growth in PA behaviour change interventions that are derived from psychosocial theories. However, there is a growing concern that such interventions are not developed rigorously, and instead the primary focus is still placed upon conducting randomised control trials, rather than engaging in extensive development and pilot work.

The systematic review within chapter 3 uses the example of a theory that is gaining prominence for informing PA interventions, SDT. It aims to investigate how interventions aiming to increase PA behaviours amongst clinical populations have been developed prior to conducting either a pilot study or RCT. The review demonstrates that due to the lack of primary research in the intervention development phase, there is a dearth of published contextual groundwork upon which such interventions are designed.

Chapter 3 demonstrates that due to the lack of investigation into the clinical setting that the intervention aims to operate within, there is a lack of mapping between theory and healthcare context, meaning that the justification for using SDT to affect clinical PA is largely based upon correlational data conducted within non-clinical samples. Therefore, SDT-derived interventions typically fail to consider the specific features of the healthcare context, meaning that although they may be effective in controlled conditions, the practical utility of these interventions is ambiguous. To facilitate intervention development, the way SDT has been operationalised, for example using behaviour change techniques, will also be extracted.

3.2 Introduction

As previously discussed in chapter 2, the positive effects of PA on physical and mental health, quality of life, and healthy aging are well documented, with exercise and PA perceived to be a vehicle for preventing and treating many of the leading causes of ill health (The Academy of Medical Royal Colleges, 2015). Locally, a 1% reduction in physical inactivity has been hypothesised to save the UK's National Health Service (NHS) £1.2 billion per annum (Speake et al., 2016), meaning increasing PA across the population has become an important research and public health agenda.

To address the global health problem of physical inactivity, an exponentially growing body of behaviour change research has used psychosocial theories to design interventions aiming to promote PA engagement (Rhodes et al., 2019). Generally, it is accepted that utilising theory to design and implement behaviour change interventions to promote health behaviour is good practice and more likely to result in an effective intervention (Medical Research Council, 2008; Prestwich et al., 2015). However, when authors state interventions are guided by theory this is often not the case, or the conceptual overlap is only minimal (Michie, van Stralen, et al., 2011; Michie & Prestwich, 2010). Therefore, it is currently unclear how theory underpins these different interventions, why a specific theory has been selected to inform the intervention, and precisely how and why it has been operationalised.

3.2.1 Intervention Development

A health intervention is *"an effort, activity or combination of programme elements designed to improve health status"* (O'Cathain et al., 2019, p.2). Currently, MRC guidelines describe four phases of developing, feasibility/piloting, evaluating and implementing complex interventions (Medical Research Council, 2008). The other three phases are described in detail in the MRC guidelines and accompanying publications, however until recently there has been little guidance pertaining to how research teams should develop interventions (O'Cathain et al., 2019).

Although MRC guidelines advocate the use of theory in intervention design, it does not specify how to select and apply theory (Michie, van Stralen, et al., 2011), which may have contributed to the dearth of published intervention development studies, defined as "*a study that describes the rationale, decision making processes, methods and findings which occur between the idea or inception of an intervention until it is ready for formal feasibility, pilot or efficacy testing prior to a full trial or evaluation*" (Hoddinott, 2015, p. 36). In recognition of this issue, there are currently a range of projects underway to develop guidance in developing complex interventions, such as the *IdenitfyiNg and assessing different approaches to Developing complex interventions* (INDEX study), where the primary aim is to produce guidance for researchers on how to develop complex interventions to improve health or health care outcomes (Croot et al., 2019; O'Cathain, Croot, Duncan, et al., 2019).

A recent systematic review from the INDEX study constructed a taxonomy of intervention development approaches, synthesising the actions within each approach in order to inform future guidance on intervention development (O'Cathain et al., 2019). This review is the first time such a detailed and broad review of approaches was undertaken, and it was acknowledged that there is a lack of transparency and publication detailing the specific approach that research teams have taken during the intervention development process. Through the lack of insight into the most effective approaches to develop interventions, the decision-making behind the ‘what’, ‘why’ and ‘how’ of intervention development is seldom reported in the health literature, meaning that interventions are commonly designed without an analysis of either the target behaviour or the theoretically predicted mechanisms of action (Michie, van Stralen, et al., 2011). Instead, interventions appear to typically be developed on implicit common sense models of behaviour (Michie et al., 2009), meaning the extent to which they are based on contextual needs is currently ambiguous.

Providing empirical evidence for the ‘what, ‘why’ and ‘how’, alongside explanations of how an intervention was operationalised can help to develop a logic model to explain the hypothesised mechanisms of change (Hoddinott, 2015). Reporting how the intervention has been developed in a manner that is considerate of the nuances of the healthcare context, as well as how these issues have been mapped onto SDT within the intervention, would assist the development of interventions that are contextually relevant and therefore tailored to remediate salient issues within a setting, as well as ensuring they are evidence-based through the explicit mapping of theory. Taking such an approach would remediate the claim that interventions of this sort may be more evidence-inspired, rather than evidence-based (Michie & Abraham, 2004), or that they may wash out of healthcare context following the research process (O’Cathain et al., 2019). A greater focus on contextual factors during the development process would address the concern that intervention research, if ineffective, is a waste of research and public resources (O’Cathain et al., 2019).

3.2.2 Self-Determination Theory (SDT)

As discussed in chapter 2, SDT is a motivational theory that has gained much prominence and support for promoting physical activity, and has been used to underpin PA behaviour change interventions (Edmunds, Ntoumanis, & Duda, 2006; Murray et al., 2015; Murray et al., 2016; Ntoumanis, Thøgersen-Ntoumani, Quested, & Hancox, 2016; Rouse et al., 2014). According to SDT, self-determined or intrinsic forms of motivation are most adaptive for promoting and sustaining physical activity behaviour when psychological needs for feeling autonomous (autonomy), competent (competence) and connected to others (relatedness) are met (Chan et al., 2009; Donnachie, Wyke, Mutrie, & Hunt, 2017; Kinnafick, Thøgersen-Ntoumani, & Duda, 2014; Rose, Parfitt, & Williams, 2005). There is a plethora of research to date that has explored the tenets and application of SDT principles for understanding and promoting PA. Moreover, a number of systematic reviews exist that consider the effectiveness of SDT for physical activity engagement (Silva et al., 2010) and for other health behaviours (Ng et al., 2012; Silva et al., 2008; Teixeira, Silva, et al., 2012).

In their systematic review, Teixeira et al. (2012) indicated consistent support for a positive relationship between more autonomous forms of motivation and PA, demonstrating that satisfaction of the three basic psychological needs of autonomy, competence and relatedness positively predict exercise participation across a range of samples and settings. However, some inconsistencies were identified regarding the relationship between certain SDT constructs and exercise behaviour. For example, competence satisfaction is the most frequently assessed basic psychological need, with the literature demonstrating consistent support for a positive association with exercise. Conversely, bivariate analyses within Teixiera's systematic review demonstrated that relatedness satisfaction had a mixed association with PA, although no studies found a negative association with PA. Teixeira et al. suggested that the exercise context itself could explain the differing relationship between relatedness need satisfaction and PA, as if an individual engages in solitary PA, the need for relatedness may not be as integral in driving the development of habitual PA behaviours relative to the other psychological needs (Teixeira, Carraça, et al., 2012). The inconsistent nature of the measurement of the basic psychological needs, the subsequent heterogeneity in their operational definitions, and the differential role of the basic psychological needs in facilitating the development of habitual PA that the authors identify is suggested to conceal a lack of applicability of particular components of SDT to different PA contexts (Teixeira, Silva, et al., 2012).

A factor that may contribute to the currently unknown level of applicability of SDT to different clinical PA contexts is evident by how there is currently not a consensus of how different psychosocial theories should be applied and operationalised when attempting to develop interventions. For example, a 2021 systematic review demonstrated that although much is known about how theory can predict behaviour change, behaviour change interventions' readiness for implementation, evaluation and use in routine healthcare practice is currently unclear (Presseau et al., 2021). Furthermore, there is scant evidence of any intervention development studies that are informed by SDT, and specific barriers relating to the use of SDT-based communication strategies in clinical practice have not been identified (Matthews et al., 2015). Instead, there is a large number of publications outlining the correlations between different components of SDT and (typically self-reported) PA behaviour, relative to evidence that could elucidate how SDT can be used to explain how SDT can be used to remediate problematic engagement with health-related behaviour. Pragmatically, this paucity in the literature means that currently, interventions typically do not adequately identify potential intervention targets prior to developing and implementing a SDT-derived intervention that aims to increase PA. Therefore, evidence that provides the rationale for using SDT to develop a PA intervention typically fails to adequately investigate contextual differences that may affect its implementation (Quested et al., 2017). Ultimately, this means that the barriers and facilitators of PA that are salient in a specific healthcare context, and that may act as intervention targets have not typically been explicitly identified and investigated prior to the implementation of an intervention.

The variability in the delivery and application of theory has led to inconsistent findings with respect to the effectiveness of health behaviour interventions (Prestwich et al., 2014). Similarly, a recent systematic review demonstrates that although health psychology is at the forefront of developing and disseminating evidence that have improved the understanding of health behaviour change, current approaches to dissemination and research may be insufficient for promoting broader application and impact of this evidence to benefit the health of patients, or healthcare professionals' clinical practice (Presseau et al., 2021). Recent development in health intervention research reflect this claim, with extensions of the MRC guidelines calling for process and impact evaluations of interventions to occur concurrently, to elucidate how and why an intervention achieves its effect (Moore et al., 2015). To extend this, optimising the implementation of motivational theory, such as SDT, for promoting engagement in health-related behaviours, such as physical activity has recently emerged as an important research agenda (Quested et al., 2017). This is reflected by a growing number of publications investigating the implementation of SDT-based PA interventions by conducting process evaluations or feasibility studies prior to randomised evaluation (Hancox et al., 2017).

As such, to determine the effectiveness of theoretically informed PA interventions in clinical contexts, the implementation of intervention delivery and its application is becoming increasingly recognised within the SDT PA research domain. The concerns outlined by Quested et al. (2017) primarily discuss issues associated with variable levels of implementation fidelity, asserting that the quality of implementation in studies that aim to apply motivation theory to promote PA is often under-reported. However, to date there is limited consideration of how contextually relevant interventions can be developed in line with SDT. Arguably, Quested's claims can be replicated in the previous step of intervention research, meaning that SDT-based intervention development research also needs to progress and be better reported.

3.2.3 Aims of Review

A recent systematic review from the INDEX project identified that future research should understand how interventions are actually developed in practice (O'Cathain, Croot, Sworn, et al., 2019). Accordingly, this review aims to systematically review how motivational interventions, based on SDT, are developed in terms of planning and design, prior to evaluation, to promote PA among clinical populations. Firstly, the review aims to consider the *a priori* rationale, decision-making, methods and findings underpinning SDT-based interventions to promote PA in clinical populations. Secondly, the review aims to identify specific intervention components to elucidate how SDT has been operationalised in each intervention. In conjunction, if successful these aims will provide a strong theoretical basis for the intervention within this thesis, as it will elucidate why SDT is used to develop interventions, how it maps onto the healthcare context, and why specific intervention components and behaviour change techniques are selected and developed.

By investigating the approaches that research teams take to developing interventions based upon motivational theory, this review will generate a better understanding of intervention implementation and the theoretical mechanisms and processes driving the intervention. Furthermore, this will provide recommendations for how future research teams can develop theoretically-based, contextually relevant interventions that align with current discourses in public health surrounding initiatives such as patient and public involvement in research, and involving key stakeholders in the research process (Staley, 2009), as alluded to by the MRC guidelines (Medical Research Council, 2008).

3.3 Methods

A systematic review was undertaken, with the protocol published on PROSPERO. The review utilised both topic searches and cluster searching, to identify how SDT-based interventions aiming to increase physical activity uptake and/or adherence in clinical populations had been developed and implemented. This review does not aim to investigate how successful interventions are at changing PA behaviour, but instead aims to investigate how interventions of this sort were developed in-line with SDT and implemented prior to conducting a RCT.

3.3.1 Developing a research question and identifying relevant articles

The first stage of the review was to identify the purposes of the review and develop a focused research question. The overall aim of this review is to identify the approaches utilised when developing interventions utilising SDT to increase levels of PA amongst clinical populations, and to understand how SDT was operationalised to form the intervention. This was achieved by identifying relevant published literature and determining their relevance of the review. Published articles up to 23rd November 2019 were identified using PsycINFO, CINAHL, MEDLINE, SPORTDiscus with Full Text, CENTRAL and PubMed search databases, as well as ClinicalTrials.gov.

The systematic search returned 3920 citations from the six databases. 709 duplicates were deleted, leaving 3211 citations. An additional search was conducted of relevant journals and articles using citation searching, reference lists, contact with experts, and dissemination through the SDT mailing list. Remaining citations were screened based on the following inclusion criteria: (i) the intervention is derived from SDT only, (ii) the primary aim of the intervention was to affect uptake and/or adherence of PA, (iii) study participants are from a clinical sample, (iv) study participants are eighteen years of age or older, (v) the study is a randomised-control trial, pilot study, feasibility study, or intervention development study. Protocol papers were included if the primary aim of the protocol was to describe intervention design methods or process, or if it provided a rationale and/or justification for the use of SDT in designing the intervention. Studies were excluded if (i) the full text was not available in English, (ii) no intervention was present, and (iii) PA was not a primary outcome.

3.3.2 Cluster Searching

Following the initial search, cluster searching was implemented, in line with guidelines provided by Booth et al. (2013). Cluster searching is defined as *"an explicit methodology for the identification of conceptually rich or contextually thick clusters of data"* (p.3). Cluster searching helps to explore the theoretical underpinnings and/or the context of an intervention and assumes that the theoretical content is frequently detached from the trial, because it is in an associated publication or in an early study from which the identified source is a derivative. Since the introduction of the EQUATOR Network, randomised control trials (RCTs) are expected to adhere to CONSORT publication standards, meaning that there may be little room for a detailed description of contexts. Instead, publications of this sort may only provide only a brief description of a setting (Booth et al., 2013). Therefore, the logic underpinning the development and implementation of a complex intervention may be present over a cluster of studies. Clusters refer to several publications, expanding longitudinally throughout the lifespan of the study, which may provide a deeper description of the context of the complex intervention, as well as greater detail into how the intervention was developed.

Cluster searching stems from the identification of a key pearl citation, defined as *"an authoritative article, typically identified by experts, of particular relevance to the topic of inquiry that can be used to search for relevant and authoritative materials sharing common characteristics with the original pearl"* (Booth, 2016, p.3, Ramer, 2005, p.397). Subsequently, a systematic search strategy takes place, leading to the attainment of both conceptual richness and contextual thickness, and allowing the full research process that may have contributed to an intervention to be identified. Using the guidance provided by Booth et al. (2013), cluster searching occurred as follows:

(1) Identify pearl citation

(2) Search reference list for antecedent projects

(3) Recheck additional records by authors

(4) Search for lead author (e.g. institutional webpages/repositories)

(5) Citation searches on pearl citation

(6) Search project name or clinical trial identifier

(7) Search opengrey.com

Prior to removing duplications, there were 3920 records. Once the duplicates were removed, 3211 citations were screened (see Fig. 1). 2849 records were excluded based on the title and abstract screen resulting in 378 articles with a full-text screen. Following the full-text screen, 56 articles remained. Records were then grouped by intervention, using the cluster search process. Following screening, 15 interventions were included in the systematic review, across 43 separate sources. The PRISMA diagram outlining the stage 1 process of data extraction can be found in Figure 7.

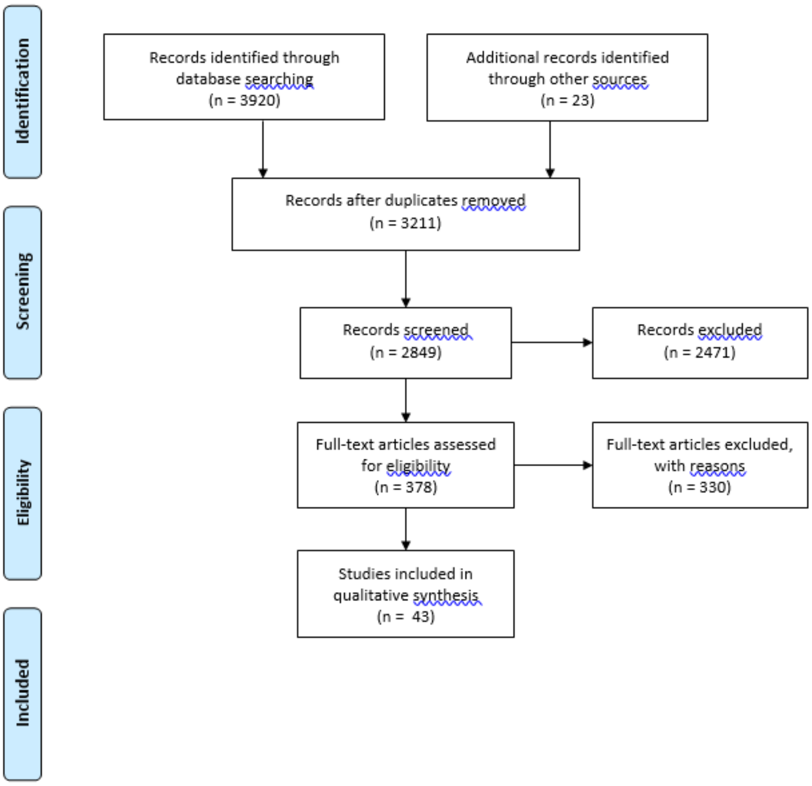


Figure 7 **PRISMA flowchart**

Forty-three papers across fifteen trials were identified for inclusion within the systematic review, as evidenced in Table 1. Table 1 provides an overview of the cluster of papers identified within each trial, and their role within each trial, for example whether they explained the process of intervention development, study design, or evidenced the trial's effectiveness.

Table 1 **All trials included within systematic review, and clusters of papers within each trial**

Trial Acronym	**Full name of trial**	**Pearl Citation**	**Type of Study**	**Clinical Population**	**Trial Cluster**
MotM	Men on the Move	(Cornish et al., 2017)	RCT Outcomes	Overweight or obese African-American men.	• Needs Analysis: (Griffith et al., 2011) • Needs Analysis: (Griffith, Ellis, et al., 2012) • Needs Analysis: (Griffith et al., 2011) • Needs Analysis: (Griffith et al., 2011) • Systematic Development: (Griffith, Gunter, et al., 2012) • Pilot: (Griffith et al., 2014)
EMPOWER		(Duda et al., 2014)	RCT Outcomes	GP Exercise Referral.	• Rationale & Study Design: (Jolly et al., 2009)
PAC	Physical Activity Counselling	(Fortier et al., 2011)	Outcomes	Recruited from a primary health care provider because they were inactive.	• Rationale, methods & intervention: (Fortier et al., 2007) • Book chapter: Fortier, Williams, Sweet & Patrick (2009) • Cost analysis of PAC: (Hogg et al., 2012)
HAES	Health At Every Size	(Hsu et al., 2013)	Feasibility	Overweight women.	• HAES: (Miller & Jacob, 2001) • HAES: (Robison et al., 2007)

TAVIE en m@rche	A Web-Based Tailored Nursing Intervention to Increase Walking in Patients After an Acute Coronary Syndrome	(Kayser et al., 2017)	Protocol	Acute Coronary Syndrome patients with no contraindications that would impede adhering to moderate physical activity.	• Literature Review and concept analysis: (Kayser et al., 2014)
NERS	National Exercise Referral Scheme	(Littlecott et al., 2014)	Outcomes	GP Exercise Referral.	• Protocol for trial and integrated economic and process evaluation: (Murphy et al., 2010) • Qualitative experiences of HCPs: (Moore et al., 2011) • Evaluation of effectiveness and cost effectiveness, RCT: (Murphy et al., 2012) • Mixed methods study to inform intervention: (Moore et al., 2012) • Mixed-methods process evaluation: (Moore et al., 2013)
DEF	Diabète en Forme	(Moreau et al., 2015)	Development	Type 2 Diabetes.	None

PARA	An intervention fostering autonomous motivation, physical activity and cardiovascular fitness in rheumatoid arthritis	(Rouse et al., 2014)	Protocol and rationale for RCT	Rheumatoid arthritis.	• Outcome paper: (Duda et al., 2015)
PESO	Promotion of Exercise and Health in Obesity	(Silva et al., 2008)	Rationale and intervention description	Moderately obese women.	None
SHINE	Support, health information, nutrition and exercise	(Trief et al., 2017)	Study design, procedures and outcomes	Type 2 Diabetes.	• Development: (Weinstock et al., 2013) • Development: (Trief et al., 2014)
ACTIVATE-CF		Hebestreit et al. (2018)	Study protocol	Cystic Fibrosis	None
Aussie-FIT	Aussie Fans in Training	(Quested et al., 2018)	Feasibility and pilot RCT	Overweight and obese men	None

CONNECT	Communication style and exercise compliance in physiotherapy	(Lonsdale et al., 2012)	Rationale, design and methods for cluster RCT	Chronic lower back pain	• Implementation fidelity (Conference abstract): Lonsdale et al. (2012) • RCT: (Murray et al., 2015b) • Face validity and feasibility of implementation: (Matthews et al., 2015) • Cluster RCT: (Lonsdale et al., 2017) • Reliability and validity of the communication evaluation in rehabilitation tool: (Murray et al., 2019)
ENGAGE-HD	Supporting PA engagement in people with Huntington’s disease	(Busse et al., 2017)	Randomised, controlled pilot feasibility study	Huntington's Disease	• Protocol for RCT (Busse et al., 2014) • Intervention development and delivery (Quinn et al., 2016)
NST2DM	Need-supportive PA intervention among patients with T2DM	(Vanroy et al., 2017)	RCT pilot	Type 2 Diabetes.	None

Data were extracted from the papers within table 1 based upon four criteria:

(1) Needs analysis/description of the context

  a. Was a needs analysis conducted?
  b. If a needs analysis was conducted, how was this conducted, what were the outcomes, and what are the implications of this step for subsequent stages of the intervention?
  c. Were stakeholders (e.g.: healthcare professionals, staff, patients, carers, commissioners) consulted in the development of the intervention?

(2) Justification for the use of SDT to design the intervention

  a. Why was SDT chosen to inform the development of the intervention?
  b. Do the reasons for the selection of SDT align with the needs analysis?

(3) Alignment with/operationalisation of SDT

  a. How was SDT operationalised in the intervention?
  b. Do the intervention components map onto the tenets of SDT?

(4) Justification for the intervention components

  a. Why was each intervention component selected for inclusion?

3.4 Results

This section will use the MRC (2008) guidance to outline why SDT was selected as a basis for the intervention, how each intervention was developed, and how it was piloted prior to evaluation. MRC guidelines highlight four phases of developing and evaluating interventions: *development, feasibility/piloting, implementation and evaluation*. Collectively, three activities outline how research teams can conduct each phase. This review will utilise the three activities within the development phase (*identify the evidence base, identify/develop theory, and model process and outcomes*) to highlight how each activity is evident, and the relative contribution of each activity to developing the intervention within each trial. Doing so aims to fulfil O'Cathain et al.'s (2019) claim that there is a need to understand how interventions are developed in practice, using SDT as an example of a theory that has been used to inform intervention development in a range of different populations and clinical settings.

3.4.1 Development: Identify Evidence Base

According to the MRC guidance, this step allows research teams to identify an evidence base for carrying out an intervention, for example by carrying out a systematic review. Whilst this was not apparent in any trials in the review, it may be that these publications may not be explicitly linked to the clinical trial identifier and may therefore be a stand-alone publication.

There is limited evidence that systematic reviews were conducted as a form of primary research forming part of the intervention development phase of the trials within this review. However, the use of existing systematic reviews as a justification for the use of SDT demonstrates how there are few intervention studies in the PA for health domain, relative to the number of cross-sectional studies that have tested the relationships between SDT's variables and exercise behaviours (Teixeira, Carraça, et al., 2012). This may explain why there are no examples of conducting a primary systematic review during the intervention development phase, as there are only a limited number of studies demonstrating how SDT has been used to affect PA within specific clinical populations.

Instead of research teams conducting primary systematic reviews, two systematic reviews, widely cited across several trials, were used by teams to justify their use of SDT to design an intervention. Firstly, a meta-analysis of 184 independent data sets from studies that utilised SDT in health care contexts, conducted by Ng et al. (2012) suggests that SDT is a viable conceptual framework for interventions to promote physical and mental health in clinical settings. Secondly, a systematic review of experimental, cross-sectional, prospective and intervention studies aimed at increasing exercise behaviour, conducted by Teixeira et al. (2012) is used to further elucidate Ng's findings by demonstrating more specific effects of SDT components in driving PA behaviours. In conjunction, these systematic reviews suggest that since the satisfaction of the basic psychological needs is a central tenet of SDT, more interventions are needed to examine the effect of basic psychological need satisfaction and its relationship with PA behaviour.

For example, within TAVIE en m@rche, Kayser et al. (2017) used Ng et al.'s (2012) meta-analysis to hypothesise the satisfaction of two of the three basic psychological needs as a mechanism of action of their intervention. To further develop this logic model, the authors draw upon Teixeira et al.'s (2012) systematic review, using it to support the relationship of SDT constructs and PA outcomes. Therefore, they suggest that these systematic reviews collaboratively rationalise how interventions that effectively increase measures of SDT constructs may also influence improvements in PA outcomes. This section demonstrates that rather than conduct their own systematic reviews, research teams typically rely on previously conducted reviews to justify the theoretical basis of their intervention.

3.4.2 Development: Identify Theory

For the purposes of this review, the activity *identifying and developing theory* within the MRC's *development* phase has been divided to demonstrate how, and with what effect, researchers may use primary (developing theory) and secondary (identifying theory) research during the intervention development phase. Therefore, the step of identifying theory in this instance refers to using previous literature to justify why SDT is an acceptable theoretical framework to inform the development of the intervention.

In addition to systematic review evidence, identifying a rationale for the use of SDT is typically evident through the inclusion of three forms of evidence. The first refers to correlational studies that typically investigate the relationship between PA or exercise behaviour and the satisfaction of the basic psychological needs of autonomy, competence and relatedness. Alternatively, these studies will correlate forms of behavioural regulation with PA or exercise behaviour. Within NERS, the authors supplement the aforementioned forms of research with policy recommendations taken from Department of Health guidance for exercise referral which places emphasis on enhancing baseline motivation (Littlecott, Moore, Moore, & Murphy, 2014; Moore, Moore, & Murphy, 2011), therefore providing a further rationale for an intervention derived from motivational theory.

Many trials cite research that demonstrates a correlation between more autonomous forms of motivation and typically self-reported levels of PA to provide a rationale for the use of SDT to inform their intervention design. Within EMPOWER, Duda et al. (2014) suggest that publications such as this provide *"compelling theoretical and empirical reasons from pulling from SDT to develop an intervention to be applied within an exercise referral setting"*. (p.3) By reviewing the literature used to justify the use of SDT, it is evident that the majority was conducted within non-clinical samples, for example within an aerobics class at a university gym (Ryan, Fredrick, Lepes, Rubio, & Sheldon, 1997), university-based exercise classes (Wilson & Rodgers, 2007), or gym participants (Duncan et al., 2010). This may be problematic as the extent to which these insights are applicable to clinical settings is unknown.

For example, within M4H/MotM, Cornish et al. (2017) drew upon correlational research investigating motivation to adhere to PA classes amongst university students. From this, they suggested that interventions aiming to promote PA in African American men should use principles of SDT and motivational interviewing (MI). Similarly, HAES (Hsu et al., 2013) drew upon correlational studies in non-clinical settings, alongside the effect of satisfying basic psychological needs on long-term behaviour to demonstrate how SDT's components mediate exercise participation. Hsu et al. (2013) also cite findings from the PESO trial (Silva et al., 2008) to differentiate the effects of SDT's components on PA behaviour. They suggest that Silva's findings, taken from a sample of people living with obesity, demonstrate SDT's utility in informing interventions in clinical populations. Through a discussion of Silva's findings, which differentiate the effects of SDT's components on PA behaviour, Hsu suggests that since *"interventional studies were consistent with the propositions of SDT, this provides support for applying SDT to promote exercise behaviour"* (Hsu et al., 2013, p.284). Silva's work, alongside seminal SDT by Deci and Ryan and early health applications of SDT such as in smoking cessation is commonly cited, highlighting how people reporting more feelings of autonomy are more likely to adhere to an intervention, are less likely to drop out, and more likely to maintain the behaviour in the long-term (Williams et al., 1996, Ryan et al., 1997, Wilson and Rodgers, 2002).

EMPOWER utilises a similar evidence base, extended by work by Edmunds et al. (2007) to demonstrate how amongst overweight or obese individuals involved in a 3-month exercise referral scheme, an increase in competence and relatedness need satisfaction corresponded to greater adherence, and how participants with more autonomous motivation exhibited greater well-being over the course of the programme. According to EMPOWER's protocol paper (Jolly et al., 2009) such evidence highlights that SDT-based research demonstrates that more self-determined regulations can predict adherence to a range of health behaviours and health-related behaviour change. Therefore, Jolly et al. argue, a strong theoretical and empirical foundation already exists for testing the utility of a SDT-based exercise intervention in an exercise referral scheme, as well as elucidating the processes by which different health behaviours may be changed and maintained. Consequently, SDT *"deserves application and evaluation with respect to the adoption and maintenance of PA"* (Jolly et al., 2009, p. 7). This may suggest that because of the existence of an extensive evidence base, the authors do not deem it necessary to conduct their own primary research to elucidate potential intervention targets.

Conceptual and philosophical evidence base

As well as utilising existing empirical investigations, previous scholars have highlighted similarities and conceptual overlaps between humanism, SDT, MI, and the Rogerian (person-centred) approach to counselling. Such scholars observe that although MI arose from clinical practice, and is perhaps more unidirectional than classic Rogerian person-centred psychotherapy, a number of practitioners have utilised SDT as a de facto model for understanding how and why MI is effective (Resnicow et al., 2012). This can differentiate SDT from other psychosocial theories, in that through its philosophical overlap with MI, it can be operationalised using an already extensively utilised counselling approach (MI). To demonstrate how the philosophical underpinnings can provide a rationale for SDT's selection as a guiding framework within interventions, PAC contextualises SDT within a counselling-based approach to demonstrate how the theory has been operationalised. To do so, the publications within PAC consider how the underpinning philosophy of SDT, denoted by its roots in humanism, aligns with the person-centred approach to psychotherapy which has been incorporated into many existing healthcare practitioners' training packages. The discussion of the humanistic philosophy underpinning SDT and its commonalities with a patient-centred approach facilitates deeper understanding of how SDT can be operationalised to better inform the roles of HCPs within interventions, and therefore acts as a starting point within the intervention development process by allowing SDT to be operationalised.

In summary, a number of trials within this review used non-clinical, typically correlational research findings to justify the use of SDT within their trials. These may provide useful insights, elucidating relationships between SDT's components, but it is unclear how easily findings of these sorts can be transferred to other populations. Additionally, the recognition that SDT and MI have common philosophical roots differentiates SDT from other psychosocial theories, and could be seen as a method of providing a middle ground between SDT and healthcare professionals' practice. However, none of the trials suggested this as a rationale for the use of SDT within their interventions, meaning that the use of SDT as a theoretical basis for the intervention was predominantly driven by previous research findings, rather than features of healthcare professionals' standard practice, where MI training is frequently available.

3.4.3 Development: Developing Theory

According to the MRC guidance, developing theory is defined as *"developing a theoretical understanding of the likely process of change, drawing on existing evidence and theory, supplemented if necessary by new primary research"* (p.9). To further elucidate why selecting a theoretical basis of interventions is necessary, several sources cite Michie *et al.*'s numerous publications regarding how interventions should be theoretically-based as a justification for basing the intervention upon a psychosocial theory (Michie & Abraham, 2004; Michie & Prestwich, 2010; Prestwich et al., 2014).

To accompany this theoretical basis provided by previous empirical insights, there is a growing appreciation of the benefits of conducting primary research as part of the intervention development process. For example, across the wider public health domain, involving stakeholders, such as healthcare professionals, staff, patients, carers and commissioners, within research is of primary relevance, and is increasingly recognised as an example of best practice. In 2009, the UK's National Institute of Health Research (NIHR) developed guidelines explaining how patient and public involvement (PPI) should be incorporated into the research process from the start. This initiative is founded on the principle that people who are affected by research have a right to say in what and how research is undertaken (Staley, 2009). To elucidate the influence of the PPI narrative in the wider health domain, funding bodies are increasingly encouraging research teams to document how they plan to engage in PPI throughout the research process, as well as how the intervention will be co-developed between key stakeholders and academics. Given the increasing importance placed upon engaging stakeholders such as patients and healthcare professionals within the entire research process, it is important to understand precisely how stakeholders are involved in the research process.

Within this review, Men 4 Health/Men on the Move (M4H/MotM; Cornish, McKissic, Dean, & Griffith, 2017; Griffith, Allen, Johnson-Lawrence, & Langford, 2014; Griffith, Gunter, & Allen, 2012) evidence the most extensive period of stakeholder engagement to afford researchers with a theoretical understanding of behaviour. Within M4H/MotM, researchers utilised focus groups during the intervention development phase, examining both individual and collective perspectives on the broad social, cultural, and environmental barriers and facilitators to overweight and obese African American men's healthy eating and physical activity. Of particular interest was how intersections of race/ethnicity, gender, life stage, and social and environmental contexts influence these men's health behaviours (Griffith, Gunter, & Allen, 2012). These publications then linked together to systematically develop a *"culturally, contextually, and gender-sensitive intervention that addresses the individual and social barriers to healthy eating and physical activity among middle aged and older, urban African American men"* (Griffith, Ober-Allen, & Gunter, 2011, p. 483).

Within each needs analysis publication of M4H/MotM, recommendations and implications for interventions were highlighted, alongside barriers and facilitators of PA within this population. This provides an opportunity to map between features of the healthcare context identified during this exploratory phase, SDT, and the intervention components, by identifying potential context-specific targets for change that the intervention should focus upon. This trial demonstrates an approach to intervention development that could be replicated elsewhere. It clearly demonstrates how researchers have featured the intervention context within intervention development, rather than solely basing the intervention on previous research conducted within predominantly non-clinical samples, as is evident in a number of other trials.

Another example of good practice is evident within the ENGAGE-HD trial, with researchers outlining that *"the intervention was developed following wide-ranging consultation with people with Huntington's Disease and their families, so as* *to give due consideration and to accommodate the known limiting factors in this population"* (Busse et al., 2014, p. 11). Within ENGAGE-HD, focus groups were used to *"capture varied perspectives from people with Huntington's Disease, their family members, carers and professionals"* (Quinn et al., 2016, p. 72), as well as understanding how SDT was applicable to explaining PA behaviour within this clinical group. Similarly, within AUSSIE-FIT, intervention development was formed by a multi-method investigation aiming to assess the appeal of AUSSIE-FIT within the target population, suggesting that 90.5% of those surveyed would be interested in the intervention. Interviews with potential participants further substantiated the theory, allowing the intervention to be further developed and refined (Quested et al., 2018).

Publications across these trials demonstrates that there are examples of stakeholder engagement during the intervention development process that links to the later stages of developing and evaluating interventions, however, the majority of trials did not report that they had undertaken this sort of work. This means that there is currently a limited understanding of how SDT is applicable to different healthcare contexts, and corroborates previously made suggestions that interventions appear to typically be developed on the basis of existing empirical and correlational evidence demonstrating a link between the basic psychological needs and PA adherence. For this area of research to develop, and enhance our understanding of how PA behaviour can be explained across a range of healthcare settings to assist with intervention development, future trials could utilise the qualitative or mixed methods approaches utilised in trials such as ENGAGE-HD and MotM to explore nuances within healthcare contexts that if left undetected could affect the effectiveness of the intervention.

3.4.4 Development: Model Process and Outcomes

Incorporating theoretical insights into an explicit model of how the intervention might alter behaviour or affect other links in the causal chain between intervention and outcome is a useful step in intervention development (MRC, 2008). This allows a logic model to be generated that links the evidence base with the intervention's target behaviours, explaining how the intervention is theoretically hypothesised to change behaviour.

Differentiating between the relative effects of SDT's basic psychological needs of autonomy, competence and relatedness, as well as drawing on MI principles, can allow research teams to generate of a logic model (Moore et al., 2015). Such models outline how the intervention and healthcare context will interact to drive PA behaviours. Within this review, several trials explicitly mapped between different basic psychological needs and intervention components, allowing a more defined and detailed hypothesised mechanism of change to be outlined, and helping to more precisely demonstrate the link between SDT and individual intervention components (see tables 2-4). For example, a particularly effective method of mapping between theory and intervention components was evident in TAVIE en m@rche, where specific intervention strategies (e.g. *providing information and feedback on walking behaviour*), was mapped onto intermediate intervention goals (*help patients build or consolidate motivation to increase walking behaviour*), which then mapped to specific BCTs and targeted SDT variables.

Similarly, EMPOWER's *rationale and study design* paper (Jolly et al., 2009) hypothesises a similar hypothesised logic model by which their intervention is expected to exert an influence. Their logic model is common across several trials and suggests that autonomy support from a significant other contributes towards heightened levels of perceived efficacy, autonomy and social connectedness, in turn facilitating the development of self-determined motivation for PA, and finally increased and maintained PA and wellbeing. This paper also provides an in-depth description of the intervention, outlining techniques that would be expected to be included at each session, however, there is little mapping between SDT and intervention components. Whilst it is a strength of the intervention that specific intervention components are outlined, so that replication with fidelity could take place, the lack of mapping between intervention and theory means that it is difficult to suggest a potential explanation for the intervention's effect.

Due to the aforementioned philosophical and conceptual overlap between SDT and MI, several trials utilised MI techniques within the interventions to operationalise SDT. For example, PAC (Fortier et al., 2007) uses a *7As framework*, with CONNECT utilising an adapted *5As framework* (Lonsdale et al., 2012), both of which integrated MI components. PAC's logic model outlines different intervention components, such as MI techniques and behaviour change techniques (BCTs), before mapping them to the three basic psychological needs, the satisfaction of which is expected to facilitate the development of more autonomous forms of motivation, which finally generates PA behaviour change and maintenance. Similarly, CONNECT's *study rationale, design and methods* paper (Lonsdale et al., 2012) explains the intervention's hypothesised mechanisms of action through the generation of a *SDT model of behaviour change*, highlighting how the intervention affects the social context (autonomy support from physiotherapist), in turn affecting levels of competence, autonomous motivation and fear avoidance beliefs, which drives adherence and generates less pain, and greater function and wellbeing. By doing so, this model explains how SDT is generally hypothesised to contribute to behaviour change, and the paper then outlines how the content within the *theory-based communication skills training workshops* maps onto the three basic psychological needs of autonomy, competence and relatedness.

To bridge the gap between SDT and practice, the interventions and sessions within CONNECT are based around the '5A' framework (ask, advise, agree, assist and arrange), all of which had been specially adapted to suit a physiotherapy session for patients with chronic lower back pain. Each 'A' within the framework is broken down into between three or six strategies that could be incorporated into physiotherapy sessions. In each instance, CONNECT highlights the strategy used (e.g. *Ask*) specific BCT (e.g. *using open-ended questions*), a description/example of how the healthcare professional could utilise the BCT (e.g. *"tell me"/"what?"/"how?" are useful terms when asking questions as they allow the patient to elaborate on his/her story),* and the main basic psychological needs that are targeted by the specific technique *(relatedness).* This demonstrates an example of transparently modelling the process by which an intervention is hypothesised to create its effect. Such an approach clearly maps between SDT and intervention, providing concrete examples that demonstrate how the intervention could be used in practice, and with clear theoretical rationale in the form of mapping onto the basic psychological needs.

Given that MI training is the most prominent form of behaviour change training that many healthcare professionals have access to, integrating MI techniques into SDT-based interventions may allow a common ground to be established between theory and practice, and acting as a starting point from which SDT-based competencies can be developed (Frost et al., 2018). Although several trials outlined or described their intervention components, this was to varying extents, ranging from simply bullet pointing vague components such as *"ask open questions",* through to explicitly mapping between SDT components and BCTs and providing examples to elucidate how the intervention component could be utilised in practice. Clearly, there needs to be a standardised process to document precisely how SDT has been translated into interventions, and how these intervention components are hypothesised to affect clinical PA. For example, future research could utilise Michie et al.'s CALO-RE taxonomy of behaviour change techniques (Michie, Ashford, et al., 2011) to standardise descriptions of interventions and facilitate cross-trial comparisons more easily.

The way SDT was operationalised within each intervention is found in the tables below. Tables 2-4 demonstrate that autonomy was the most extensively operationalised need. These tables demonstrate where each basic psychological need was explicitly operationalised within each trial. Notably, there are some trials where SDT was not explicitly operationalised, hence why they are not evident within tables 2-4. Techniques were extracted and aligned with SDT to assist with intervention development in subsequent chapters of the thesis.

Table 2 Operationalisation of Autonomy

Technique	Trials
Autonomy supportive protocol for health counsellors/ using autonomy supportive phrases instead of controlling language.	EMPOWER/CONNECT
Self-management exercise promotion booklet	EMPOWER
Minimise control and pressure	PAC/ENGAGE-HD
Maximise patients' choice/provide opportunities for patients' input or choice	PAC/CONNECT/ENGAGE-HD/ NST2DM
Provide a rationale for suggestions	PAC/DEF
Allow the patient to overtly express the pros and cons of changing behaviour	PAC
Tailor advice and support to the individual	PAC/ ENGAGE-HD
Involve patients in decision making and solution finding process	PAC/ENGAGE-HD
Remove the external controls in a traditional weight loss approach, such as a focus on weight loss as the only meaningful outcome	HAES
Explore various exercise options that are enjoyable and accommodate their current physical capabilities	HAES
Foster opportunities for participants to provide meaningful input and have influence on their training programme	HAES
Implement self-selected intensity exercise regimens with perceived moderate intensity.	HAES
Encourage exploration of various enjoyable PA to accommodate current physical capacity and lifestyle.	HAES
Provide alternatives to weight reduction as the only index of "success".	HAES
Avoid coercion, use "might" instead of "should".	HAES
Prevent blame or judgment.	HAES/DEF
Providing information and feedback on PA behaviour	TAVIE en m@rche/DEF
Provide information on consequences of behaviour in general by providing information on potential advantages of PA	TAVIE en m@rche
Provide instruction on how to perform the behaviour of attaining the recommended minutes per week of PA	TAVIE en m@rche
Provide feedback on performance tailored to last 7 days' PA.	TAVIE en m@rche
Explore reasons to increase PA.	TAVIE en m@rche
Motivational interviewing, asking evocative questioning to explore advantages of increasing walking behaviour, and to explore goals and values.	TAVIE en m@rche
Motivational interviewing, sharing a list of potential reasons to increase walking behaviour.	TAVIE en m@rche
Explore strengths	TAVIE en m@rche
MI, asking evocative questions to explore strengths.	TAVIE en m@rche
MI, sharing a list of potential strengths.	TAVIE en m@rche
Develop an action plan	TAVIE en m@rche
Provide instruction on how to perform the behaviour	TAVIE en m@rche
Goal setting using SMART goals.	TAVIE en m@rche

Provide information on consequences of behaviour in general by providing information on potential advantages of PA and how to make PA enjoyable	TAVIE en m@rche
Prompt self-monitoring of behaviour of SMART goals.	TAVIE en m@rche
Provide information on where and when, and instruction on how to perform the behaviour using practical tips to increase PA behaviour or to maintain sufficient PA behaviour	TAVIE en m@rche
Prompt review of the identification of behavioural goals (SMART goals, and reasons for walking).	TAVIE en m@rche
Barrier identification/problem solving.	TAVIE en m@rche
Plan social support to elicit support from significant others in the attainment of increasing walking behaviour or maintaining sufficient walking behaviour.	TAVIE en m@rche
Provide an example of action planning.	TAVIE en m@rche
Provide feedback on performance (action plan and walking behaviour).	TAVIE en m@rche
Let the client make decisions about what and how to change.	DEF/PESO
Roll with resistance	DEF/PESO
Explore options	DEF
Encourage Change-Talk	DEF
Provide a menu of effective options for change	DEF
Supporting patients' choices and initiatives	DEF
Encourage patients to develop their own reasons to practice more PA.	DEF
Asking open questions	DEF
Affirming	DEF
Reflecting	DEF
Summarizing	DEF
Informing and advising	DEF
Provide staff with information on benefits of promoting autonomy. Encourage them to identify current good practice and generate strategies by which they could be more need supportive.	PARA
Offer patients a choice of the types of exercises included in their programme.	PARA
Present options	PESO
Develop discrepancy	PESO
Gauge patient readiness to accept advice: Ask the patient if he or she is ready to consider advice regarding activities outside the clinic.	CONNECT
Identify barriers and obstacles (to following treatment advice)	CONNECT/ NST2DM
Identify solutions and obstacles (to overcoming barriers)	CONNECT
Provide a rehabilitation diary (to help keep track of home-based rehabilitation)	CONNECT
Self-regulation and PA ownership	NST2DM

Table 3 Operationalisation of Competence

Technique	**Trials**
Normalise feelings, behaviours and experiences	PAC
Assist in realistic goal setting/employing SMART goal setting/ small achievable steps	PAC/DEF/PESO/CONNECT/ ENGAGE-HD/ NST2DM
Ensure active patient participation in goal setting	CONNECT
Assisting in building skills and aiding with activities required to achieve goals	ENGAGE-HD
Assist in building skills and developing coping strategies	PAC/DEF/PESO
Provide positive feedback	PAC/DEF/PESO/ ENGAGE-HD
Patient can decide progression of their PA sessions	HAES
Trainer should present choices and meaningful individualised guidance	HAES
Provide timely, specific and personalised feedback	HAES
Provide different choices for appropriate aerobic and resistance exercise for specific clinical sample	HAES
Instruct and encourage PA at home	HAES
Suggest enjoyable, moderate exercise, gradually increase total volume of exercise, and decrease sedentary	HAES
Teach specific behavioural skills, such as self-monitoring, goal setting and problems solving, to facilitate independent lifestyle exercise.	HAES
Process focus (regulatory skills) on exercise behaviour, rather than outcome focus.	HAES
Present clear and neutral information about behaviour and outcomes	DEF/PESO
Participants are told explicitly that they are the only experts about what and how to change.	DEF
Support self-efficacy	DEF
Help skills building and problem solving	DEF
Encourage patients to ask questions	PARA
Provide staff with information on benefits of promoting competence. Encourage them to identify current good practice and generate strategies by which they could be more need supportive	PARA
Elicit and reinforce self-motivational statements	PESO
Catering for different learning preferences: Use a selection of methods (aural, visual, kinaesthetic) to educate the patient (during session and take home materials)	CONNECT
Closing the loop: Ask patients to paraphrase/demonstrate information that has been provided and provide corrective feedback as required.	CONNECT
Identify barriers and obstacles (to following treatment advice)	CONNECT
Identify solutions and obstacles (to overcoming barriers)	CONNECT

Provide a rehabilitation diary (to help keep track of home-based rehabilitation)	CONNECT
Following-up (suggest a specific follow-up appointment)	CONNECT
Offering contact (in the event of questions or difficulties)	CONNECT
Help to clarify outcome expectations	ENGAGE-HD
Understand PA, consider different types of PA	NST2DM
Consider pros and cons of PA	NST2DM
Success/failure reflection	NST2DM
Value/competence beliefs	NST2DM
Self-regulatory skills	NST2DM
Mastery focus	NST2DM

Table 4 Operationalisation of Relatedness

Technique	**Trials**
Act in a warm and caring way	PAC/ENGAGE-HD
Express empathy	PAC/DEF/PESO
Acknowledge and support patients' perspectives, feelings and values	PAC/ENGA3GE-HD
Avoid judgment, criticism or blame	PAC/DEF/PESO/ENGAGE-HD
Demonstrate understanding of the client's position	DEF
Encourage participants to identify family and friends who could support their behaviour change and the different types of support (tangible, emotional).	HAES/ NST2DM
Provide and discuss written information about local community resources to support regular PA.	HAES
Empathise with the exercise challenges and psychological concerns that are common in the clinical population.	HAES/CONNECT
Staff should show enthusiasm and spend time chatting before the session and learning participant's name.	HAES
Mix within class and ensure availability during training.	HAES
Present an attitude of caring, understanding and listening in response to client's needs regarding PA.	HAES
Offer suggestions such as buddy systems for social support.	HAES
Encourage sharing of behavioural strategies through group discussions among participants with similar challenges.	HAES
Provide strategies for ways to seek social support from family and friends.	HAES
Explore client's concern in an empathetic way	DEF/PESO
Provide unconditional positive regard/not judgmental/unconditionally recognise that patients are able to change PA behaviour	DEF
Provide a consistently warm interpersonal environment	DEF

Dedicate time and attention to the patient	PARA
Provide staff with information on benefits of promoting relatedness. Encourage them to identify current good practice and generate strategies by which they could be more need supportive	PARA
Demonstrate empathy	PESO/CONNECT
Demonstrate understanding	PESO
Use open-ended questions: “Tell me”/“What”/”How”	CONNECT
Use single questions: Avoid asking multiple questions at one time.	CONNECT
Staying silent: Allow the patient to complete sentences and finish speaking before following up with further questions.	CONNECT
Paraphrasing: After listening to the patient, summarize your perception of the main points.	CONNECT
Following-up (suggest a specific follow-up appointment)	CONNECT
Offering contact (in the event of questions or difficulties)	CONNECT
Support through planning, agreeing and reviewing PA, and support from the PA coach to identify with PA.	NST2DM
Attachments with others through PA	NST2DM
Self-perceptions in social settings	NST2DM

3.5 Discussion

At the time of writing, this is the most comprehensive review of methods associated with the development of SDT-based interventions aiming to affect clinical PA behaviour conducted to date. It is also one of the first to unite the wider health research context, such as MRC guidelines and current discourses surrounding intervention development, with the SDT-based intervention domain, as advocated by Presseau et al. (2021). Although there are examples of good practice when research teams develop interventions aiming to affect clinical PA levels, such as extensive stakeholder engagement through patient focus groups within the MotM and ENGAGE-HD trials, there still appears to be a dominant approach of developing an intervention without *a priori* consideration of the healthcare context. Instead, the secondary evidence base, typically comprising research conducted within non-clinical samples, is used to provide a rationale for developing a SDT-based intervention and its components. This review therefore echoes claims levelled at the SDT-based PA intervention field that there is currently a paucity of attention paid to the research that comes prior to evaluating intervention delivery and measures of effect, for potential reasons such as budget and resources (Quested et al., 2017), as well as extending Quested et al.'s arguments from the intervention implementation phase through to intervention development.

3.5.1 Recommendations

The *identifying and developing theory* section of this review indicates that a number of trials did not publish any primary research to inform the development of the intervention and identify targets for change. This means that most interventions for clinical populations within this review appear to be developed with little consideration of the clinical context which it aims to operate within. This echoes sentiments by Matthews et al. (2015), who suggest that to date, specific barriers relating to the use of SDT-based communication strategies in clinical practice have not been identified during the intervention development process. Therefore, it could be argued that the extent to which SDT is applicable to each intervention setting is unclear. To address this issue, future interventions aiming to influence clinical PA could firstly identify the issues that an intervention needs to target, using qualitative or mixed-method approaches to generate a more in-depth explanation of a target behaviour. Subsequently, a range of different theories that can be used to change behaviour could be considered, before selecting the most appropriate based on previous research findings and features of the intervention context. This would overcome the suggestion that theories are often selected to inform behaviour change interventions based on popularity rather than appropriateness (Davis et al., 2015; Moore & Evans, 2017).

By taking this bottom-up approach to intervention development, our level of understanding of how SDT, or other psychosocial theories, can be used to explain health behaviours such as PA across different healthcare contexts would be enhanced. Practically, the inclusion of this step in intervention development would facilitate the identification of intervention targets: factors that influence individuals' PA behaviours. These targets would act as an evidence-based starting point in developing interventions by providing a rich description of the healthcare context. Current practice, where this step is not heavily prevalent, means that theory is often selected prior to any consideration of the contextual constraints of the healthcare setting. Therefore, such interventions may not extensively influence real-world practice in the healthcare contexts and populations that they attempt to positively affect (Presseau et al., 2021), albeit within the often heavily controlled setting of a clinical trial.

The *modelling process and outcomes* section of the review demonstrates that several trials explicitly mapped between basic psychological needs and the intervention, as evidenced by tables 2-4. However, the terminology used to describe the intervention components was generally inconsistent, meaning the extent to which similar intervention components were selected was unclear, which made it difficult to compare across trials. To make the description of interventions more transparent, future logic models and/or intervention protocols could utilise the CALO-RE taxonomy of behaviour change techniques (Michie, Ashford, et al., 2011) to describe the features of the intervention. Another potential alternative to standardising the reporting of intervention based on motivational theory such as SDT is evident in a meta-analysis of techniques to promote motivation for health behaviour change, which facilitated mapping between SDT's basic psychological needs, the CALO-RE taxonomy, and the Motivational Interviewing Taxonomy (Gillison et al., 2019). This consistent mapping between theory and taxonomy, offered by either of these taxonomies, would allow subsequent attempts at intervention development to understand why specific BCTs had been selected in previous trials, how they were perceived to map onto SDT, and their relative contributions to an intervention's effect. Across all trials, CONNECT and TAVIE en m@rche demonstrated the most transparent examples of mapping between theory and intervention. As an example of good practice, TAVIE en m@rche related the intervention components not only to specific SDT variables, but also onto the CALO-RE taxonomy (Michie, Ashford, et al., 2011), therefore allowing cross-trial comparisons to be made more easily.

The generation of a hypothesised mechanism of action also elucidates a mixed understanding of SDT in the interventions within this review. For example, TAVIE en m@rche (Kayser et al., 2017) generated a logic model to explain how they envisage the intervention will influence participants' levels of PA engagement. Additionally, it explicitly maps between SDT's components and features of the intervention, as previously discussed. However, in this instance, the authors assert that their intervention will not address all three basic psychological needs, as they believe that their intervention may not be powerful enough to adequately influence relatedness. Instead, they hypothesise that their intervention will be effective through improvements in autonomy support, self-determined motivation, and perceived competence. By highlighting that their intervention will not address all three basic psychological needs, the issues highlighted in the previous section relating to how theories are often selected based upon popularity rather than applicability to the clinical context are apparent (Davis, Campbell, Hildon, Hobbs, & Michie, 2015; Moore & Evans, 2017). This is problematic as seminal SDT literature highlights that more intrinsic forms of motivation, in this instance demarcated by autonomously regulated PA engagement, would only be developed if all three basic psychological needs were satisfied. Potentially, if the clinical context had been considered in the first instance, prior to the selection of a theory upon which the intervention would be based, a different or complementary theory of behaviour change could have been identified to be more suitable, such as one that does not place the same level of importance upon relatedness, as does SDT. This may facilitate more substantial alignment between healthcare context and theory, rather than having to modify the theory in response to issues within the clinical context that become apparent through post-hoc justification of SDT.

In the wider health policy research domain, the *TIDieR checklist* (Hoffmann et al., 2014) outlines a framework by which interventions can be reported, providing a recommendation that the rationale, theory or goal of the elements essential to the intervention should be described. *TIDieR* suggests that the inclusion of this information helps others to understand which elements of an intervention are essential, rather than optional or incidental, also known as *active ingredients*. Additionally, *TIDieR* suggests that each *procedure, activity, and/or process used in the intervention* should be described. Although this guidance is useful to explain which information should be included in intervention protocols, a more explicit mapping between intervention and theory, using other sources such as CALO-RE or Gillison et al.'s (2019) taxonomy of SDT-based techniques, would allow a much more transparent intervention development process to take place and be better reported.

3.6 Conclusions

This review has discussed the approaches taken to develop interventions that are informed by SDT and aim to increase PA levels amongst clinical populations. Findings from this review helps to contextualise critiques levelled at the wider intervention development field within a theoretical framework that is currently one of the most popular psychosocial theories within health behaviour change. By doing so, using the SDT-based clinical PA field as an example, this review demonstrates that there is currently a limited number of attempts to rigorously develop interventions in a manner that is cognisant of the healthcare context, utilising methods such as stakeholder engagement. Additionally, there were some examples of good practice relating to mapping between SDT, intervention components and features of the intervention context such as healthcare professionals' practice (Fortier et al., 2007; Hsu et al., 2013). However, there was not a generic method for outlining precisely how theory has been used to guide intervention development, and a number of trials did not explain how SDT had been operationalised. Based on these findings, recommendations are provided for developing interventions in a more rigorous way that is cognisant of the healthcare context, key stakeholders, and the wider discourses in health research, including the evolving field of intervention development. This more rigorous approach will be adopted throughout the rest of the thesis.

Chapter 4: What does Cardiac and Pulmonary Rehabilitation look like in Knowsley?

4.1 Chapter Overview

When developing physical activity-related behaviour change interventions, researchers are encouraged to consider factors within a healthcare context that may influence the efficacy, operationalisation and implementation of interventions. Accordingly, chapter 4 discusses factors essential for developing an intervention to complement the existing CR/PR service. Using semi-structured interviews with healthcare professionals and patients at the point of discharge, chapter 4 describes Knowsley's rehabilitation context, the multi-component nature of CR/PR, and logistical issues that need to be considered for developing the intervention.

Chapter 4 aims to provide a case study of the nature of rehabilitation in Knowsley, such as the aims of the programme, the different components of CR/PR, staffing, and the perceived importance of PA. This is intended to contextualise the existing evidence base discussed previously, and act as a starting point from which the intervention for this programme of research will be developed.

4.2 Why consider context?

MRC (2008) suggests that to assist with intervention development, researchers should identify and develop theory to inform the basis of an intervention. Existing literature can be used to identify existing insights that can provide the starting point of a theoretically based intervention. However, chapter 3 identified that many SDT-based PA interventions in clinical populations fail to adequately develop theory further than the insights afforded by the existing literature base. Accordingly, chapter 4 acts as a starting point to develop theory, providing a descriptive case study of Knowsley's CR/PR service, and identifying potential intervention targets that a psychosocial intervention within this context could aim to remediate to promote PA.

4.3 Knowsley: What do we know so far?

The Metropolitan Borough of Knowsley (highlighted in orange within Figure 8 and referred to as Knowsley for the duration of this thesis) is situated approximately nine miles from Liverpool in Merseyside, within the wider Liverpool City Region in the North West of England. The communities within Knowsley are largely a result of Liverpool's overspill development. Most of Knowsley's population are clustered in ten deprived suburban townships: Cronton, Halewood, Huyton, Kirkby, Knowsley Village, Prescot, Roby, Stockbridge Village, Tarbuck, and Whiston. The most deprived areas within Knowsley are North Huyton, Kirkby and Stockbridge Village (Ministry of Housing, 2019)

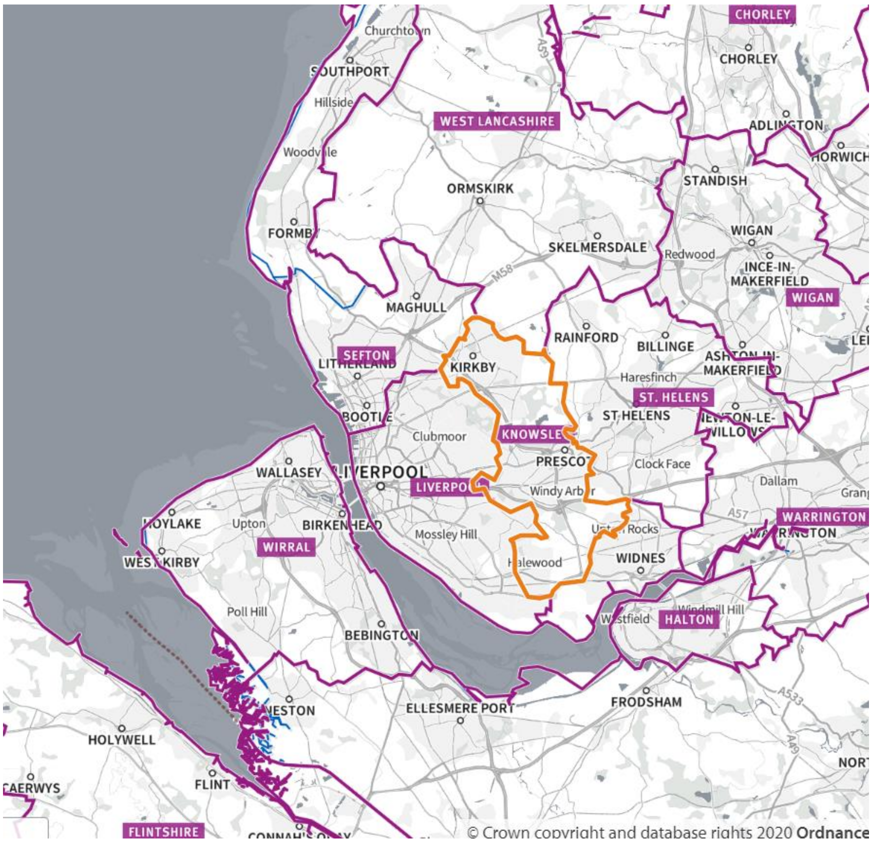


Figure 8 Knowsley District, Outlined in Orange (Source: SHAPE Atlas, PHE, 2020)

Released every four years with the latest version published in 2019, the English Indices of Deprivation (IoD2019) divides England into 32,844 Lower-layer

Super Output Areas (LSOA's), each of which comprise approximately 1500 residents or 650 households. In terms of the average deprivation score of the LSOA's within local authorities, Knowsley was the second most deprived local authority in England behind Blackpool, and closely followed by geographical neighbour Liverpool. 51.11% of the LSOA's within Knowsley were in the most deprived decile of multiple deprivation, meaning that over half of the LSOA's within Knowsley were found within the most deprived 10% of the country. Most notably, all LSOA's within Knowsley could be found within the lowest five deciles of the IoD2019. This finding is comparable to other local authorities in the north west of England, as no LSOA's in Knowsley, and only a relatively small proportion of LSOA's in Liverpool (16.10%) and Blackpool (4.25%) were found in deciles 6-10.

The detrimental impact of deprivation on health has been well documented. As evidenced in work by Marmot, deprivation correlates with shorter life expectancy, quality of life, and heart disease related death, amongst a range of other health outcomes (Marmot, 2005, 2020). Epidemiological research also demonstrates that the leading causes of years of life lost in England are tobacco use, unhealthy diet, alcohol consumption, and physical inactivity, all of which are socioeconomically patterned (Marteau et al., 2019). Marmot (2020) reported that 2.5 million years of life are potentially lost to health inequalities by those dying prematurely each year in England. Perhaps more disturbingly, the average difference in disability-free life expectancy is 17 years. In summary, people in poorer areas will not only die sooner, but they will also spend more of their lives with a disability or experiencing a lower quality of life. This social gradient of health is evident in Knowsley, with the most deprived areas of the borough displaying double the mortality rates from COPD compared to the least deprived areas (Knowsley

Council, 2016b). This makes the development of effective interventions that are able to decrease mortality by engaging in adaptive health behaviours an extremely important agenda across a number of health conditions.

Cardiovascular disease (CVD) is one of the key contributing factors to reduced life expectancy in Knowsley and is the second leading cause of death after cancer, accounting for approximately 25% of local deaths and 349 people dying of CVD in 2012 (Knowsley Council, 2016a). In 2013/14, Knowsley Clinical Commissioning Group (CCG) spent £146 per head of population on circulatory disease conditions compared to an average of £120 in England and £119 for comparable CCGs, demonstrating a higher spend and worse outcomes compared to comparable areas in England (Knowsley Council, 2016a). NICE identify nine major modifiable risk factors for myocardial infarction in order of Population Attributable Risk, indicating the proportion of cases that would not occur if the factor were eliminated. NICE estimate that 57.1% of the national population above the age of 18 will have at least one of these factors, increasing to 88% of the population over 55, and 84% of over 65s. NICE estimate that 38.4% of cases would not occur if Knowsley's population met PA guidelines. In addition to these modifiable risk factors, including diet, smoking or tobacco use and excess alcohol consumption, deprivation is listed as a risk factor of experiencing one or more vascular condition, evidenced by the positive correlation between deaths from circulatory diseases and levels of deprivation (Knowsley Council, 2016a).

COPD is the fifth biggest killer disease in the UK, killing approximately 25,000 people per year, and accounting for more than one million 'bed days' in UK hospitals each year. In Knowsley, COPD is one of the key factors contributing to reduced life expectancy and is the third leading cause of death after cancer and CVD. Between

2011 and 2013, out of 326 local authorities in England, Knowsley has the sixth highest mortality rate due to respiratory disease. As is evident in the CVD data, Knowsley CCG has a higher respiratory spend per weighted head of population than is average for England (£113 compared to £89) but generally has much poorer outcomes and a larger volume of potential years of life lost according to programme budgeting data (Knowsley Council, 2016b). Clearly, CVD and COPD pose extremely large problems within Knowsley through the health of population and the economic findings that Knowsley has a higher spend and worse outcomes when compared with comparable local authorities. This indicates that effective initiatives need to be developed and implemented that are able to address the burden of these diseases at a local level by changing the population's health-related behaviours, such as PA.

4.3.1 Knowsley Community CVD and COPD Service

Since 2010, Liverpool Heart and Chest Hospital NHS Foundation Trust has been commissioned by Knowsley CCG to deliver a Community CVD Service and Community Respiratory Service throughout Knowsley. Between February 2015 and January 2016, there were 43,301 individual attendances at the Trust's Community Clinics. The services provided are multidisciplinary comprising of: CVD and Respiratory, heart failure, Home Oxygen Assessment and Review Service (HOSAR), consultant led diagnostic, spirometry, community cardiac, pulmonary and stroke rehabilitation. The CVD service comprises 20 allied health professionals. For the Pulmonary Rehabilitation service, the staffing ratio to service delivery was in line with the national recommendations by the British Thoracic Society for pulmonary rehabilitation. Patient exercise classes were staffed (1:8) and (1:16) for education sessions, with a minimum of two supervisors in attendance, 1 of whom must be a qualified respiratory specialist health care professional to supervise the exercise component (Care Quality Commission, 2016).

The quality of the CVD and COPD service has been identified in the community health services for adults last Care Quality Commission (CQC) report conducted in 2016, where the CVD and COPD services were awarded an overall rating of Outstanding (Care Quality Commission, 2016). Similarly, Liverpool Heart and Chest Hospital NHS Foundation Trust were awarded an Outstanding overall rating in their CQC report in 2019 (Care Quality Commission, 2019). Levels of patient satisfaction consistently exceed national averages, with the 2016 CQC report highlighting that *"staff provided compassionate and highly personalised care to patients in the community. Staff were highly motivated to offer support to patients which was kind and caring and they were willing to go the extra mile"* (p.19).

Since mid-2016, the CVD and COPD services have begun to integrate, offering cardiopulmonary rehabilitation in an increasingly integrated service. Clinics run at four centres throughout Knowsley, in Kirkby, Huyton, Halewood and Whiston. Clinics in Kirkby, Huyton and Halewood run are based at council-run leisure centres, meaning that patients have access to either gym-based or circuit-based physical activity sessions. Conversely, Whiston clinic is based in a town hall, meaning patients only have access to circuit-based activity sessions. Typically, clinics in Huyton and Kirkby demonstrate higher attendances, with Halewood attendances significantly smaller than the other clinics.

4.3.2 Aims of Chapter

Chapter 3 demonstrated that SDT-based PA interventions in healthcare settings typically fail to extensively make contextual considerations during the intervention development phase, for example failing to consider how these healthcare contexts or services typically operate. To remediate this, chapter 4 aims to provide a description of Knowsley's CR/PR healthcare context, with particular attention afforded to describing the programme's different components and their relative importance in affecting PA behaviours. In turn, this aims to establish a solid basis from which the intervention can be developed, and addresses aforementioned concerns about health intervention research that interventions are typically developed without extensive consideration of the wider health context. By doing so, chapter 4 will firstly develop a description of Knowsley's CR/PR healthcare context. Secondly, the chapter will assess the relative importance of the different components of CR/PR and their relative importance to PA behaviour change.

4.4 Methods

4.4.1 Sampling

Through purposeful sampling, cardiac and pulmonary rehabilitation patients (*n*=8) and healthcare professionals (*n*=11) participated in this study. All patients were from Knowsley and had taken part in CR or PR delivered by Knowsley Community CVD/COPD Rehabilitation Services. Healthcare professionals held a variety of roles within the outpatient cardiac and pulmonary rehabilitation services, reflecting the multidisciplinary nature of a rehabilitation team, and the variety of disciplines that operate within CR and PR. Healthcare professional roles included cardiac nurse (*n*=3), matron (*n*=1), exercise physiologist (*n*=3), healthcare assistant (*n*=1), assistant practitioner (*n*=1), exercise instructor (*n*=1), and physiotherapy assistant (*n*=1) To access this patient sample, in line with National Health Service (NHS) ethics, patients were recruited by a healthcare professional during their penultimate appointment, or were contacted via phone if they had dropped out of the programme. Healthcare professionals were already aware of the research project and were informed of the intention to develop an intervention derived from their interview data and were invited to participate via email. A total of nineteen participants were included in the study because they had experience of CR and/or PR within a UK region. A final interview was conducted that confirmed data saturation because no new codes were identified, and therefore recruitment stopped.

4.4.2 Ethics

The research was given favourable ethical opinion by the North West - Greater Manchester West Research Ethics Committee (REC reference: 17/NW/0332; IRAS project ID: 226025) on the 9th June 2017. Fuller documentation regarding the ethical approval process can be found in the documentation that accompanies this thesis. Following the interview, participants received a debrief form that reiterated the aims and rationale of the study, as well as the research team's contact details for any participant concerns that may arise, such as if a participant wished to withdraw their data.

Due to the sensitive nature of data, anonymity of the data was of prime importance. Therefore, each participant was assigned a pseudonym to protect their identity and any other identifiable demographic information was removed. Additionally, participants were advised that their data would be stored securely and confidentiality would be assured through the use of pseudonyms for the purposes of dissemination. The first author recorded and conducted all interviews. Immediately following the participant's departure, written memos and reflections were made to assist with contextualisation during the analysis process.

4.4.3 Data Collection and Procedure

Data were collected using face-to-face semi-structured interviews in either a hospital seminar room or private room in a leisure centre, based on participant availability. To ensure discussion remained pertinent to the aims of the study, an interview guide was developed which allowed the interviewer to ensure the same coverage of topics across all participants (see accompanying documentation for the interview guides). The interview guide was informed by a review of the literature, and consultancy between the research team and senior healthcare professionals, in line with the pragmatic epistemological stance and the research aim to affect real-world healthcare practice. A combination of open and closed questions was utilised. Open questions provided participants with the opportunity to discuss their lived experiences, for example, *'When you received your admission phone call, what were your initial thoughts about attending rehabilitation?'* Closed questions, prompts and probes were utilised to garner greater depth of responses. Interviews lasted between 23 and 81 minutes (M=44 minutes), supplemented by briefing regarding the aims of the study and assurances about confidentiality. In total, 13.5 hours of interview data were collected.

4.4.4 Data Analysis

Data analysis followed Braun & Clarke's (2006) thematic approach, including data familiarisation, coding, searching for and defining themes, and included data saturation (Saunders et al., 2018). A thematic approach was adopted as it is able to provide a rich and detailed, yet complex account of data (Nowell et al., 2017). An inductive approach to TA was adopted, meaning that the findings were strongly data-driven, as a pre-existing coding frame was not adopted, but instead subthemes were formed inductively throughout the concurrent processes of data collection and analysis.

Through this concurrent process, emergent themes and issues raised during earlier interviews informed the conduct of subsequent interviews. As data collection and analysis progressed, a coding frame was devised, tested and refined by the lead researcher and a supervisor. Miscellaneous subthemes that did not intuitively fit with the rest of the data were also recorded, described and discussed by the research team. Both parties applied the coding frame to the data, allowing comparison and reflection on differences, and allowing the coding frame to evolve and expand to incorporate new knowledge. Data collection ceased when no new themes were identified or significantly elaborated upon, meaning that saturation had occurred (Saunders et al., 2018).

4.5 Results

4.5.1 What is CR/PR?

To elucidate how the formal definitions of CR and PR are interpreted within Knowsley's service, participants discussed how they would summarise the programme's aims. The key finding of this chapter, as will be explained through all themes collaboratively, is that CR/PR was referred to as a holistic programme of rehabilitation, rather than simply providing an opportunity for patients to be active. This multifaceted nature of CR/PR is exemplified by healthcare professionals 1 and 6, who discuss the multiple components of rehabilitation when they are admitting patients to CR/PR, taking the focus away from the PA component of the programme:

> *"We offer other services, so we've got the complementary services, we've got (medication) titration, so I mention to them that we've got these other services, we've got the weight management, I don't just sell it as an exercise programme, I sell it as the full picture"* (Healthcare Professional 1, lines 39-44).

> “We'd like to get you the next port of call, come and see us, talk about what you’ve had, we'll talk about your medications, how you feel, going forward, there may be an exercise element to it…” (Healthcare Professional 6, Line 220-222).

The first contact that Knowsley’s healthcare professionals make with a patient is via telephone, where they invite the patient to attend CR/PR in either a leisure centre or town hall. These quotes demonstrate how during the phone call, healthcare professionals attempt to highlight how CR/PR could benefit the patient in a range of ways other than purely engaging with PA. By highlighting these *“other services”* (Healthcare Professional 1, line 39) within CR/PR that *“get you to the next port of call”* (Healthcare Professional 6, line 220), participants portray CR/PR as a method of delivering continuity of care following the patient’s discharge from hospital. By portraying PA as a peripheral component of CR/PR rather than the key component, healthcare professionals instead highlighted how CR/PR aims to deepen patients’ understanding of their current situation and events that precluded their admission to CR/PR. By portraying CR/PR as a holistic programme of rehabilitation, CR/PR was perceived to be a vehicle to facilitate a return to normality. Healthcare professionals outlined how CR/PR aims to allow patients to feel as though they are successfully negotiating a hugely stressful life event, such as a heart attack or major surgery:

> *“My job holistically is getting a person either as one-to-one or as a group back to some kind of normality… Improve fitness, generally just try and improve their wellbeing. Yeah, getting a person back to normality… I try and get them back to normality in the short-term as part of the MDT* (multidisciplinary team) *in the short time that we've got and long-term, try and get them on the road so they can start to look after themselves and refer them if we have to”* (Healthcare professional 6, lines 300-308).

In this instance, healthcare professional 6 highlights how they perceive their role to be to equip patients with the skills to self-manage their condition in the long-term in order to facilitate continual progression back to their normal levels of functioning. In this instance, healthcare professional 6 elucidates how PA is implicated alongside the other components of CR/PR: *"improve fitness, generally just try and improve their wellbeing"* (Lines 302-303). Patients who perceived themselves to have returned to a normal level of functioning exhibited greater confidence and possessed the ability to self-direct their own care. These factors enabled patients to more effectively negotiate the life event that precluded their referral to CR/PR, and in turn strengthened their understanding of their new normal level of functioning. Consequently, a psychosocial intervention that will operate within CR/PR should seek to equip patients with the confidence, skills and understanding to safely change their health-related behaviour of their own volition. Doing so will facilitate a perceived return or a progression towards a recognisable level of normality. The importance of establishing normality is further exemplified by patient 2 as a major concern of his upon entering rehabilitation:

> *"They (healthcare professionals) want you to get back to normal as quickly as possible because, I'll be honest with you, that's all I was bothered about when I came out of hospital because I've always considered myself fit and healthy so when they say you've had a heart attack it does tend to knock you for six a little bit and I was bothered whether I was going to be able to do what I would normally do. You know just stupid little things like mowing the lawn and things like that, you know I've always… as I say what I was bothered about basically how quickly I could get back to doing the things I do and as far as, touch wood as far as I am concerned now I feel as fit and healthy as I did beforehand. As I say nobody is 99.9% sure I'm not going to have another heart attack but I feel equally as good as I did beforehand". (Lines 16-30)*

In this instance, patient 2 suggests that a major element of his experience of CR/PR is how he developed confidence that has enabled him to return to normality. Patient 2 highlights how his main concern was re-establishing normality following his cardiac event and being able to perform the activities that he engaged in previously. Patient 2's narrative highlights how his initial cardiac event was a shock because he perceived himself to be *"fit and healthy"* (line 17), therefore suggesting that he feels this incident was out of his control. This perceived lack of control led to him losing confidence in his ability to perform his normal behaviours such as *"mowing the lawn"* (Line 23). In contrast, at the point of discharge participant 2 perceived himself to have returned to normality despite understanding that he could suffer a secondary cardiac event. This excerpt demonstrates how CR has alleviated patient 2's initial concerns about returning to normality, as he "feels as fit and healthy as (he) did beforehand" (line 30). Therefore, an intervention operating within CR/PR should help fulfil this aim of returning patients back to a perceived normal level of functioning. Patient 2 further elucidates this by discussing how *"confidence"* (Line 33) that he developed by attending rehabilitation was an important factor facilitating his return to physical activity:

> *"I thought I'm not going to be able to jog again because I didn't feel as though I could but I can now and I'm not saying I'm going to you know, but I don't think I'll be running any 10k's or anything like that but I feel that if I really wanted to I don't think there's anything that would really stop me now because I feel that much better about it*" (Patient 2, lines 63-66).

This demonstrates that following his course of CR/PR, patient 2 feels in control of his PA behaviours and therefore does not perceive there to be any psychological barriers that may prevent him from being active. However, he has become more educated in relation to which activities are safe for him to participate in, and which he should avoid. Therefore, an increase in patients' confidence is perceived to alleviate the psychological barriers that may prevent them from engaging in health-related behaviours. This demonstrates that as well as the physiological barriers that may prevent a patient from engaging in PA, a psychological barrier also exists. Therefore, interventions should ensure that they seek to understand what a patient defines as normality, before working to facilitate a patient's progression towards this perceived normality, or an adapted version on the basis of the severity of their condition. Patient 2's experiences suggest that the intervention should help to develop patients' levels of confidence in their own abilities to self-direct their care, in order to facilitate a gradual progression back to a perceived normal level of functioning.

To further reflect the fact that CR/PR has a broader focus than simply PA, healthcare professionals perceived secondary prevention to be a key aspect of the programme. Several healthcare professionals discussed how they aimed to achieve this by providing patients with both instrumental and social support, which was perceived to allow patients to increase their understanding of their condition, to learn how to make adaptive health-related behaviour changes, and to provide an opportunity for patients to take ownership over their rehabilitation:

> *"(The support) can be psychologically, it can just be doing a clinical observation, making sure they're on the right medication, making sure all their observations, blood pressure, heart rate is all right. Stopping them from getting readmitted into hospital. Preventing that really. Making sure they know what they should be doing at this stage, what's going to happen next, what we're going to do…things like that really"* (Healthcare Professional 3, lines 76-81).

In this instance, healthcare professional 3 highlights how her role necessitates an ability to provide psychological support as well as making clinical observations and educating patients about their condition and what is required of them within CR/PR. All of these features of her role seek to facilitate secondary prevention. This again demonstrates how CR/PR transcends a PA focus, but comprises a range of interrelated components that collectively aim to prevent a secondary event that may require further hospitalisation. Participants suggested that the development of independence helped to facilitate secondary prevention, with healthcare professional 8 suggesting that: *"the whole point of rehab is to maintain independence"* (line 562). The perceived importance of the continual development of independence was also corroborated by patients. For example, patient 4 highlighted how he was empowered to take an active role in his rehabilitation and discussed changes to a range of his health-related behaviours, such as physical activity, smoking, and diet:

> *"I know it's not a cure but it's something to help you on your way. That's what it's for and then it's down to me to look after it, to stop smoking and stop eating shite and sitting on your arse doing nothing and getting out and doing it"* (Patient 4, line 180-182).

This demonstrates that although CR/PR has helped patient 4 to initiate his recovery process, the success of his long-term rehabilitation is now his own responsibility, rather than being reliant on the influence of healthcare professionals. This demonstrates that an integral aim of CR/PR is to empower patients to improve their own health behaviours by internalising the health-related messages within the programme. Therefore, a behaviour change intervention aiming to operate within CR/PR should assist healthcare professionals to develop and maintain independence amongst patients, so that behaviour change is largely driven by the patient. In addition to the importance of independence, patient 4's claim that *"I know it's not a cure but it's something to help you on your way"* (line 180) reflects previously made claims that secondary prevention is a key component of CR/PR. This also demonstrates that secondary prevention is perceived to be achieved through an interplay of health-related behaviours, such as PA, smoking and diet, again reinforcing the claim that CR/PR's focus is more than PA. Similarly, healthcare professional 3 suggested that her role within the programme is to develop patients' confidence, help them to better understand their condition, and empower them to change behaviour. She suggests that:

> *"When they come to us, it's us about explaining, providing them with the confidence to gain confidence to get their lives back, to change their lifestyle. Say this has happened because of that, this is what we need you to do".* (Healthcare Professional 3, lines 91-93).

Thus, successful health-related behaviour change that is driven by patients' own volition is perceived to be a central objective of CR/PR. This quote summarises previously made points, demonstrating how CR/PR provides education, developing patients' confidence levels, and facilitating continual progression towards a patient's normal level of functioning, and supporting patients to change salient health-related behaviours. Therefore, it is important to consider each of these as potential intervention targets and to consider how an intervention can support these programme aims.

4.5.2 Working Together

In Knowsley, CR/PR operates on an increasingly merged basis, with service-level changes in aiming to progress towards the development of a single cardiopulmonary rehabilitation service. Patients did not perceive there to be a difference between the two clinical populations: *"you don't really notice (a difference) to be honest because they (professionals) all seem to be concerned about everybody whether they're cardiac patients or chest (pulmonary) patients"* (Patient 2, lines 80-81). The idea of a merged rehabilitation service was generally well-received by professionals:

> *"I think it works well, because we're learning about their patients and they're learning about our patients, and then say if there's more in one group than the other, then we can get some of our staff or their staff to help each other, and then the patients can talk to each other as well, so I think it's really good"* (Healthcare Professional 1, lines 212-214).

The use of *"their patients"* (with reference to PR), and *"our patients"* (with reference to CR) suggests that the service is currently not extensively merged, and may still be operating as two largely separate services. Healthcare professional 1's suggestions demonstrate that as well as healthcare professionals working across disciplines, they are required to work with a range of clinical populations. This has been further exacerbated by merging cardiac and pulmonary rehabilitation together, which in this instance is perceived positively as it has provided an opportunity for her to increase her professional competence across a range of conditions that she would ordinarily be exposed to if she was purely working within a CR service. Although working with two clinical populations that have different primary morbidities may require a broader range of knowledge for healthcare professionals, the merged rehabilitation service also reflects comorbidities commonly evident in this clinical sample, meaning that a merged CR/PR service may be better suited to future iterations of long-term condition rehabilitation where there is an increasing incidence of individuals living with one or more long-term condition: *"we've got heart patients with COPD, they've got COPD patients with heart (problems), so there is a lot of crossover and you can say to them look well when you come to the classes, COPD team are there as well so you're gonna benefit from them as well"* (Healthcare Professional 2, lines 99-102). This is also reflected by how a number of heart failure patients experience breathlessness (Dube, Agostoni & Laveneziana, 2016).

Despite these suggestions indicating potential benefits of a merged rehabilitation service, the methods of combining two existing services were questioned. Interviews revealed some examples of healthcare professionals being resistant to change and being challenged to change their practice: *"we changed some of the practices and mind-sets with that merger and it opened up a big can of worms"* (Healthcare Professional 8, lines 192-193). This suggests that initially, the merger led to underlying issues that were previously not identified, in turn preventing substantial progress being made. For example, healthcare professionals suggested that some team members are resistant to change, evident through healthcare professional 10's displeasure with a combined service: *"I don't like the merged* *groups"* (Healthcare Professional 10, line 321). Collaboratively, operating as a merged CR/PR service is a contentious issue that requires two existing teams to operate as a homogenous group: a step that some healthcare professionals felt to be problematic and not beneficial.

The initially problematic nature of the merger manifested by how some professionals queried the progress made through the merger, and suggesting that a merge has not extensively taken place: *"I think there's a long way to go. At the moment, I don't feel we've actually merged at all, I think we share space"* (Healthcare Professional 5, lines 46-47). This reflects how both services tend to operate from the same leisure centre room but demonstrate limited, if any crossover in terms of patients and healthcare professionals. This sentiment was echoed by other professionals, who suggested that *"the crossover between staff might be a little bit better… from a staff point of view I still think we could work a little bit more seamless"* (Healthcare Professional 6, lines 28-33). This highlights that some healthcare professionals still perceive there to be two separate services, and the extent to which the two services will be merged is unclear. This is further reflected by healthcare professional 5, who conceded that due to governance reasons, and to continue to deliver the outstanding quality of care that the service currently provides, the possible completeness of the merger is limited:

> *"Probably in the future it will still be a very separate service for each. I think it has to remain that way for the specialisms because I don't want to really dilute people skills too much. I don't want a cardiac rehab nurse to become a rehabilitation nurse and not have that specialism in cardiology, I think they'll need that… however I think that patients can be managed better on the ground"* (Healthcare Professional 5, lines 59-67).

This highlights that when merging existing services, commissioners and management need to formulate an idea of how extensive the merger will be so that specialisms are protected and quality of care is not reduced. Ideally for this service, specialism in either cardiology of pulmonary medicine need to remain in order to deliver the high level of patient care that is evident within an NHS trust that the CQC have awarded an 'Outstanding' mark to. However, given the logistical overlap between CR and PR, in particular how they operate on a very similar basis, there is the potential to explore opportunities for mergers, for example in the PA component of CR/PR. Given the evolving nature of the merger, the intervention must cater for all of the conditions that are eligible for CR/PR, allowing it to be used flexibly in response to a patient's normal level of functioning.

Furthermore, some professionals suggested that the composition of staff teams and professionals' levels of motivation limited the effectiveness of the merger:

> *"I think I'll be perfectly honest. I work right across, it depends on what areas you're doing it. Some areas it works really, really well, and some areas it doesn't. I think that depends on the staff and who you're working with. So, in my eyes it does work, but it just depends on what staff is in those groups… I just don't think it's organised, all I can put it down to is staffing, in (clinic A) it's like us and them, but in (clinic B) it's totally different"* (Healthcare Professional 3, lines 25-33, 36-42).

Healthcare professional 3 suggests that although the CR/PR service is merged on paper, the success of the merged is reliant on the composition of the team of healthcare professionals within a clinic, as their personalities and how supportive they are of the merger affected the extent to which the clinic operated on a merged basis. The claim *"I don't think it's organised" (*line 36) suggests that organisational factors may be limiting the success of the merger, and may indicate that more senior managers need to explore how the merger can operate more effectively. Clarifying the extent to which a merged service can be achieved may be beyond the scope of this thesis. However, to progress the merger further it may be beneficial to investigate levels of staff motivation and potential barriers to changing their practice, as well as further elucidating what factors may cause the merger to be effective in one setting but ineffective in another. As part of this, future work needs to be conducted to ensure that healthcare professionals have the requisite knowledge to work with both cardiac and pulmonary clinical populations.

4.5.3 The Exercise Programme?

As previously highlighted, CR/PR is a holistic programme of rehabilitation, comprised of several components, of which PA is one. Through an interplay between these components, CR/PR aims to develop patient confidence and facilitate continual progression towards a patient's normal level of function. Despite the multi-component nature of the programme, several participants suggested that CR/PR is perceived to purely be an *"exercise programme" (*e.g. Healthcare professional 3, line 108, line 139)*.* The perception that CR/PR and exercise are synonymous was perceived to originate from the earlier phases of CR/PR, particularly ward-based care:

> *"So they're oh no, the hospital says I can't (be active) and things like that. So that can have a big impact on their uptake because once you've planted that seed, they don't want to know. But if they plant the seed and go right, you're going to go on this programme, it's really good, you'll get loads of support, they'll check your blood pressure, they'll check your wound, they'll check your symptoms, they'll be your first port of call, sort of like look after you. They'd be waiting for you then, wouldn't they?"* (Healthcare Professional 8, line 299-305).

In this instance, healthcare professional 8 highlights a dichotomous view of CR/PR between ward-based healthcare professionals and phase three CR/PR healthcare professionals. She suggests that when they are referring patients to CR/PR and describing the programme, ward-based healthcare professionals' focus is largely placed upon the PA component of the programme as they refer to CR/PR as *"the exercise programme"* (Healthcare professional 9, Line 298), whilst simultaneously giving the impression that patients should not be active. This quote suggests that the description of CR/PR that ward-based healthcare professionals provide is pervasive and largely resistant to change. Participants suggested that if the multi-component nature of CR/PR was reflected by ward-based professionals, instead portraying CR/PR as a way of providing continuity of care following a patient's discharge from hospital, levels of uptake of CR/PR would be positively influenced.

Conversely, phase three healthcare professionals highlight how CR/PR is a multi-component programme, where PA is not the sole focus, hence demonstrating a contradiction between ward-based and CR/PR-based healthcare professionals. Additionally, healthcare professional 8 suggests a further dichotomy arises from the ward-based healthcare professionals who discourage patients from PA whilst they are in the early stages of recovery. These discourses discourage uptake of CR/PR because patients simultaneously are instructed to be largely inactive yet will soon be contacted by *"the exercise programme"* (Healthcare professional 9, Line 298). Healthcare professional 8 perceives these discussions on the ward to *"plant the seed"* (Healthcare Professional 8, line 301) that PA is somehow negative and should be avoided, and therefore as CR/PR is synonymous with exercise, should also be avoided, meaning that this perception of CR/PR is perceived to be negatively impacting levels of uptake. These views were corroborated by healthcare professional 3:

> *"Once you say cardiac rehab will get in touch, the exercise programme, it's the worst thing you can say. Because if you've had open heart surgery, you don't want someone phoning you up saying you're going to come to an exercise class. That's the last thing isn't it…? You're explaining it's not just exercise, there's a lot of other components involved"* (Healthcare Professional 3, lines 108-111).

The perception that CR/PR and exercise are synonymous was widely discussed by participants, who suggested that the lack of coherent message between ward-based healthcare professionals and phase three CR/PR professionals, and the subsequent perception that CR/PR is purely exercise, typically delivered whilst simultaneously instructing the patient to avoid exertion, is limiting uptake of the programme. The messages from the ward that patients should limit their PA were perceived to be pervasive, and therefore in many initial contacts with patients, healthcare professionals were required to unpick patients' perceptions of CR/PR by explaining to them that CR/PR provides continuity of care, rather than simply an opportunity for them to be active. In a number of cases, these conversations were perceived to stem from ward-based descriptions of CR/PR as the *"exercise programme"* (Healthcare professional 9, Line 298). Therefore, work needs to be done to provide ward-based healthcare professionals with a more thorough and accurate understanding of the scope of CR/PR, so that they describe the programme in a manner that reflects the holistic nature of CR/PR and aligns with the descriptions of the programme that CR/PR-based healthcare professionals provide.

Phase three healthcare professionals who previously worked on the wards reflected upon their level of understanding of CR/PR when they worked in inpatient care, and how it has evolved since moving to phase three CR/PR. In several instances, healthcare professionals highlighted how they did not understand what was involved in CR/PR before they started to work within a community setting. This is exemplified by the suggestion that *"the name cardiac rehab is like a poisonous word in the hospital here, because of the culture because they don't know that much about it"* (Healthcare professional 8, line 104-106). Healthcare professional 8 further suggests that prior to moving to community from a ward-based role she did not have a comprehensive understanding of what CR/PR was:

> *"I didn't really know anything about it; I just knew that it was an exercise group, that was it… I just thought that they go to an exercise class and they do exercise, but it was everything but that and it was amazing to see what cardiac rehab delivered. There was always a taboo, like it's just this exercise group"* (Healthcare Professional 8, lines 16-17, 23-27).

The acceptance that healthcare professionals who have the responsibility to refer into CR/PR *"don't know anything about it"* (line 16) reinforces the need for education to be provided to ward-based healthcare professionals about the holistic nature of CR/PR. This sentiment is echoed by another healthcare professional:

> *"I think mainly it's the way it's sold to them on the wards. I've been there. I have done that job. You do. When you're on the wards, you say you're going to get a phone call from cardiac rehabilitation. First thing patient says is what's that? It's an exercise programme where you go and exercise. I've done it. I've done it for years myself. As I say, (in phase three) I phone them up and they go excuse me dear, do you know I've just had surgery? You want me to - they're not seeing the other components of it. So, if I phone them up now, I will leave the exercise bit to the last. I'll say I need to just check you're on the right medication, check your blood pressure and go through the programme with you. You'll get them there then. You might still get the odd one that's listen, I do enough walking, or I do this and that, I don't want to come"* (Healthcare Professional 3, lines 139-150).

Healthcare professionals 3 and 8 highlight the perception of phase three CR/PR as a poor relation relative to inpatient ward-based care, suggesting that it is *"taboo"* (Healthcare Professional 8, line 26) subject on the wards, where its purpose is little understood (Healthcare Professional 8, lines 16-17). Both healthcare professionals 3 and 8 suggest that whilst working in inpatient care, they referred to CR/PR as *"the exercise class"* (Healthcare professional 8, line 24), echoing previously discussed sentiments that CR/PR is perceived to be synonymous with exercise. Healthcare professional 3 reflected upon how these messages exert an influence over patients' perceptions of CR/PR upon their initial contact from CR/PR in the form of a phone call. This suggests that the likelihood of patients taking up CR/PR is reduced by the ward-based perceptions of the programme. Practically, the focus on exercise manifests as phase three healthcare professionals needing to convince patients that CR/PR is a multicomponent programme, and that they will not be forced to engage in PA. Instead, if CR/PR was conceptualised as an opportunity to ensure continuity of care, providing patients with an opportunity to increase health literacy and ask questions within a supportive environment, and where PA is a peripheral component, participants suggested that levels of uptake of CR/PR would increase as patients were perceived to be more open to attending. These sentiments are echoed by healthcare professional 6:

> *"We'll get you exercising. For that, for someone who's just literally, some of them are literally being discharged that day, exercise, love, don't know about that. So the kneejerk reaction for some of them is no, it's not for me. Whereas I think if, on the phone call if it said, listen we'd like to get you to the next port of call, come and see us, talk about what you've had, how you feel going forward, there may be an exercise element to it. I think how it's termed to a patient initially"* (Healthcare Professional 6, lines 217-224).

As is evident in healthcare professional 3's narrative, healthcare professional 6 discusses how the perception of CR/PR as purely an exercise programme is perceived to be a factor that makes uptake less likely. Amongst patients who previously reported low levels of PA, the strong focus on PA was perceived to inhibit uptake, as these individuals were more likely to suggest that the programme is *"not for them"* (Healthcare Professional 6, Line 219) and will not take up CR/PR. Therefore, the way in which CR/PR is framed by ward-based healthcare professionals is of prime importance when attempting to influence levels of uptake. This means that it is necessary to understand and develop the level of consistency between ward-based healthcare professionals and CR/PR healthcare professionals. Once this is consistent, with CR/PR referred to in the holistic and multi-component sense, patient and ward-based healthcare professionals' level of understanding of the scope of the programme should increase, inpatient discharges would be made more accurate, and levels of uptake are hypothesised to increase. These claims also reinforce the suggestion that CR/PR should be perceived as a programme that will iteratively progress the patient back towards a normal level of functioning. Therefore, the intervention should seek to address patients' rehabilitation in its more holistic sense, in that it can be used flexibly to influence a variety of health-related behaviours.

The focus of the PA component of CR/PR provided by ward-based healthcare professionals and phase three healthcare professionals was perceived to be greatly affecting uptake. These conflicting messages could further serve to alienate and limit uptake particularly amongst patients who are historically more inactive. This is perceived to be because they have experienced a life event in the form of a cardiac event, are struggling to comprehend what has happened to them, and whilst still an inpatient are instructed that the *"exercise class*" (Healthcare professional 8, line 24) will be in contact. This focus on the PA element of CR/PR suggests that patients fundamentally perceive CR/PR to be an opportunity for them to be forced to engage in a behaviour that they have not historically participated in (PA). As the patient in this instance is not accustomed to being active, and at the point of inpatient discharge has largely been instructed to rest, the prospect of being enrolled into an exercise class causes them to fail to uptake CR/PR. This hypothetical example is further exemplified by healthcare professional 8, where patients; level of understanding of PA was perceived to be an additional barrier to uptake:

> *"So in the education we say that to them because they don't understand (what PA is); they just think oh God, they just want me to go on the treadmill, they want me to walk faster, they want me to - but they need to know why that is. It's just as important as your medication isn't it? Lowers your blood pressure, widens your arteries, prevents a further - but they don't see that; they just think you're going to work them hard don't they?"* (Healthcare Professional 8, lines 395-400).

In this instance, healthcare professional 8 suggests that patients' misunderstanding of PA stems from a lack of awareness that PA can be at different intensities and does not just refer to exercise. Healthcare professional 8 suggests that when they are attempting to progress patients' PA during rehabilitation, so they complete either more repetitions or a higher intensity activity, patients express concern or panic as they believe they should be resting rather than engaging in PA. She suggests that this stems from a lack of awareness of what constitutes PA, how it is different from exercise, and the potential physiological health-related benefits of being physically active.

This section demonstrates that any intervention aiming to operate within the PA component of CR/PR should ensure, at an early stage that patients properly understand what constitutes PA, how it is different from exercise, and the physiological and wider health benefits of a physically active lifestyle. Doing so may remediate the perceived barrier to being active in this population due to patients' lack of understanding of what PA is, and how and why patients should be active. Alongside a wider awareness of the broad scope of CR/PR, this may act as a method of combatting the currently problematic levels of uptake that are an omnipresent concern across the UK CR/PR landscape.

4.5.4 Education Component

BACPR (2017) suggest that the education component of CR *"should be delivered not only to increase knowledge but importantly to restore confidence and foster a greater sense of perceived personal control"* (p.12). This reinforces the previously made claims that developing confidence is a key component of a successful CR/PR programme. During education, topics such as diet, smoking cessation, weight management, risk factors, and psychological/emotional self-management. Education sessions provided patients with *"little things that you didn't know… sticks in your head"* (Patient 5, line 357), demonstrating how although she perceived herself to have a strong grasp of how she could self-manage her COPD, her knowledge was enhanced. This meant that patient 5 was able to provide examples of what she has learned through attending education, and how she has implemented them into her lifestyle. Additionally, she appreciated the opportunity to *"ask questions"* (Patient 5, line 366), that allowed her to deepen her understanding of her condition. This reflects the BACPR and BTS guidelines, where the development of patients' autonomy and ability to self-manage their condition is a central aim of CR/PR, as well as enhancing patients' level of understanding of their conditions.

Encouraging patients to engage with CR/PR was perceived to be a key feature of all healthcare professionals' role within the education component of CR/PR:

> *"I'd probably say sometimes I feel a bit like a salesman. Because when they come in and you do all your nursey and that but you really want to come along and you want them to engage. Some people- it's just so hard and you try to flog the service and just get them to make those first steps. So yeah, I feel a little bit like a healthy lifestyles sales person"* (Healthcare Professional 4, lines 67-71).

This demonstrates that healthcare professional 4 perceives it as within her remit to encourage patients who are reticent or unwilling to uptake CR to attend CR/PR with the goal of changing their lifestyle behaviours. Healthcare professional 4's quotes could also suggest that she perceives herself to be under pressure to sell, promote, and encourage patients to engage with CR/PR. This may be indicative of a conflict in the way in which CR/PR is perceived by patients and healthcare professionals, where patients see the programme as a product that they can choose to uptake, and healthcare professionals conversely perceive CR/PR attendance as an adjustment that patients should be prepared to make to their lifestyles following their hospitalisation or exacerbation. Therefore, this could therefore demonstrate that healthcare professionals feel somewhat responsible for patients' non-attendance at CR/PR, even though paradoxically patients should engage with CR/PR of their own volition. Healthcare professional 6 suggested that education was perceived to be less important than the other components of CR/PR, meaning that some patients were less inclined to stay to complete this component:

> *"I think people see it as a bit- not a bugbear themselves but they don't see it as important. Oh, the education, what is it today? Who's doing the talk? Once they hear, for example, it's life support or they hear it's about weight management, they think, oh no, not for me. Again, there may need to be education about the education, if you see what I mean… "they tend to leave It's funny how many people say they've got to pick people up from the airport and can't do education"* (Healthcare Professional 6, lines 88-89, 91-95).

Several healthcare professionals corroborated this claim by discussing how patients typically attend the PA component of CR/PR, yet often excused themselves from the educational component as they perceived it to be less important. Healthcare professional 6's notion that patients *"need education about the education"* (Healthcare professional 6, lines 94-95) suggests that patients typically have a limited understanding of the scope of CR/PR and underestimate the value of the education component. This may stem from the previously made claims about the initial perception of CR/PR, purported to be contingent on the fact that when informing patients about CR/PR, ward-based healthcare professionals primarily focus on the PA component of CR/PR at the expense of the other components. This may lead to patients failing to understand the broader scope of the programme, which is predicated on suggestion that to prevent experiencing a secondary event, patients need to learn about their conditions and how to self-manage, as well as increasing their engagement with PA. Therefore, the perception of education as a less important component of CR/PR and patients' lack of engagement with this component may inhibit the development of a patient's self-management abilities. In turn, this may generate a dependence on the healthcare professionals within CR/PR, as the patient has failed to internalise knowledge about their condition and potentially salient changes to their health-related behaviours.

Alongside participants questioning patients' willingness to habitually engage in the education component of CR/PR, participants' perceptions of the effectiveness of education were equivocal. Healthcare professional 2 suggested that *"the education's great, we're constantly wanting to revamp the education to make it better"* (Healthcare Professional 2, lines 144-145), suggesting that although the team were open to be challenged about the quality of their work she was satisfied that the education component is of a high quality. However, healthcare professional 3 suggested *"they're (education sessions are) rubbish… I'm just in the process of changing them"* (Healthcare Professional 3, line 192), and healthcare professional 8 highlighted how *"I don't think it's (education's) good at the moment and it disappoints me because I'm massive on that"* (Healthcare Professional 8, lines 699-700). The pedagogical techniques associated with the education component of CR/PR were also described as *"archaic" (HCP6, line 61),* highlighting that the pedagogical techniques within the education component of CR/PR may need updating or reviewing as part of the continual review of education that healthcare professionals described. Despite these equivocal opinions about the standard of the education component, these quotes demonstrate a willingness to challenge and improve standard practice, which for any intervention is beneficial.

The evolution of the education component of CR/PR has been highlighted across the long-term condition domain, with telehealth initiatives and programmes such as Leicester Hospital's *Activate Your Heart* programme providing patients with internet-based CR/PR which is accessible to patients on their computer or mobile device at their convenience. However, in Knowsley CR/PR is delivered either in one of the four clinics or through home visits, meaning that currently education is currently delivered face-to-face. Although there have been attempts to introduce telehealth through applications from the *mymhealth* brand such as *MyCOPD* and MyHeart, such initiatives were associated with an excessive burden on healthcare professionals relative to the limited patient benefit this would deliver.

Additionally, within a team meeting a senior member of staff remarked that *"there's the UK, then there's Knowsley",* with respect to how most households in the UK have internet access and therefore the capability to utilise web-based apps as part of their rehabilitation, but Knowsley's residents were not perceived to have this level of internet access that is evident in other areas of the UK, perhaps reflective of the high level of deprivation within this local authority. These views demonstrate that although there is scope to improve the pedagogical techniques within CR/PR, the ways in which improvements are made need to consider the clinical setting and time constraints that healthcare professionals are required to operate within. Additionally, it highlights how assessments of patients' and healthcare professionals' level of capability of using telehealth and computer-based rehabilitation programmes, as well as the opportunities (such as internet access) that are available to Knowsley's residents. Doing so prior to introducing such programmes will help to ensure that these interventions are suitable for the target population, as well as mitigating the risk of widening health inequalities.

Therefore, an intervention aiming to operate within this context should conceptualise the educational component as an opportunity for patients to better understand their condition and gain the skills to self-manage, whilst facilitating a progressive return to normality. By conceptualising education in this way, this component serves to facilitate behaviour change by remediating the skill or knowledge deficit that may be underpinning a patient's engagement in unhealthy behaviours. Negative perceptions of the pedagogical techniques evident within the education component of CR/PR indicate that there may be scope to embed motivational techniques and communication skills within this component of CR/PR. Such an approach would aim to remediate the skill deficit, hypothesised to be a majorly contributing factor to patients' lack of PA engagement, alongside a motivational intervention that would aim to increase the likelihood of patients engaging in PA of their own volition.

4.5.5 Social Component

Healthcare professional 2 discussed the importance of the social element of CR/PR:

> *"You're selling the rest of the programme saying you're going to meet other people, seeing what they've been through, seeing them progress, and it's a time to ask questions about everything you need to know about your lifestyle and anything else you want support with, it's not just about exercise, there's lots of other aspects that we can perhaps help you with as well. So, it's all the rest of it as well really, encouraging them and trying to get them to see the sociable side"* (Healthcare Professional 2, lines 192-197).

This quote summarises the multi-component nature of CR/PR, demonstrating how the programme is a combination of education, PA, reassuring the patient, facilitating a progressive return to normality, and providing an opportunity to access social support. In this instance, healthcare professional 2 suggests that the scope of CR/PR is wide-ranging, in that it should be perceived as an opportunity for patients to better understand their condition, and to enable them to change their lifestyle behaviours in a supportive environment, facilitating their progression towards what patients perceive to be normality. The inclusion of *"lots of other aspects"* (line 195) such as meditation and relaxation within CR/PR aims to remediate any anxiety issues that patients may report upon commencing CR/PR. In some instances, if the phone call highlighted that the patient does not perceive themselves to be ready to attend CR/PR, complementary services can be offered as a way of attempting to remediate these psychological issues that may act as a barrier to phase three attendances. The inclusion of a weight management component to CR/PR also highlights how the predominant focus is not solely placed upon PA levels, but instead indicates that patients are able to receive support on changing the lifestyle behaviours that they perceive as being personally salient to them. Healthcare professional 2's quotes highlights that during the phone call and initial sessions, she *"sells the rest of the programme" (lines 192-193),* exemplifying the importance that phase three healthcare professionals place upon the multi-component nature of CR/PR. The use of the word *"sell"* (line 192) corroborates previously made claims that patients do not always positively receive their invite to CR/PR, meaning that part of healthcare professionals' role is to convince them into attending the programme by emphasising the holistic benefit of participating in CR/PR.

To corroborate healthcare professional 2's claims about the multi-component nature of the programme, healthcare professional 6 highlights how the social aspect of CR/PR was perceived to be extremely important in driving patients' adherence to CR/PR:

> *"For me, if I was to put one word into the rehab that I think's the most important, it's the social. For me, the social side. So, I know people come to Whiston, for example, because they like a good cup of tea and a chat. Or I know people say to me, do you know what, I'm off work at the moment. I'm getting fed up at home and they come to exercise because they can't take much more Jeremy Kyle of a day time. That can be tough. The exercises let them know they're using it as a stepping stone or they're using it as a transition to get to the next stage. I think most of the time it's just the social side. Many people are loving the exercise, don't get me wrong, but yeah, to get back to the point, I think it's* (social element is) *absolutely very, very important"* (Healthcare Professional 6, lines 204-213).

Although the social elements of CR/PR are not highlighted as a key component within the respective UK national guidelines, healthcare professional 6 suggests how rehabilitation can provide social support for patients, helping them to gain reassurance and confidence to take part in rehabilitation. In this instance, healthcare professional 6 suggests that attending CR/PR allows patients to escape the loneliness and monotony of their enforced period of rest and affords patients with an opportunity to meet other individuals who have experienced a similar event to themselves. This begins to elucidate the potentially positive psychological experiences that may arise following a cardiac event or acute exacerbation, and demonstrates how CR/PR's social element is perceived to act as a vehicle to alleviate these issues. Supported by this social element, the PA component of CR/PR enables patients to experience a feeling of accomplishment as ideally, they should see their exercise capacity increase over the 8-week period. Therefore, by discussing the interplay between the social aspect of CR/PR and the feelings of confidence that increasing competence in performing adaptive health behaviours can elicit healthcare professional 6 corroborates the extensively made claims that CR/PR is a multi-component programme. PA is not the primary focus but instead a component part of a holistic programme of rehabilitation that aims to facilitate a continual return towards normality.

All healthcare professionals defined their role within the programme to be multifaceted, with *"giving them support and making sure they know what they are doing"* (Healthcare Professional 2, lines 257-258) perceived to be a particularly important component of their job, again highlighting the salience of the social aspect of CR/PR. As well as providing this support, it again reinforces how healthcare professionals perceive themselves to be educators, with the aim of developing a patient's ability to self-manage their condition in the long-term to prevent a secondary event.

As previously highlighted by healthcare professional 6, healthcare professional 3 discussed how the social aspect of CR/PR service to remediate psychological problems a patient may experience following their acute illness. Healthcare professional 3 perceived this social support to remediate psychological issues such as social isolation, with a view to ensure that patients attend CR/PR in the long-term. This kind of support was perceived to be particularly pertinent when a patient is extremely socially isolated and attending CR/PR is their only face-to-face contact. This again demonstrates the value of face-to-face delivery over more remote methods of delivery, which may mitigate the social component of CR/PR:

> *"I have patients come and will sit with me and they'll be on a treadmill for half an hour, literally going step by step but chatting away. I know I've made her day. She might not speak to anyone else that day. So you think, do you know what are we wasting our time? Well, really, no"* (Healthcare Professional 3, lines 500-504).

Healthcare professional 3's views reiterate the integrity of the social aspect of CR/PR. Several patients, typically those who were older and who lived alone, were suggested to attend rehabilitation primarily as it allowed them to access a social network that they would not ordinarily have access to. Although she perceived CR/PR to be a worthwhile opportunity to combat the isolation these patients experience, these patients' motives were problematic to healthcare professional 3. She suggested that from a secondary prevention perspective, it might be a *"waste of time"* (line 504) to treat these patients as they are unlikely to change their health-related behaviours, primarily because their discharge is likely to mean that the main factor that drives their adherence (social support) has been removed. Therefore, interventions aiming to facilitate health-related behaviour change should consider the motives underpinning patients' attendance and adherence to CR/PR, and how these patients can be better empowered to take ownership over their own rehabilitation. Again, this demonstrates the interplay of the social component of

CR/PR with the other components, and how an intervention aiming to operate within CR/PR should consider the programme holistically, rather than focusing on a single component. The integrity of social element of rehabilitation within some patients' adherence behaviours was echoed by healthcare professional 10:

> *"A little Irish lady, she was lovely, quiet. She wasn't keen on coming at first, but once she started she'd made friends and each week she'd gone from doing a bit sat down in the chair to I'll have a go at the bike and stuff like that… she improved, her walking distance had improved, and we got her a little walking frame with a trolley, she runs around with it now everywhere… we referred her to (group) and she goes to that and she goes with a friend. She's got herself fitter, she's got a little Zimmer frame, she's carrying on her exercise because she goes to that group and it's the social aspect of it as well"* (Healthcare Professional 10, lines 575-595).

As is evident in healthcare professional 3's interview, healthcare professional 10 highlights how some patients' adherence is underpinned by the social support they receive within CR/PR. In order for these patients to continue to be physically active, PA settings that provide social support for patients is integral. In healthcare professional 10's interview, she highlighted how similar patients have become more sedentary upon being discharged from CR/PR as they have not found settings that provide social support alongside an opportunity to be active. When such patients were approaching discharge and considering settings that may enable them to be physically active in the long-term, solitary pursuits such as the gym were not perceived to satisfy personally salient motives that drive their PA behaviours. Therefore, at the point of phase three discharge it is important to provide a range of opportunities for patients to continue to be physically active in a setting that aligns with their personally salient values and motives to be active. Doing so may stimulate an increase in patients' long-term PA adherence.

4.6 Discussion

The descriptive account of Knowsley's CR/PR service aims to act as a starting point for intervention development, with the aim of remediating the claims within chapter 3 that the intervention development process within health research is infrequently explained. As such, chapter 4 acts as a starting point from which salient components of the healthcare context can influence intervention development. Five themes were inductively developed, encompassing how CR comprises multiple components that collectively aim to change their health-related behaviours, such as PA, in order to progress a patient towards a normal level of functioning.

The key finding of chapter 4 is that CR/PR should not be considered to purely afford patients with an opportunity to engage in PA. Instead, the first theme within this chapter: ***What is CR/PR?*** demonstrated how CR/PR is a multi-component programme comprising PA, education and a strong social element, and is perceived to act as a vehicle that allows patients to return to normality by developing their confidence in enacting health-related behaviour change and their ability to self-manage their condition. The overarching aim is secondary prevention, aiming to prevent re-hospitalisation, which again reflects the integrity of a return to normality within CR/PR. Therefore, the definitions of Knowsley's services largely aligns with the BACPR and BTS' definitions of CR and PR (BTS, 2013; Cowie et al., 2019).

The importance of re-establishing normality following the patient's hospitalisation or cardiac event was widely discussed by patients and healthcare professionals who suggested that establishing an understanding of patients' new-normal level of functioning post-hospitalisation is a hallmark of an effective rehabilitation programme. For patients, returning to normal was perceived to be facilitated by gradually increasing their level of confidence in being physically active and being increasingly able to self-direct their own care and initiate their rehabilitation programme. At the time of writing, there are currently limited research insights that aim to describe the functions and relative contributions of different aspects of CR/PR in facilitating behaviour change. For example, a recent systematic review described programme characteristics of PR programmes, but suggested that it was impossible to determine which of these characteristics made the most important contribution to reducing patients' risk of hospitalisation (Wageck et al., 2021). Therefore, future research should aim to provide descriptions of how CR/PR services operate to identify how each component can be optimised and change patients' health-related behaviours.

The second theme ***working together*** demonstrated how since mid-2016, the CR/PR service within Knowsley has been operating on an increasingly merged basis, and provides insight into the logistical challenges of operating a merged CR/PR service. As CR and PR were both previous services in their own right, healthcare professionals perceived the merger to be superficial, with very limited practical overlap between CR and PR healthcare professionals. Opinions about the merger were equivocal, with patients not perceiving there to be major differences between patient groups. However, although some healthcare professionals perceived the merge to be adaptive, some were not in favour. Potential organisational issues were highlighted, with healthcare professionals also suggesting that they were unclear about the extent to which the two services could operate on a merged basis, and some suggested that the merger had not been adequately organised by management. Additionally, some healthcare professionals suggested there was a reticence on some of their colleagues to operate on a merged basis. There is currently limited evidence assessing whether cardiopulmonary rehabilitation should be offered on a combined basis. For example, the primary objective of PR is to improve an individual's exercise capacity to subsequently reduce their symptom burden, most commonly dyspnoea. Conversely, although CR is similar in structure to PR, prevention of secondary cardiac events is the main objective (Jones et al., 2019). Given these differences in primary objectives, the extent to which CR and PR can be completely integrated is currently unclear, but is beyond the scope of this thesis given its psychological focus.

Theme three: ***The exercise programme?*** explored the previously held assumption that CR/PR is synonymous with PA, suggesting that an intervention aiming to operate within CR/PR should primarily focus on affecting patients' PA behaviours. As discussed in theme one, PA was perceived to be part of a more extensive network of interrelated components, including education, behaviour change, and social support. To further develop theme one, this theme demonstrates the existence of a dichotomous view of the importance of PA within CR/PR. Healthcare professionals suggested that although PA is a key component of CR/PR, other components such as the social and educational components were perceived to be as, if not more important. Conversely, ward-based healthcare professionals referring into rehabilitation describe CR/PR as an *"exercise programme"*, which means that patients are discharged from hospital with the view that attending CR/PR will require them to exert themselves, rather than have access to a programme that delivers holistic continuity of care and support for them post-discharged. Previous qualitative research corroborates these findings, with patients demonstrating a limited knowledge of CR. The programme was not seen as a process incorporating a range of elements, aimed at behaviour change. Instead, patients commonly perceived CR to be a weekly exercise class, demonstrating a lack of understanding of the multifaceted nature of CR (Hird et al., 2004).

The perception of CR/PR as solely an *"exercise programme"*, alongside patients' misunderstanding of what specifically constitutes physical activity, was suggested to comprehensively limit CR/PR uptake, particularly amongst patients who have not habitually been active in the past. This claim is corroborated by previous literature, where cardiology fellows who referred into CR had extremely limited knowledge of the scope of CR, which was perceived to inhibit the success of referral into the programme (Kellar et al., 2021). Additionally, qualitative work conducted in CR has demonstrated that contradictory information given by different healthcare professionals about the scope of CR negatively affected patients' levels of uptake and engagement with the programme (Bäck et al., 2017). Therefore, to benefit levels of programme uptake, it is important to ensure that CR/PR is not solely described as an opportunity for patients to be active, but instead affords them an opportunity to be supported to change a range of health-related behaviours.

The penultimate theme: ***education component*** demonstrated how the educational component of CR/PR was inconsistently attended by patients, meaning that healthcare professionals suggested that they needed to encourage the patients to attend this component to a greater extent relative to the PA component. Healthcare professionals suggested this is because patients do not perceive the educational aspect of the programme to be as important as the other components. However, the educational component of CR/PR aims to enhance patients' understanding of their condition, to enable them to self-manage in the long-term, and to understand how and why they may need to change their health-related behaviours. Relative to the overwhelming benefit for PA training amongst CR and

PR patients, the education component has received little attention, with previous research suggesting that although educating patients about their symptoms and disease management appears intuitive to improve their health, how and when this should be done is less clear (Blackstock & Evans, 2019). This lack of focus on the education component of CR/PR is surprising, given that 90% of programmes in Europe, North America and Australia offering educational activities (Spruit et al., 2014), and potentially how optimising them using behaviour change interventions could present an opportunity for facilitating patients' PA behaviour change, rather than didactically teaching patients about their condition, as is suggested to be the traditional approach (Blackstock & Evans, 2019). Further research could therefore seek to identify how behaviour change techniques are currently used within the education component of CR/PR, and how their use could be optimised with the aim of facilitating greater health-related behaviour change amongst CR/PR patients.

The final theme ***social component*** demonstrated the importance of social support to patients participating in CR/PR. Social support was perceived to be extremely important in driving patients' adherence and allowing them to re-establish normality. For example, reassurance provided by healthcare professionals allowed patients to feel comfortable to explore what constituted their optimal intensity of PA, safe in the knowledge that healthcare professionals were monitoring them physiologically. This opportunity to participate in PA within a safe and supportive environment allowed patients to gain confidence and understand their safe PA levels. In turn, this provided them with the confidence to be active of their own volition outside CR/PR, as well as a deeper understanding of their new-normal level of functioning. The importance of the social elements of CR/PR is reflected by previous studies, where healthcare professionals working within CR were perceived by patients to be trusted experts who supported them in learning the right level of effort during PA and reducing the fear of being active. Additionally, the study demonstrated that a sense of security was an important factor for attendance at CR and that this could be partly mediated by the physiotherapists, as well as the context of performing PA in a safe, controlled environment (Bäck et al., 2017). Additionally, social support has been shown to be an important mediator of physiological and psychological health status in COPD patients, and may influence improvement and survival following PR (Hill et al., 2013; Thorpe et al., 2012), and CR (Blikman et al., 2014).

4.7 Implications for Intervention Development

The theme ***What is CR/PR?*** is integral to shaping the intervention development process. Most importantly, it demonstrates how an intervention aiming to operate within CR/PR should ensure that patients are aware that CR/PR is not solely synonymous with PA, but instead is a holistic programme of rehabilitation that aims to provide continuity of care following their acute period of illness. The importance of patients' perceptions of normality within this theme suggests that an intervention should ensure that healthcare professionals are assisted in understanding patients' perceptions of normality and help facilitate a continual progression towards a normal level of functioning. Developing patients' confidence was perceived to be a key mechanism for achieving this return towards normality, indicating that an intervention should also equip healthcare professionals with opportunities and techniques to build patients' levels of confidence.

The theme ***working together*** demonstrates that due to the merge that is currently underway between the CR and PR services, an intervention needs to consider the needs of both cardiac and pulmonary patient groups. Given that these groups are heterogeneous and diverse, the intervention needs to be able to be used flexibly and to be tailored to respond to an individual patient's needs. This theme also demonstrated that healthcare professionals were open to being challenged on aspects of their practice and were continually seeking to make improvements to their work to deliver the highest level of patient care possible. Although it may be outside the scope of this thesis' work, the theme working together elucidated some confusion on the part of healthcare professionals in relation to how extensively the CR and PR services could merge, with healthcare professionals suggesting that to provide the outstanding level of patient care the service currently does, some specialities need to be protected. Therefore, it is necessary for the NHS trust to properly understand the ideal extent of the merge and plan how this should occur, before communicating these decisions to healthcare professionals. If this does not occur, it is likely that the services will continue to operate largely separately, rather than on a merged basis.

Theme three ***the exercise programme?*** further elucidated claims made in theme one that CR/PR should be perceived as a holistic programme of rehabilitation, rather than a PA programme. As well as suggesting that an intervention should make patients aware that CR/PR is not solely synonymous with PA, it should also seek to increase patients' understanding of PA, for example how it is more than exercise. Additionally, this theme suggests that CR/PR should increase patients' physical literacy so that the patient understands how they can be physically active post-discharge, in turn allowing the patient to progress towards their perceived normality. Therefore, an intervention should support this behaviour change, enabling a patient to engage in PA in the long-term, with a view to facilitating secondary prevention and/or a reduction in symptom burden. Across the wider CVD/COPD system, there needs to be a consistent message between ward-based and CR/PR-based healthcare professionals regarding what CR/PR is, as the predominant description of CR/PR emanating from discussions from ward-based staff and patients was perceived to be that CR/PR is an exercise programme. Instead, the NHS trust could provide better education for ward-based staff so that the accuracy of the description of CR/PR is enhanced, portraying CR/PR as a holistic programme of rehabilitation, rather than just PA.

Theme four ***education component*** demonstrated how education was perceived to be the least important component of CR/PR for patients, but how healthcare professionals perceived it to be important yet undervalued. This theme suggests that an intervention should increase patients' understanding of the value of the educational component of CR/PR. By doing so, this aims to remediate the problematic levels of attendance at the education component, where patients were perceived to excuse themselves from education after completing the PA component. In turn, improving the education component of CR/PR is perceived to increase patients' abilities to self-manage their condition in the long-term, as this component will provide them with deeper knowledge about why they may need to change their health-related behaviours to prevent a secondary event, as well as providing them with the skills to enact this behaviour change. Therefore, an intervention could provide communication and behaviour change techniques that healthcare professionals could utilise to affect patients' levels of motivation to engage in the educational component of the programme. Although they may be outside the scope of this thesis, factors underpinning patients' non-attendance of education, alongside healthcare professionals' suggestions that the pedagogy within the education component needs updating or may be of poor quality requires further investigation.

The final theme ***social component*** demonstrated that the social aspects of CR/PR. This theme suggests that the benefits of social support within CR/PR are wide ranging, facilitating the remediation of psychological issues that a patient may experience following their acute event or hospitalisation, providing reassurance and confidence, and alleviating the loneliness and monotony of the enforced period of rest a patient has to complete following their event. Social support was perceived to be the most important component for some patients, particularly those for whom CR/PR was the only form of face-to-face contact they could access. An intervention within CR/PR should aim to enhance these positive effects of the social nature of CR/PR to help facilitate greater engagement with PA. However, it was perceived to be problematic if a patient's adherence was solely driven by the social aspects of the programme as these patients were typically not perceived to exhibit long-term behaviour change. Therefore, an intervention within this context needs to enhance the positive effects of the social component, whilst simultaneously progressing the patient towards a form of adherence that is driven to a greater extent by more intrinsic factors, with a view to facilitate greater long-term behaviour change.

4.8 Conclusion

Chapter 4 provides a description of Knowsley's CR/PR service, highlighting the multifaceted nature of the programme. The rationale for including a chapter that is purely descriptive, rather than positioned within extant literature, is to provide a starting point for intervention development by providing a rich description of the intervention's healthcare context. By doing so, chapter 4 revealed the complex interplay between the different facets of CR/PR and how they were implicated in PA behaviour change. Most importantly, chapter 4 demonstrates that multiple health behaviours are important within CR/PR, with PA acting as one of these important health behaviours, rather than the only behaviour that patients need to change during their rehabilitation. The implications of chapter 4's findings are discussed over subsequent chapters.

Chapter 5: Self-Determination Theory in Cardiac and Pulmonary Rehabilitation

5.1 Chapter Overview

A small body of research has investigated how SDT affects physical activity levels amongst clinical populations. Chapter 5 aims to inform the development of an SDT intervention that will operate within an existing cardiac and pulmonary rehabilitation service to promote PA behaviour change amongst patients. Chapter 5 builds on the finding within chapter 4 that PA is one of the key health behaviours within CR/PR, and therefore focuses on understanding how SDT can be used to explain PA behaviours in CR/PR, whilst recognising the importance of other health-related behaviours in CR/PR.

Using nineteen semi-structured interviews with cardiac and pulmonary rehabilitation patients and healthcare professionals who deliver CR/PR, chapter 5 explores how SDT can explain uptake and adherence of PA behaviours amongst this population. Through theoretical thematic analysis chapter 5 identified where and how SDT's three basic psychological needs of autonomy, competence and relatedness were most salient for patients' levels of uptake to and adherence of cardiac and pulmonary rehabilitation.

Chapter 5 indicates that in the early stages of rehabilitation, relatedness was the most pertinent basic psychological need in facilitating adherence to the programme, whereas the satisfaction of competence and autonomy became more salient as the patient progressed towards discharge. It was also possible to distinguish two groups of patients who adhered to the programme: (i) patients whose adherence was motivated by relatedness had fewer and less specific intentions to engage in physical activity post-discharge. Conversely (ii) patients whose adherence was motivated by autonomy could articulate more specific intentions to engage in PA post-discharge in a range of contexts.

Based upon these findings, chapter 5 offers recommendations for clinical care and interventions aiming to affect levels of PA behaviour change amongst clinical populations, and highlights how these findings will influence subsequent chapters within this thesis.

5.2 Introduction

5.2.1 Self-Determination Theory in Cardiac and Pulmonary Rehabilitation

Current UK cardiac and pulmonary rehabilitation guidelines highlight the importance of developing patient autonomy within CR/PR (British Association of Cardiac Prevention and Rehabilitation 2017; British Thoracic Soceity 2013). This demonstrates the potential for the development of an SDT-derived intervention that aims to harness this autonomy, manifesting as patients' best efforts driving their own rehabilitation. However, the current dearth of research investigating SDT in CR and PR manifests as a lack of understanding relating to how SDT can be utilised to influence clinical practice. This would provide a deeper understanding of SDT tenets that contribute to patients' experiences within the rehabilitation and following discharge. In turn, this can help facilitate the development of interventions that are better able to remediate issues such as uptake and adherence, which are both omnipresent concerns for CR and PR rehabilitation programmes (Arnold et al., 2006; Hinde et al., 2019; BHF, 2019) .

Although intervention research utilising SDT is emerging within other clinical populations, such as rheumatoid arthritis (Fenton et al., 2018) and in primary care (Fortier et al., 2007), a consensus does not yet exist regarding how SDT-based interventions should be developed and implemented within CR/PR. An attempt to integrate an SDT-based intervention into an existing CR programme did not find significant differences in perceived autonomy support and exercise behaviour between the 'autonomy support' group and controls (Mildestvedt et al., 2007; Teixeira, Carraça, et al., 2012). Despite systematic review evidence demonstrating positive relationships between the basic psychological needs and adherence to physical activity programmes (Teixeira, Carraça, et al., 2012), SDT and other behaviour change theories have to date exerted a limited influence on *real-*

world practice to change behaviour (Presseau et al., 2021). Thus far, the variability in the use of terminology and operationalisation of SDT makes it challenging to identify consistently effective and ineffective intervention features across studies, despite all of them being underpinned by SDT (Quested et al., 2017). Additionally, such research was associated with considerable burden on healthcare professionals and participants, alongside a lack of consideration of standard clinical practice, meaning that the implementation of SDT into clinical settings may not readily be achievable (Clark et al., 2015).

5.2.2 Aims of Chapter

Given the lack of a consensus of how to develop and implement SDT-derived PA interventions within CR/PR, the research questions within chapter 5 are:

1) Through the lens of SDT, how are autonomy, competence and relatedness implicated in the uptake and adherence of CR/PR?
2) How should autonomy, competence and relatedness be operationalised to inform the development of an intervention aiming to increase levels of PA uptake and adherence in this context.
3) What practical recommendations, based on SDT, should be made to healthcare professionals working in the inpatient and outpatient stages of CR/PR to influence patients' levels of PA behaviour change?

5.2.3 Analysis

Theoretical thematic analysis (TA) was used to analyse the experiences of patients and staff taking part or delivering CR/PR. Theoretical TA (Braun & Clarke, 2013) was chosen as the analysis was guided by an existing theory (SDT). TA's flexible nature, with the focus placed upon what participants said rather than how it was said and how this relates to SDT aligns with the pragmatic epistemological stance adopted, and the desired outcome of informing intervention development (Braun & Clarke 2006, 2013). Additionally, given the heterogeneous sample of patients and healthcare professionals, a thematic approach was deemed more suitable than a phenomenological approach, as TA is able to integrate the perspectives of different groups of research participants, and of a relatively large data set (Nowell et al., 2017). Data were deductively analysed, which is appropriate when the structure of analysis is made based on previous knowledge or theory. Given that the aim of the study was to inform a SDT-derived intervention, theoretical TA was deemed appropriate to reveal experiences of rehabilitation within the theoretical framework of SDT (Thorup et al., 2016; Vaismoradi et al., 2013). The six-step process of conducting TA, as proposed by Braun and Clarke (2006) was utilised. Previous research has been criticised for inadequately explicating how this process was followed (Clarke & Braun, 2013), therefore the following section details how steps one to five of this process was followed, as well as considering how the researcher's personal experiences have influenced sampling, data collection, and analysis. Step six is achieved by virtue of writing this chapter.

1) *Familiarising yourself with the data*

Interviews were conducted and transcribed verbatim. Once transcribed, the data corpus was actively re-read to search for meanings and patterns, specifically how, why and with what effect SDT's psychological needs were evident. Initial notes or marking ideas were made, and the reflections made immediately following the interviews were integrated into the transcripts. In this instance, I was known to all healthcare professionals, meaning that these reflections allowed a consideration of how these prior experiences, discussions and previously-held beliefs may have influenced the conduct and potential interpretations of the data.

2) *Generating initial codes*

Once transcription was completed, initial codes that summarised salient points across transcripts were generated. Each transcript was afforded full and equal attention, before interpretations were cross-checked between the author and a colleague, who initially analysed each transcript separately before comparing and contrasting interpretations. This allowed codes to be rigorously interrogated and refined, ensuring that the codes were representative of the data, as well as ensuring that codes were both 'data-driven', as well as 'theory-driven'. Given the lead author's previous experience with many of the participants, this process of cross-checking with a supervisor who did not know the participants ensured that the themes generated were representative of the data collected. Such critical friend discussions were used to encourage reflexivity and provide a *'theoretical sounding board'* throughout the research process, and provided an opportunity for dialogue and the acknowledgement of multiple perspectives within the research process (Smith & McGannon, 2017).

3) Searching for themes and 4) Reviewing the themes

Once initial codes had been interrogated they were sorted into the three basic psychological needs. This process was underpinned by the questions 'how is each psychological need evident within the CR/PR context and what is its effect?'. During this process, it became evident that the presence and effect of the three basic psychological needs was different between the inpatient and outpatient phases of rehabilitation.

5) Defining and naming themes

Once main themes had been refined, the differences between the inpatient and outpatient phases were clearly defined to show how the effect of the three basic psychological needs was different as a patient progressed through CR/PR.

5.3 Findings

This section will contrast the inpatient and outpatient phases of CR/PR, and discuss the importance of SDT's basic psychological needs at each stage in driving uptake and adherence to the programme and PA behaviour change. Doing so aims to highlight the evolving salience of each need as a patient progresses through CR/PR. CR/PR typically comprises four phases: Phase 1 – the period in hospital following the patient's acute event or surgery, where information on the patient's condition and recovery is provided; Phase 2 – an outpatient visit to review the patient's progress and decide their next steps for recovery; Phase 3 – structured and supervised PA training, together with continued education and psychological support in an outpatient setting; and Phase 4 – the facilitation of long-term maintenance of lifestyle changes, occurring in community settings.. In this chapter, the inpatient phase refers to phase 1 of CR/PR, and the outpatient phase refers to phases 2 and 3. At the point of data collection, participants either worked in or had completed their phase 3 programme of CR/PR.

5.3.1 Inpatient Phase: Uptake

In the inpatient phase, patients experience hospital admission, may undergo surgery, and before their discharge are told about CR/PR. Generally, healthcare professionals suggested that *'the taboo from the wards and taboo from (ward) staff is, it's just exercise'* (Healthcare Professional 8, line 42*),* and that patients are instructed that they will be contacted by the *'exercise programme'* following inpatient discharge. Healthcare professionals suggested that this talk is typically delivered by a healthcare professional who does not have experience of working in an outpatient rehabilitation programme, meaning participants questioned the accuracy of the descriptions of CR/PR given within the inpatient phase.

Alternatively, they may be referred to CR/PR by their general practitioner or primary care and before their discharge are told about CR/PR.

Inpatient Phase: Relatedness

Within the inpatient phase, relatedness was facilitated by healthcare professionals and is perceived to be the most pertinent psychological need in driving patients' adherence to their rehabilitation programme. At this stage, relatedness need satisfaction aims to provide reassurance and allows the patient to feel comfortable and cared for. Patients perceived healthcare professionals to deliver relatedness by *'how the consultant came to saw me every day in hospital',* coupled with how the staff *'kept popping in to see me… they couldn't treat you any better, they're just lovely'* (Patient 4, lines 129-133).

Inpatient Phase: Competence

Patients suggested that as they approached their discharge from inpatient care, competence was developed in the form of *'a booklet on what to do and advice on how to get yourself back to normal'* (Patient 2, line 10). This was perceived to *'really help because I didn't really know what I could and couldn't do so I was like finding my way in the dark a little bit'* (Patient 6). The Heart Manual, published initially by NHS Lothian, is provided to patients as standard, and contains information surrounding their condition and the sorts of activities they could expect to be able to complete as their recovery progressed.

Inpatient Phase: Autonomy

Conversely, autonomy was thwarted within the inpatient phase, with patients experiencing little volition and psychological freedom. Healthcare professionals suggested that *'a lot of the information that's given out is very general in the hospital:*

> *They forget that there's 30-year-old men and 90-year olds. They're given a pack and flip. It says after week one, do this, after week two, do this, after week four, do this. That's no good, when they've read the leaflet top to bottom, because they're nervous, and you've got a 42-year-old bloke who isn't even picking up his cup of tea afterwards because it says so in the leaflet'* (Healthcare Professional 5, lines 408-414).

Healthcare professional 5's quote demonstrates that although patients felt reassured by the publication they received upon discharge, healthcare professionals within this study felt that this document was too prescriptive, thus potentially thwarting patients' autonomy and manifesting as a reluctance to physically exert themselves alongside an overreliance upon this sort of guidance.

5.3.2 Outpatient Phase: Adherence

Outpatient Phase: Relatedness

During the outpatient phase, relatedness had an important role in determining patients' adherence to the programme and PA behaviour change. Initially, patient 6 suggested that she needed reassurance to participate in CR. Her sister accompanied her to her first appointment as she did not know what to expect, however the peer support she received from both staff and patients helped to satisfy her need for relatedness. Staff helped to reassure her: *'I met the team and it was dead reassuring, dead welcoming and I felt part of the group'* (Patient 6, lines 32-33). She highlights how feeling *'part of the group'* allowed her to share common lived experiences and realise she was *'in the same boat'* as other people. This suggests that the peer support that patient 6 received particularly from other patients was perceived to transcend different demographics, in turn highlighting how shared experiences and peer support provided reassurance. Fundamentally, this demonstrates how relatedness, whether it is satisfied by peer support from either staff or patients, is implicated in patients' adherence by allowing her to feel valued and part of a community, all of whom have shared experiences.

Further evidence relating to how staff provided peer support and satisfied patients' need for relatedness is also evident in patient 6's account. She suggests that staff *"giving a shit"* (Patient 6, line 100) provided her with reassurance and helped drive her adherence to the programme, for example by assisting her in alleviating initial psychological issues she faced. By providing this reassurance, this patient perceived her mental health to have improved throughout rehabilitation:

> *(At the start of rehabilitation) 'I suffer depression, severely, and I have done most of my life, and it doesn't take an awful lot for me to slump into my…and call it 'sitting in my stink" and I mean that literally because I just sit in bed and I won't get dressed and I won't get washed and I won't go out. So I'll kind of switch my phone on flight mode and just don't bother with people so when I got that call I was sinking into that direction so I wasn't really arsed, if I'm honest'. (In contrast, following rehabilitation) 'I can't praise the NHS enough for what I've been through so, you know. So from a depression point of view, I'm actually feeling healthier than I have, and I don't mean just in the short term but I mean in years'* (Patient 6, lines 48-52, 78-80).

Specifically, patient 6 perceives the support she received from staff as important in helping to improve her mental health:

> *'I was very surprised at the level of motivation that the guys have got and the level of commitment they have for the patients as well. I felt like an individual and not an NHS number and that was amazing… it's way over and above what is expected'* (Patient 6, lines 54-55, 61).

Taken together, patient 6's account highlights how the support and reassurance she received from other patients and healthcare professionals allowed her to feel comfortable within the CR setting by allowing her to feel part of a community. Specifically, patient 6 perceives staff to provide reassurance using four methods: taking an interest, listening, providing advice and *'geeing her on'* (Patient 6, lines 100-101). Practically, the support she received from staff helped to satisfy her need for relatedness and were perceived to be implicated in her completing CR, improving her mental health, changing her PA behaviour, and formulating specific intentions for engaging in PA in the long-term. In summary, patient 6's narrative demonstrates how powerful relatedness can be in driving patients' adherence to the programme, by developing a safe space that enables the patient to feel comfortable and part of a group, whilst allowing them to explore opportunities to engage in PA, hence working towards satisfying their need for competence.

Outpatient Phase: The dark side of relatedness?

By utilising the basic psychological needs of relatedness and autonomy, a distinction can made between the driving factors behind patients' adherence. A PR patient highlights that relatedness is important to her because the similarity of *'seeing the same faces'* (Patient 3, line 139) allows her to feel comfortable and part of a community in rehabilitation. Additionally, this drove her adherence because she *'looked forward to seeing them'* (Patient 3, line 182) every week. From these quotes, it appears that her adherence is primarily determined by relatedness, in that she is attending for the social benefits associated with the programme because she feels part of a community of individuals with similar lived experiences, rather than internalising health behaviours and participating because of intrinsically-motivated factors. This view is corroborated by a CR patient, who discusses the differences between patients who self-direct their own care but do not think that they are being observed, with the patients who need attention, again highlighting the difference in motivational regulation between self-sufficient and patients who are more reliant on healthcare professionals' support. Healthcare professional 11 also corroborated views expressed by other colleagues, indicating the potentially negative effect of relatedness:

> *'A little Irish lady, she wasn't keen on coming at first, she'd come and she'd made friends and each week she'd gone from doing a bit sat down in the chair to having a go at the bike... we referred her onto the group, because I think she did go in the gym once and she wasn't really keen on it. But I thought she's going to miss the company. She had improved, her walking distance had improved... so I introduced her to the group, and she attends there with a friend, and she's*

> *carrying on her exercise because she goes to that group and it's the social aspect as well'.* (Healthcare professional 2, lines 575-595).

Taken together, these quotes suggest that patients whose adherence is relatedness-driven are likely to only engage in PA outside CR/PR only if the context allows their need for relatedness to be satisfied. Although in these instances, patients will have adhered to CR/PR, their PA behaviour appears to remain context-specific. Practically, it could be suggested that patients may be less likely to engage in PA outside CR/PR when the context does not satisfy their need for relatedness, such as the gym which is typically a more solitary pursuit than a group exercise class. Therefore, the integrity of relatedness in this patient's PA behaviour is demonstrated by how she was able to maintain her PA behaviour when she found a class that was more akin to PR. This patient's story therefore suggests that relatedness has helped develop context-specific PA motivation, yet this has failed to translate into other PA contexts, as her PA adherence did not transfer to settings that were different to the rehabilitation context. In terms of the basic psychological needs, this demonstrates that although relatedness is perceived to be particularly pertinent during the early stages of rehabilitation as she feels as though she belongs to a group, it may become problematic if it is the factor that drives patients' long-term adherence. At this juncture, it is important to suggest how healthcare professionals can detect an over-reliance on relatedness. Healthcare professional 5 suggests that the relatedness-focused nature of CR/PR may influence the extent to which autonomy and competence are developed:

> *'A lot of patients will come in and they will stand there and they will wait for you to tell them what to do, even if they've been there four or five times. The other ones will pick up the cards and off they go. They're the self-motivated ones. I want to do it. I'm ready. Show me what to do. They'll do a bit more than you ask and so on'.* (Healthcare professional 5, lines 573-578)

This extract indicates a potential reliance on the healthcare professional when adherence is relatedness-driven. This leads to patients failing to self-initiate the PA component of their rehabilitation, despite spending several sessions receiving instruction regarding how they can safely be active. Therefore, it is unclear whether sufficient competence or autonomy has been delivered in the previous sessions, hence potentially indicating that the pedagogical techniques utilised by the staff in the initial sessions may be unsuitable.

Outpatient Phase: How can autonomy and competence facilitate adherence?

In contrast, participants reflected upon how it is more adaptive if patients' adherence is determined by autonomy and/or competence. For example, patient 5 explains how his competence has increased in different domains: he has developed more effective coping mechanisms for *'dealing with stress better'* (Patient 5, lines 57-58), as well as noting a psychological and physiological improvements in his wellbeing: *'it still gets me angry in a different way… (Rehab's) taught me a lot in dealing with things I can't control. You can't control them, and you're just wasting your time'* (Patient 5, lines 66-67). Additionally, he highlights how he internalised health messages evident during the educational component of outpatient rehabilitation, which has allowed him to take ownership over a range of health-related behaviours, by becoming vegetarian. Such examples demonstrate that patient 5 has developed a deeper understanding of his condition and is now able to articulate the symptoms he is experiencing, when these may become a contraindication for PA, the causes of such symptoms, as well as how he can self-manage his condition to deal with these issues. These explanations show that alongside patient 5 developing competence in a range of domains related to his rehabilitation, he has taken ownership over his rehabilitation, hence demonstrating that he has successfully achieved the aims of the programme as he is able to self-manage. Therefore, this patient's adherence appears to be predominantly determined by autonomy. He appears to be satisfied with the level of PA-related competence he has developed: *'I know I'm not going to be Usain Bolt, but at least I can play football with the lads and I've got my granddaughter so that'll do me… and I can walk up a flight of stairs without getting out of breath'* (Patient 5, lines 86-67).

The PA competence that patient 5 has developed appears to transcend the rehabilitation context, meaning that his PA adherence is not specific to CR. Given that he has internalised messages of education, understands his condition, and crucially has taken ownership over his rehabilitation, the internalisation process has allowed him to translate these messages into contexts that are personally salient. In this instance, patient 5 has developed intentions and a plan for how to engage in PA post-discharge that will allow him to remain active in several different contexts.

Although patients may demonstrate adherence on paper, those who are compliant within rehabilitation but do not intend to remain active is highlighted as a particular source of frustration for healthcare professionals:

> *'Patients come, do the full programme, because they feel they have to. They've got nothing out of it, they're never going to exercise again, they're never going to change their lifestyle, they're not going to pack smoking, they're not going to change their diet but they love coming because they can have a chat to somebody. Sometimes that frustrates me'* (Healthcare Professional 3, lines 403-407).

Healthcare professional 3 cites such experiences as a source of *'frustration* (line 407)*'*, suggesting that it may become problematic when relatedness transcends the official programme aims, or as in this case, is the primary aim for participants. Therefore, it could be argued that such a heavy focus on relatedness manifests as the development of controlled motivation, which has been demonstrated by previous research to often mitigate the likelihood of developing intrinsic forms of motivation.

5.4 Discussion

Historically, rather less attention has been paid to examining the associations between satisfaction of psychological needs and PA than for behavioural regulations (Teixeira, Carraça, et al., 2012). This is the first study to describe how SDT, specifically the psychological needs, can be used to explain uptake and adherence of PA within CR/PR. The relative importance of relatedness at different stages of the rehabilitation pathway can be exemplified by contrasting the inpatient and outpatient phases. During the inpatient phase, relatedness was the most pertinent need, followed by competence, whereas autonomy was perceived to be thwarted, as patients typically received a pre-determined package of care on the basis of their acute event and/or surgery. This early salience of relatedness aimed to allow patients to feel comfortable and supported whilst they were an inpatient, with the aim of facilitating their progression onto the later stages of CR/PR. Although this chapter is the first to investigate need satisfaction within CR/PR, this staged approach to need satisfaction is reflected in previous SDT and PA research which demonstrated that relatedness can act as a gateway to behaviour change, before autonomy and competence act synergistically to facilitate the process of internalisation (Kinnafick et al., 2014; Rahman et al., 2011; Sebire et al., 2018). Similarly, studies examining the endorsement of different forms of behavioural regulation through the process of habit development consistently demonstrate that more self-determined regulations distinguish between individuals in the later stages from those in the early stages, demonstrating how the process of internalisation, achieved through a staged approach to psychological need satisfaction, facilitates the development of more autonomous forms of behavioural regulation (Teixeira, Carraça, et al., 2012). When applied to the present study, this finding suggests that relatedness and competence, satisfied in the earlier stages of habit formation, act as a vehicle for developing habitual PA engagement throughout the latter stages of the outpatient rehabilitation programme, and into phase 4. This finding therefore corroborates a range of previous research within the PA and SDT domains, and demonstrates the potential utility of SDT within CR/PR.

Whilst the absence of autonomy was perceived to be intentional within the inpatient phase as patients receive a predetermined package of care and the focus was on enabling them to feel comfortable and begin to understand their condition, both the CR and PR guidelines suggest that an outpatient programme should be underpinned by the satisfaction of patient autonomy, with the aim of patients self-directing their rehabilitation (BACPR, 2017; BTS, 2013). Therefore, as a patient progresses through CR/PR into the outpatient phase, their level of autonomy should grow, meaning that they will theoretically be more likely to internalise adaptive behaviours, with a view to sustaining PA behaviour in the long-term, in line with SDT principles (Deci & Ryan, 2008). How this staged approach to psychological need satisfaction is evident within healthcare professionals'practice has not been reported in published literature before. Instead, SDT-based interventions and empirical studies typically support the motivational sequence proposed by SDT (i.e., need-supportive health care climate -> need satisfaction - > autonomous exercise regulation - > PA behaviours) (Edmunds et al., 2006; Silva et al., 2010), but do not elucidate how need satisfaction can be achieved. Therefore, the present study may act as a starting point for explaining how and when healthcare professionals working within CR/PR could utilise SDT to change patients' PA behaviours.

Within SDT, autonomy thwarting has been extensively studied and is perceived to be problematic as it is associated with a wide array of negative outcomes, such as lack of effort and negative affect (Radel et al., 2013). Despite UK guidelines for both CR and PR highlighting the importance of patient autonomy within their respective definitions, autonomy need satisfaction was not always perceived to have been accomplished by the time a patient had been discharged from phase three of CR/PR. A potential explanation for this is the discord between the perceived relevance of autonomy between the inpatient and outpatient phases. This is specifically evident within the initial outpatient consultation when healthcare professionals attempt to encourage patients to set goals and behaviour change targets that they will work towards throughout CR/PR. This is challenging for patients, as up to this point they received extremely prescriptive guidance regarding their rehabilitation and have little experience of exerting influence over their own care, as the inpatient phase is predominantly underpinned by relatedness satisfaction, meaning autonomy is not a central concern, which may explain the patient's difficulty in goal setting. Similarly, Meis et al. (2014) demonstrated that healthcare professionals working within PR considered it a challenge to stimulate patients to set goals, and instead reported feeling as if patients were working towards the healthcare professional's goals, rather than their own. In turn, when a patient struggled or was unwilling to set their own goals, they failed to become intrinsically motivated, which has overwhelmingly been demonstrated to poorly predict behavioural persistence in a range of physical activity settings (Rahman et al., 2015).

As relatedness need satisfaction was particularly pertinent in patients' inpatient rehabilitation, this need was extensively utilised in the outpatient phase to patients to feel more comfortable within CR/PR. Whilst this was perceived to be effective in driving patients' early adherence to CR/PR, greater emphasis should ideally be placed on satisfying patients' levels of competence and autonomy as the patient progresses through this phase, with the hope that by the point of discharge, patients can effectively self-manage their condition. To achieve this and hence allow adherence to be driven by more autonomous forms of motivation, as opposed to purely the social elements inherent within the programme, autonomy and competence were perceived to become more important as a patient progresses through and approaches their outpatient discharge. However, despite patients overwhelmingly reporting that they experienced high levels of relatedness satisfaction, facilitated by both other patients and staff, the extent to which patients felt autonomous and competent to self-direct their care by their outpatient discharge is unclear.

This finding is corroborated by qualitative insights into adherence within PR, which demonstrated that ongoing adherence to the outpatient programme was positively influenced by a sense of group support (Arnold et al., 2006). Further support is provided by research conducted within exercise referral schemes, which demonstrated that participants' motivation transitioned from extrinsically driven at the start of their scheme to more intrinsic towards the end of the scheme (Eynon, O'Donnell, & Williams 2016; Hardcastle & Taylor 2005). In accordance with a large volume of SDT-based research, this form of motivation would be adaptive as more intrinsic forms of motivation have been associated with greater behavioural persistence, meaning that patients are more likely to sustain their levels of activity in the long-term (Ng et al., 2012; Silva et al., 2010).

5.4.1 Implications for Theory, Practice and Interventions

Chapter 5 provides a deeper understanding of how SDT's basic psychological needs of autonomy, competence and relatedness can be used to explain PA behaviours within CR/PR. Previous literature suggests that all three basic psychological needs should be satisfied simultaneously to create an optimally supportive environment (La Guardia, 2017). However, this study demonstrates that whilst it is important that all three needs are satisfied over the course of the patient's rehabilitation pathway, different needs are more pertinent at different time points.

Although it is acknowledged that a one size fits all approach is not enough for operating within a context as complex as rehabilitation, initially healthcare professionals should primarily aim to satisfy the patients' need for relatedness, before focusing on autonomy or competence. This approach allows the patient to feel comfortable in the rehabilitation environment and encourage them to progress to subsequent phases of rehabilitation. Therefore, when developing SDT-derived interventions with the aim of developing an optimally supportive environment, an overarching focus should be placed upon developing adherence that is underpinned by autonomy, whilst relatedness should be used to allow the patient to feel secure in the context before the focus shifts to the satisfaction of patient autonomy.

The staged approach to need satisfaction, evident within this chapter as well as previous research, poses important questions for SDT around whether prioritisation of a specific psychological need at any given time reflects need thwarting, or simply the absence of the other two needs. For example, it could be suggested that within the early stages of CR/PR, relatedness was prioritised at the expense of autonomy, which may suggest that autonomy need satisfaction was thwarted. Previous research has demonstrated that thwarting of any of the basic psychological needs, most notably autonomy, is likely to forestall the process of internalisation and therefore mitigate the likelihood of more autonomous forms of behavioural regulation being developed. Conversely, it could be argued that this prioritisation of one psychological need at any given time does not reflect thwarting or partial internalisation, but is instead reflective of the staged approach to need satisfaction that a body of previous research has demonstrated is often apparent when PA behaviour changes.

This would mean that over the process of CR/PR, need satisfaction would be achieved, but simply may not be a priority at a single point in time. Therefore, this chapter does not reflect the "dark side" of relatedness, but instead demonstrates the current absence of the other two needs, as was evident towards the start of a patients' CR/PR journey. This claim also reflects the potential for longitudinal approaches, such as that evident in Kinnafick et al. (2014), in investigating the staged approach to need satisfaction, internalisation, and the increasingly autonomous forms of behavioural regulation that would be developed if need satisfaction and internalisation was adequately achieved.

This phased approach to need satisfaction, with relatedness acting as a gateway before competence and autonomy become increasingly salient as a patient progresses through CR/PR, may reflect a conflict between theory and patient/healthcare professional ideas. This conflict is best elucidated by a 2003 paper that sought to differentiate autonomy from individualism and independence. The paper suggests that the opposite of autonomy is not dependence, but rather heteronomy, where a person's *"actions are controlled by forces that are phenomenally alien to the self or that compel one to behave in specific ways regardless of one's values or interests"* (Chirkov et al., 2003, p. 98).

In relation to the findings within this chapter, patients could be seen to be demonstrating dependence on the healthcare professionals given the absence of extensive autonomy need satisfaction. Alternatively, they could be seen to be exhibiting heteronomy, as they are in a completely 'alien' setting, and are seeking to better understand what has happened to them with a view to progressing through their rehabilitation. In a similar vein, the opposite of dependence is independence, not autonomy, as someone can be autonomously dependent on another, particularly if the other is perceived as supportive and responsive (Chirkov et al., 2003; La Guardia, 2017). This idea is reflected by the findings within this chapter, as patients exhibited a self-directed dependence on healthcare professionals, who they perceived to be supportive and responsive. This is unsurprising, given that humans have a basic need to be connected with others, as well as how relatedness need satisfaction and the need to feel supported is perceived as the need that needs to be met the earliest to facilitate the process of internalisation (Kinnafick et al., 2014; Rahman et al., 2011; Ryan & Deci, 2000).

By highlighting these differences between autonomy, heteronomy, independence and dependence, it could be suggested that participants within this study perceive autonomy and independence to be similar concepts. Therefore, it could be argued that the specificity of the theoretical tenets is being lost when SDT is applied to a real-world context. As this is the first study to investigate how the basic psychological needs are implicated within healthcare professionals' practice and patients' adherence to their rehabilitation programme, future research could be conducted with the aim of differentiating the concepts of heteronomy, autonomy, independence and dependence within specific healthcare contexts. Doing so may help to develop a more nuanced understanding of such theoreretical constructs within real-world settings, which in turn may allow more effective intervention development to take place. Additionally, it would help to contextualise theoretical constructs within real-world healthcare practice.

Practically, this study demonstrates how and why peer support is important in driving patients' adherence to CR/PR, hence helping to satisfy their need for relatedness. However, it is necessary for healthcare professionals working in rehabilitation to *'wean'* patients off this relatedness, as when this was the sole factor driving patients' adherence, their intentions to engage in PA were not as developed or specific as patients whose adherence to CR/PR was driven by autonomy. Although initial attempts have been made to operationalise SDT within the healthcare domain, advocated most notably through the integration of SDT and motivational interviewing (Lundahl et al., 2010), further investigations such as the present study should be conducted to produce a more nuanced understanding of how SDT can explain potential intervention target behaviours over the duration of a treatment programme.

Furthermore, SDT was not able to provide a definitive explanation of all factors acting as a barrier or facilitator of uptake and/or adherence to CR/PR. For example, the perceived inaccuracies within the inpatient staff description of outpatient rehabilitation were implicated as a major barrier to patients' uptake of outpatient rehabilitation. Healthcare professionals reported that their inpatient counterparts describe outpatient rehabilitation as *'the exercise programme'* (Healthcare Professional 1, line 41), whilst simultaneously encouraging patients to limit their physical activity. This contradiction between encouraging patients to be inactive, whilst discussing *'exercise'*, was perceived to manifest as patients failing to accurately understand the content of CR/PR and feeling sceptical about attending a programme that they believe will require them to exert themselves physically. Examples such as this demonstrate that whilst developing interventions, a theoretical understanding of the target behaviour, albeit useful, is insufficient. Practically, this means that events that cannot be explained using a specific theoretical lens should also be considered during the development process, rather than rejected as irrelevant as the chosen theory is unable to explain the problem. Future research should therefore seek to provide a theoretical explanation of behaviour that can help to develop a logic model of the hypothesised mechanisms of action of an intervention, alongside a consideration of the wider contextual issues that may influence upon the target behaviour. Doing so will ensure that interventions are both theoretically-based and contextually-relevant.

5.4.2 Limitations

It is important to acknowledge the limitations within this research. This study demonstrates how SDT can explain uptake and adherence behaviours within a single CR/PR service in the UK. The method is idiographic, disclosing participants' experiences of this particular service with a view to intervene in a theoretically-informed, yet contextually-relevant manner. Therefore, generalisability is purely naturalistic, in that it makes no claim to be representative of other people or cultures, but instead resonates with my personal engagement within this service (Smith, 2018). Additionally, through the pragmatic epistemology adopted within this project, the ontological approach adopted is focused on intervention development, and how effectively these insights can inform intervention development and provide recommendations for healthcare professionals' practice. As such, generalisability to other healthcare services and participants is not a central objective of the research. Nonetheless, CR and PR programmes across the UK use almost identical modus operandi, and therefore the experiences discussed within this may be evident elsewhere. Participant recruitment was based upon participant availability and willingness to participate within the study, and therefore may not be reflective of individuals who were not motivated to participate. Engaging patients who do not attend CR/PR is an important agenda for both the BACPR and BTS, and as such future research should consider investigating the motivational regulation amongst this population. This would allow interventions to affect the barriers to CR/PR engagement within patients who do not uptake the programme.

Additionally, it is acknowledged that these findings are based upon interviews conducted at a single time point. Although this study provided valuable insight into the experiences of a typically hard to reach population whose experiences have not been extensively researched from a SDT perspective, a longitudinal approach would be an interesting direction of future research. This would allow the evolving motivational regulation of patients to be investigated following their discharge from rehabilitation, in turn providing insight into how patients can prepare for this transition. Using semi-structured interviews, this study provided insight into CR/PR from an individual perspective. Given the integrity of relatedness and feelings of support throughout patients' rehabilitation, future research should also consider utilising focus groups with patients who have experienced rehabilitation together, or dyadic interviews with patients and their spouse or caregiver in order to better investigate how relatedness was facilitated. This recommendation was also suggested by previous research where relatedness was also perceived to be integral in driving participants' adherence to a PA programme. Collectively, such insight suggests that as well as focusing on autonomy need satisfaction, SDT research needs to investigate how, and with what effect, relatedness need satisfaction is achieved with the aim of developing SDT-derived interventions that are better able to drive psychological need satisfaction.

5.5 Conclusions

Contemporary health research utilises motivational theory, such as SDT to increase levels of PA within a range of clinical and/or inactive samples. However, there are currently limited qualitative investigations regarding how SDT can explain PA behaviours within these contexts. Accordingly, the present study demonstrates that within the early stages of rehabilitation, relatedness drives patients' adherence to CR/PR, allowing them to feel part of a community within the context. Following the satisfaction of the need for relatedness, patients should develop autonomy, and this should drive their adherence. Practically, healthcare professionals should demonstrate an awareness of how patients whose adherence is predominantly underpinned by relatedness are less likely to form intentions to participate in PA once they have been discharged. Conversely, wherever possible adherence should be underpinned by autonomy and competence: where this was evident, patients could demonstrate more specific plans to engage in PA in a range of contexts that transcends the rehabilitation context.

Chapter 6: How important is psychological theory and behaviour change within clinical rehabilitation? Perspectives from healthcare professionals

6.1 Chapter Overview

In addition to their traditional clinical roles, healthcare professionals are increasingly expected to cover a range of health promotion topics within their consultations with patients. For example, healthcare professionals are encouraged to 'prescribe' PA to patients, largely founded upon the perception of PA as a panacea that is able to address a range of psychological and physiological health issues.

Similarly, healthcare professionals across a variety of disciplines are expected to deliver behaviour change interventions as part of their standard clinical practice. In a CR/PR context, behaviour change is an integral component of an effective CR/PR service. However, previous research has demonstrated that there is a lack of insight pertaining to how competent healthcare professionals feel in relation to delivering behaviour change within their standard clinical practice. Therefore, there is currently a gap between the evidence that demonstrates the beneficial effects of adopting an active lifestyle and guidance that explains how healthcare professionals can encourage patients to change behaviour.

As such, chapter 6 builds on the key finding within chapter 4 that CR/PR's focus is broader than simply providing an opportunity for patients to be active. To do so, it aims to investigate healthcare professionals' perceived level of understanding of the psychological and psychosocial aspects of rehabilitation and their perceived competence in delivering behaviour change interventions as part of their standard practice. Additionally, chapter 6 highlights key psychological content that healthcare professionals would like to be featured within the intervention. Additionally, healthcare professionals' perceptions of previous continuing professional development courses will be investigated, with the aim of ensuring that the intervention's mode of delivery is accessible, acceptable and feasible for the healthcare professionals within Knowsley's CR/PR service.

6.2 Background

The significant financial strain currently experienced by the NHS, coupled with the increasing number of patients living with long-term conditions, has led to the role of non-physician healthcare professionals expanding and diversifying to include public health advocacy (Byrne-Davis et al., 2018). Despite this role expansion being extremely common across a range of healthcare disciplines, healthcare professionals report feeling that their training in delivering behaviour change as a component of their standard practice is poor (Rollnick et al., 2005). This contributes to the perception that these additional responsibilities detract from their key roles (Byrne-Davis et al., 2018), pessimism about the success of these behaviour change interventions, and concern that attempting to discuss potentially sensitive topics such as weight loss may damage their relationships with their patients (Dewhurst et al., 2017). Therefore, despite the enormous potential of effective behaviour change interventions to improve a number of public health concerns if properly embedded into routine clinical practice, healthcare professionals often make a cursory attempt or may avoid engaging in this conversations altogether (Rollnick et al., 2005). To address these concerns, research is needed that is able to better understand healthcare professionals' opinions and experiences of this role expansion, in order to identify ways in which they can be assisted to incorporate topics such as behaviour change into their standard practice.

Despite it being essential that research evidence can be translated into clinical practice to deliver safe, transparent, effective and efficient healthcare provision (Curtis et al., 2017), there is currently limited understanding how research can be used to improve healthcare practice rapidly, comprehensively and sustainably, with limited progress made over the past decade (Wensing & Grol, 2019). Within the field of behaviour change, there has been a proliferation in research focusing on predicting, explaining and promoting behaviour change amongst a range of populations (Michie et al., 2008; Michie, van Stralen, et al., 2011). However, there is limited translation of this knowledge with the aim of affecting healthcare professionals' practice (Chisholm et al., 2012). For example, doctors may suggest that they were trained primarily for diagnosing and treating medical conditions, not monitoring and attempting to modify their patients' behaviour, meaning they may be hesitant to attempt to deliver behaviour change interventions within their standard practice (Rollnick et al., 2005). This problem may be further exacerbated by how only some healthcare professionals receive training in consultation skills, as well as the discomfort expressed by some healthcare professionals in relation to discussing psychological issues, and a frustration with patients' apparent failure to follow health advice (Swanson et al., 2011). Within CR/PR, systematic review evidence has demonstrated that the depression prevalence in acute myocardial infarction survivors reported major depression was present in between 15% and 31% of the population, depending on the type of screening instrument used (Thombs et al., 2006). This is problematic as the presence of anxiety and depression has also been linked to increased mortality and re-occurrence of cardiovascular events (Sumner et al., 2018). Therefore, the extent to which CR/PR healthcare professionals understand and feel comfortable discussing the psychological elements of the programme warrants further investigation.

Additionally, despite theories of behaviour change being increasingly applied to complex clinician behaviours such as prescribing practices, behaviour change models have not been applied rigorously to clinicians' communication behaviours, meaning that there is a lack of understanding of how behaviour change should be delivered in these clinical settings (Sisk et al., 2019). To summarise, beyond the parameters of intervention research, opportunities to discuss behaviour change with patients are often missed, in turn suggesting that the potentially efficacious role that healthcare professionals have in tackling patients' health behaviours is not being realised (Chisholm et al., 2012).

Within CR/PR, behaviour change aims to prevent a patient's readmission to the service by developing a patient's ability to self-manage their condition (BACPR, 2017). Self-management of chronic illness has been widely recognised as a way to support patients in living the best possible quality of life with their chronic condition, and is integral in facilitating secondary prevention (Engelen et al., 2020). Despite the effectiveness of self-management in facilitating secondary prevention, it is often difficult for patients to develop this ability. Therefore, CR/PR occupies a unique space as healthcare professionals can provide support at a teachable moment shortly after a stressful life event such as acute illness or hospitalisation, where healthcare professionals can advise patients in how to improve their health by changing their health-related behaviours (Bredie et al., 2011). Nurse-led interventions initiated during this time show promising results for patients with a range of chronic diseases (Coster & Norman, 2009), meaning there is scope for behaviour change to be embedded within the CR/PR domain to a greater extent.

6.3 Aims of Chapter

Chapter 6 aims to investigate healthcare professionals' perceived level of understanding psychological theory applied to CR/PR, and their perceived competence in delivering behaviour change interventions as part of their standard practice. Additionally, chapter 6 will investigate healthcare professionals' perceptions of previous professional development courses, in order to elucidate how the intervention should be delivered.

6.4 Methods

6.4.1 Sampling

Through purposeful sampling, cardiac and pulmonary rehabilitation patients (*n*=8) and healthcare professionals (*n*=11) participated in this study. All patients were from a Knowsley and had taken part in CR or PR delivered by Knowsley Community CVD/COPD Rehabilitation Services. Healthcare professionals held a variety of roles within the outpatient cardiac and pulmonary rehabilitation services, reflecting the multidisciplinary nature of a rehabilitation team, and the variety of disciplines that operate within CR and PR. Healthcare professional roles included cardiac nurse (*n*=3), matron (*n*=1), exercise physiologist (*n*=3), healthcare assistant (*n*=1), assistant practitioner (*n*=1), exercise instructor (*n*=1), and physiotherapy assistant (*n*=1). To access this patient sample, in line with National Health Service (NHS) ethics, patients were recruited by a healthcare professional during their penultimate appointment, or were contacted via phone if they had dropped out of the programme. Healthcare professionals were already aware of the research project and were informed of the intention to develop an intervention derived from their interview data and were invited to participate via email. A total of nineteen participants were included in the study because they had experience of CR and/or PR within a UK region. A final interview was conducted that confirmed data saturation because no new codes were identified (Nowell et al., 2017), and therefore recruitment stopped.

6.4.2 Ethics

The research was given favourable ethical opinion by the North West - Greater Manchester West Research Ethics Committee (REC reference: 17/NW/0332; IRAS project ID: 226025) on the 9th June 2017. Following the interview, participants received a debrief form that reiterated the aims and rationale of the study, as well as the research team's contact details for any participant concerns that may arise, such as if a participant wished to withdraw their data.

Due to the sensitive nature of data, anonymity of the data was of prime importance. Therefore, each participant was assigned a pseudonym to protect their identity and any other identifiable demographic information was removed. Additionally, participants were advised that their data would be stored securely and confidentiality would be assured through the use of pseudonyms for the purposes of dissemination. The first author recorded and conducted all interviews. Immediately following the participant's departure, written memos and reflections were made to assist with contextualisation during the analysis process.

6.4.3 Data Collection and Procedure

Data were collected using face-to-face semi-structured interviews in either a hospital seminar room or private room in a leisure centre, based on participant availability. To ensure discussion remained pertinent to the aims of the study, an interview guide was developed which allowed the interviewer to ensure the same coverage of topics across all participants. The interview guide was informed by a review of the literature, and consultancy between the research team and senior healthcare professionals, in line with the pragmatic epistemological stance and the research aim to affect real-world healthcare practice. A combination of open and closed questions was utilised. Open questions provided participants with the opportunity to discuss their lived experiences, for example, *'When you received your admission phone call, what were your initial thoughts about attending rehabilitation?'* Closed questions, prompts and probes were utilised to garner greater depth of responses. Interviews lasted between 23 and 81 minutes (M=44 minutes), supplemented by briefing regarding the aims of the study and assurances about confidentiality. In total, 13.5 hours of interview data were collected.

6.4.4 Data Analysis

Data analysis followed Braun & Clarke's (2006) thematic approach, including data familiarisation, coding, searching for and defining themes, and included data saturation (Saunders et al., 2018). A thematic approach was adopted as it is able to provide a rich and detailed, yet complex account of data (Nowell et al., 2017). An inductive approach to TA was adopted, meaning that the findings were strongly data-driven, as a pre-existing coding frame was not adopted, but instead subthemes were formed inductively throughout the concurrent processes of data collection and analysis.

Through this concurrent process, emergent themes and issues raised during earlier interviews informed the conduct of subsequent interviews. As data collection and analysis progressed, a coding frame was devised, tested and refined by the lead researcher and a supervisor. Miscellaneous subthemes that did not intuitively fit with the rest of the data were also recorded, described and discussed by the research team. Both parties applied the coding frame to the data, allowing comparison and reflection on differences, and allowing the coding frame to evolve and expand to incorporate new knowledge. Data collection ceased when no new themes were identified or significantly elaborated upon, meaning that saturation had occurred (Saunders et al., 2018).

6.5 Findings

This section demonstrates how important psychology is perceived to be within CR/PR, elucidates the relative contributions of mental health and behaviour change to an effective service, and investigates how competent and equipped healthcare professionals feel in addressing these topics within clinics.

6.5.1 Perceived Importance of Psychology within CR/PR

The staffing models of CR and PR are multidisciplinary, comprising nurses, physiotherapists, exercise physiologists, exercise instructors, healthcare assistants, and physiotherapy assistants, amongst other disciplines. Referral to a clinical psychology and counselling service is available to patients who exhibit clinically significant levels of anxiety and depression, Typically, CR is led by cardiac nurses, and PR is typically led by physiotherapists (British Heart Foundation, 2019; British Thoracic Society, 2013). The lack of a practicing psychologist as part of the everyday CR/PR staffing model was problematic for some healthcare professionals, as they perceived an increasing number of patients to be presenting with low-level psychological issues that they did not feel equipped to deal with:

> *"What we used to have, what we could do six months ago, we had the psychological worker here and if I had a HAD score I could say, what do you think of that? It's really high on the HAD score. Now it's a little bit more difficult because we've got to go with what the recommendations are for a HAD score, in other words, the theoretical side…* (Healthcare Professional 6, lines 491-495).

Healthcare professional 6 suggests that because of the current absence of a psychologist working as part of CR/PR, the quality of the psychological aspect of the service has reduced. This is problematic as there is perceived to be an increasing prevalence of patients experiencing one or more psychological issues that healthcare professional 6 would ordinarily refer onto a psychologist. For example, healthcare professional 6 highlighted how *"there's a lot of people on antidepressants"* (line 563), highlighting how he perceives there to be a large proportion of his patients who have previously sought help for psychological issues. Due to the absence of a psychologist within CR/PR, healthcare professionals are reliant on a *"theoretical"* understanding of the discipline, whereas previously they would have access who was better placed to assess whether a clinically significant HADS score required an onward referral. Due to the lack of a psychologist within the service, this *"theoretical"* understanding suggests that when a patient presents in clinic with low-level psychological issues or is struggling to change behaviour, healthcare professional 6 is largely dependent on a level of understanding of psychology gained from his previous studies. He perceives this limited understand to be inhibiting his ability to have discussions with patients about their mental health. Through his perceived rudimentary levels of understanding, largely provided by potentially outdated psychosocial theory, healthcare professional 6 perhaps lacks the confidence to extensively discuss mental health concerns with patients.

This example demonstrates limited knowledge translation of psychological theory and research into healthcare professionals' practice, which has been highlighted as a problem by numerous previous studies (Chisholm et al., 2012; Wensing & Grol, 2019). In this instance, healthcare professional 6 highlights that he understands the *'what?'* aspect of behaviour change, in that he understands the underpinning psychological principles and theory. However, what is currently perceived to be lacking is the *'how?'* of behaviour change, exemplified by the skills that he could use to attempt to change patients' health-related behaviour, and better discuss mental health with patients. To remediate this concern, an intervention aiming to operate within CR/PR could seek to equip healthcare professionals with the skills to deliver low-level psychological intervention and behaviour change interventions within their existing practice alongside a theoretical understanding of behaviour change. Doing so would enable healthcare professionals to deliver these sorts of interventions, as well as elucidating precisely why these interventions are posited to be effective.

Issues associated with a lack of psychological provision within CR/PR were further highlighted in a number of interviews with healthcare professionals. For example, the counsellor's capacity was perceived to be insufficient for the demands of the service, perhaps suggesting that some patients who may have benefited from a counselling referral did not receive one: *"We try not to (refer patients to the counsellor), because she's overrun with patients"* (Healthcare Professional 5, line 717-718). As a result of this limited capacity, healthcare professional 5 suggested that patients with more acutely or terminally ill were more likely to be referred to the counsellor:

> *"(The counsellor) works three days a week for the whole of the CVD service. Generally, she looks after palliative and heart failure patients, however - we've got an element of it. We tend to refer the ones that are really bad or really poor. We have got a community service as well that we can refer to [IAPT] but it's - there's a very long waiting list. We've got a sort of very, very ad hoc and very gentle therapy - holistic therapy element to it, although it is a bit of trial period. It's very hit and miss. We haven't got much capacity in it".* (Healthcare Professional 5, lines 701-708).

This quote demonstrates that as a consequence of limited capacity coupled with high demand for the counsellor's services across the CVD service, healthcare professionals feel obliged to only refer patients who are *"really bad"* (line 702) to the counsellor. The *"very long waiting list" (line 704)* for both the counselling and psychologist within the trust, as well as for the external psychological services that are available to patients is further perceived to inhibit healthcare professionals' referral to these services. This demonstrates the limited provision for patients suffering from mental health concerns that may inhibit the effectiveness of their rehabilitation, but who are not terminally ill within CR/PR. Additionally, the time lag between a patient being referred to the psychologist and attending their first appointment was sometimes perceived as efficient in remediating some psychological issues that may be apparent at the time of referral at the start of the CR/PR programme:

> *"There's a two or three week waiting list (for the psychologist). When they actually get the appointment, they're alright now, because they've done a few exercise sessions. They've understood a bit. They've achieved one of their goals that they want to try and do. I'm fine now. I don't need it. Maybe it's just having that it's coming, it's coming, it's coming, and then when it's come… We could refer a lot more, but that might happen a lot more, if you know what I mean. That initial appointment is where they score highly, but then when you've done a few…"* (Healthcare Professional 5, lines 733-740)

This quote further elucidates the problematic nature of healthcare professionals relying on a *"theoretical"* understanding of psychology when working with patients who initially present with mental health concerns. If a patient presents at their initial appointment with a clinically significant HADS score, the healthcare professional refers them to a clinical psychologist. However, once the patient attended their first appointment with the psychologist, healthcare professional 5 suggested that patients were often no longer experiencing an elevated HADS score, indicative of a clinically significant levels of anxiety or depression. This reduced score was suggested to manifest from the patient's increased understanding of their condition and an increasing comfort of participating within CR/PR. This meant that at the start of CR/PR, their recent hospital admission or ill health was likely a major factor underpinning their elevated feelings of anxiety or depression. Due to this *"theoretical"* understanding of behaviour change that healthcare professionals suggest they rely on, in comparison to a more nuanced and extensive understanding of other disciplines that they specialise in, a number of healthcare professionals reflected on the possibility that some of these patients were referred to a clinical psychologist unnecessarily, solely on the basis that their self-reported HADS score was elevated.

To further extend these points, healthcare professionals suggested that the psychological elements of rehabilitation constituted a major knowledge gap: *"I think we're all probably a little bit naïve when it comes to the psychological side"* (Healthcare Professional 6, line 469). For example, healthcare professionals 5 suggested that the psychological aspect of CR/PR is *"under-estimated from us"* (line 725), and some professionals discussed their concerns in relation to working with patients who are suffering from anxiety or depression:

> "(I struggle with) *how to word things if they're feeling anxious… or how to deal with a patient who's depressed as I would have no idea what to say. I normally bring (a colleague) over and she helps me and sits with the patient, so that side of things I'm quite stuck on… they've all been doing it for years so I normally get someone else to come over and intervene"* (Healthcare Professional 1, lines 106-117).

This quote demonstrates that because of healthcare professional 1's perceived lack of knowledge or understanding in how to communicate with patients who are experiencing mental health problems, more experienced members of staff may be relied on to deal with clinically anxious or depressed patients. This is problematic when accompanied by the suggestion that healthcare professional 6, one of these experienced member of staff, suggests that he and other members of staff are "naïve" (Healthcare Professional 6, line 469) in relation to the psychological aspects of rehabilitation. With an increasing number of patients presenting at CR/PR with one or more psychological issues, it is a major concern that healthcare professionals working within CR/PR do not perceive themselves to possess the skills to effectively treat these patients, the service is currently lacking a referral pathway to a clinical psychologist, and the counselling service does not currently have enough capacity to meet the level of demand that is apparent in CR/PR. Although it is accepted that ideally, CR/PR services should have a psychologist as part of the team, it is currently unlikely that this will be possible due to financial and commissioning constraints within NHS services. Therefore, CR/PR services should instead consider ways in which psychology can be incorporated into existing services more effectively and in a consistent manner without the need for a practitioner psychologist to be a member of full-time staff.

To further substantiate these concerns, healthcare professionals discussed the improbability of having a psychologist in the service on a full-time basis, however they believed they should be able to deliver low-level psychological intervention and behaviour change within their practice:

> *"What would be very useful is if you could provide us with the skills… our team is very unique in the way it approaches things and we're all very, very different personalities. We deal with the motivational aspect of attending CR very differently. It's a bit of a lottery about which member of staff that you get… I think it needs to be a bit more uniformed across the service, if we can make sure that we're doing things within guidelines and the most up-to-date effort at it.* (Healthcare Professional 5, lines 217-222, 226-229).

By describing it as a *"lottery"* (line 221), healthcare professional 5 highlights a lack of consistency between how healthcare professionals deliver the psychological aspects of CR/PR, suggesting that this aspect of the service could be improved by providing a consistent and approach to delivering behaviour change interventions. She also stresses the importance of ensuring that any intervention that will operate within CR/PR is *"up-to-date"* and *"within guidelines"* (lines 226-229), demonstrating the need for an intervention to be based on the best available and most recent evidence, as well as aligning with standard clinical practice and guidance that dictates how a CR/PR service should operate.

Behaviour change was perceived to be important by a number of healthcare professionals, for example healthcare professional 9 who suggested that *"(Behaviour change is) really important yeah. The types of patients that we're seeing, yeah, I do think it is an important aspect"* (Healthcare Professional 9, line 563). To extend this claim, healthcare professional 5 suggests that although behaviour change is an important component of CR/PR, it is currently sub-optimally integrated into Knowsley's service:

> "I think it's really important. It's something that we definitely under-do here, or we under-address. I think we do some screens at the beginning and we do some screens at the end, but actually what we do in the middle is a lot to be desired. Most of our staff members haven't got the history, if you like. We've all done motivational interviewing and what not" (Healthcare Professional 5, lines 201-205).

In this instance, healthcare professional 5 corroborates previous claims made by her colleagues that currently, the psychological aspects of CR/PR largely stem from a theoretical understanding of psychology and behaviour change. To extend these claims, healthcare professional 5 suggests that the team's level of competence to deliver effective behaviour change interventions is limited, as they *"haven't got the history"* (line 204), meaning that they do not have psychology backgrounds or access to the training programmes that would help to develop competence in this domain. She suggests that although members of the team have participated in motivational interviewing courses, this experience did not extensively equip them with the ability to embed behaviour change throughout the programme or effectively deliver behaviour change as part of their practice.

In summary, this theme demonstrates that psychology is perceived to be an important yet underestimated component of CR/PR. This theme highlights the importance of healthcare professionals being equipped to deal with both the behaviour change and mental health components of CR/PR, with the knowledge that if a patient requires more extensive clinical input, they can be referred onto a clinical psychologist or counsellor. Problems with the capacity of these services were highlighted as a major concern by a number of healthcare professionals, however it is beyond the scope of this project to affect these issues. Instead, this intervention will aim to address the behaviour change component of CR/PR by identifying ways to remediate the lack of consistency in how healthcare professionals deliver behaviour change as part of their standard practice, as well as ensuring that any proposed intervention is both evidence-based and aligned with existing policies and guidance that dictate how CR/PR is delivered. To do so, the intervention will allow healthcare professionals to understand how to embed behaviour change interventions within their standard practice, as well as providing a theoretical understanding to allow them to understand why certain techniques and skills are recommended. This approach aims to overcome the "naivety" that was recognised as a limitation of healthcare professionals' current practice in relation to delivering the psychological and behaviour change aspects of CR/PR.

6.5.2 Reliance on Experiential Learning

When questioned about their level of understanding of behaviour change, healthcare professionals generally perceived motivational interviewing, goal setting, and behaviour change to be synonymous, with several participants discussing motivational interviewing courses they had taken part in, or *"SMART"* goal-setting techniques that they had utilised with patients (Healthcare Professional

6, line 586). Another professional discussed how changing behaviour is *"really, really hard"* (line 930), but successfully changing behaviour could be achieved by *"getting the trust, and you knowing your stuff. You've got to be 100 per cent knowing your stuff because the patient can see right through that"* (Healthcare Professional 8, lines 930-932). This demonstrates that the intervention needs to equip healthcare professionals with the competence to deliver behaviour change in a way that the patients will trust the messages they are providing. Healthcare professional 6 also highlighted barriers to changing patients' behaviours by discussing the *"personality of the patient and their demographics and where they come from and their culture within the family"* as potential determinants of behaviour change (Healthcare Professional 8, lines 926-927). This demonstrates that professionals are generally aware of behaviour change but lack the skills to systematically implement these techniques within their practice. This lack of access to behaviour change training is corroborated by healthcare professional 3:

> *"I do think it's (behaviour change has) got its part. It's definitely got its part hasn't it? Yet again, you don't get no training. It's even when the patient - it's only through experience you pick up little things"* (Healthcare Professional 3, lines 229-231).

Given the lack of formalised training in behaviour change that has been recognised in previous sections, healthcare professional 3 suggests that her competence in delivering behaviour change is largely reliant on experiential learning. Across all healthcare professionals interviewed, healthcare professional 6 discussed his experience in behaviour change and where this understanding stemmed from most extensively, suggesting that his university education provided him with his current levels of understanding of behaviour change.

> *"(My understanding of behaviour change is) Only what I did in university. I - it's probably the - the self-efficacy model. I like to use that without using it, if you know what I mean. I like to talk to people about this self-confidence and self-confidence in particular tasks and things like that. The Kubler-Ross model built*

> *in 1969 that would be the death or it can be as you know, it can be put into sport and it can be put into how they feel about themselves, denial, anger, bargaining, depression, acceptance, that kind of thing. There are one or two other things as well that you can use without using, if you know what I mean. Let them know that if they're going through these - especially the mental health, even though we can't prescribe [top up] mental health, if they're feeling a bit low or they feel whatever their emotions might be, just to say, listen, this is an actual process. You're going through grieving. It's like a death - it's like a death kind of feeling that you're going through because of the denial and all that kind of stuff. So, it's letting them know. It does come in handy now and then to talk to them about things like that"* (Healthcare Professional 6, lines 165-181).

Due to their perceived limited understanding of behaviour change and the psychological aspects of rehabilitation, professionals suggested that they aim to remediate knowledge gaps by learning from colleagues. One nurse suggested that *"it's only through experience you pick up little things"*, extending this by suggesting *that "you're learning off other people, who's to say my way is the right way?"* (Healthcare Professional 3, lines 321-322). This demonstrates the willingness of healthcare professionals to be challenged on aspects of their practice, and highlights a worrying dichotomy that healthcare professionals are relying on more experienced healthcare professionals to help remediate perceived knowledge gaps, whilst acknowledging that the team as a whole does not currently have the depth of understanding of behaviour change.

Healthcare professional 3 further stated the utility of her role in supervising nursing students in avoiding *"getting stuck"*: *"if I have a student I say tell me things because I've been doing this (job) now for years*" (Healthcare Professional 3, lines 324-325), further elucidating her willingness to be challenged on aspects of her practice. Similarly, an exercise physiologist reported that she perceived behaviour change to be a strength of hers, whilst acknowledging that experiential learning has largely underpinned this understanding: *"(changing a patient's behaviour is) probably quite a good strength of mine, that I know how to trigger somebody. That's just through experience, I've got 15 years of doing this"* (Healthcare Professional 5, lines 299-301). Collectively, these claims suggest that healthcare professionals rely upon their experience of helping patients to change behaviour rather than drawing on formalised training programmes to increase their competence in delivering behaviour change and addressing the psychological elements of CR/PR within their practice.

6.5.3 Knowledge Translation

The notion that healthcare professionals typically rely on their colleagues to remediate knowledge gaps related to behaviour change is problematic, as an exercise physiologist reported that *"most of our staff members haven't got the history* (in behaviour change or psychology)*"* (Healthcare Professional 5, line 204), with another suggesting that *"I've got the theory, but the practice, I don't know. The psychological side for me is neglected a little bit"* (Healthcare Professional 6, lines 273-274). In this instance, the healthcare professional suggests that his theoretical understanding of the psychological elements of rehabilitation stems from his previous academic study. His understanding of behaviour change and psychology is therefore largely theoretical, such as the "*Kubler-Ross model*" (line 167), with little understanding pertaining to how such concepts could be translated into his practice. This was a commonality between a number of healthcare professionals, with a largely academic understanding of different theories of behaviour change accompanied by a limited understanding of how these models could affect practice. Therefore, the intervention should aim to remediate this knowledge gap by providing a solid theoretical basis of the intervention applied to the CR/PR service, before operationalising the theory so that healthcare professionals clearly understand how they can translate the theory into their standard clinical practice.

Even when CPD courses were perceived to be relevant, professionals reported a lack of awareness of how to translate these principles into their own practice: *"we know about (motivational interviewing), but actually putting it into place, it's difficult"* (Healthcare Professional 10, lines 333-334). This was also reflected by an exercise physiologist who suggested that motivational interviewing *"was a good course. Very limited that we've been able to use anything that was on that course because of the time. Very, very limited"* (Healthcare Professional 6, lines 899-901). In both instances, time pressures within the clinical setting were perceived to limit the extent to which the content of such courses could be translated into healthcare professionals' everyday practice. The suggestion that motivational interviewing is corroborated by previous research, where it was perceived to be a valuable tool for CR healthcare professionals (Brobeck et al., 2011), but is also a demanding method, meaning that it may be difficult for healthcare professionals to simultaneously deliver an extensive MI conversation whilst meeting the task requirements that are mandatory within their weekly consultations with patients (Engelen et al., 2020; Noordman et al., 2012).

This was further elucidated by healthcare professional 6:

> *"For me it (ideally) would be to use those skills I want to say now, in the time that we've got to be able to use them… the effective things that you can use in ten minutes, that for me would be the gold dust"* (Healthcare Professional 6, lines 904-908).

Collectively, such quotes demonstrate that CPD courses that equip healthcare professionals with the skills to deliver behaviour change and motivational interviewing should be developed in a manner that is mindful of the time constraints associated within clinical settings. For example, a motivational interviewing course should not simply equip healthcare professionals with the skills to ask open questions and make affirmations but should seek to equip professionals with the ability to deliver short behaviour change interventions that can be embedded within clinical encounters. This further reinforces the points highlighted by healthcare professional 6, who suggested that he largely understands the *“what?”* of behaviour change, indicative of the theoretical underpinnings of behaviour change theories. However, the *“how?”* is largely missing within existing CPD opportunities, meaning that the extent to which healthcare professionals have been equipped with the skills and techniques that would allow them to embed behaviour change within their practice is limited.

Therefore, interventions need to equip healthcare professionals with a theoretical understanding of behaviour change, allowing them to understand why and when they may initiate specific behaviour change techniques. Second, interventions should explain the “how?” of behaviour change to a larger extent, equipping healthcare professionals with the behaviour change they can use to remediate issues with patients’ lifestyle behaviours. When developing these interventions, research teams should be mindful of the stringent time constraints within clinical settings. Practically, intervention developers should ensure that examples used to elucidate specific behaviour change techniques should demonstrate how healthcare professionals can implement evidence-based techniques in a contextually-relevant manner, in a way that is feasible within the constraints of the clinical setting.

6.5.4 Perceptions of Existing CPD Programmes

The theme *perceptions of existing CPD programmes* explains what attracts healthcare professionals to continuing professional development (CPD) courses, and their perceptions of the value of such courses. Some healthcare professionals highlighted the limited practical utility of existing CPD courses within CR/PR and community rehabilitation settings, with this perceived to be a key factor preventing them from engaging with CPD:

> *"What puts me off is I feel like I'm so busy in this role, what puts me off is the fact I don't think I'm going to learn anything… I've got 10,000 million things to do and I'm wasting half a day, or a day probably, sitting in a room and learning not much"* (Healthcare Professional 5, lines 171-177).

In this instance, healthcare professional 5 highlights the number of competing agendas she has within her role, meaning that any CPD she chooses to engage with needs to benefit one or more of the roles she undertakes for her to perceive it as a productive use of her time as she has *"10,000 million things to do"* (lines 174-175).

In a similar vein, healthcare professionals perceived a lack of practical utility of existing CPD courses within their own practice in community settings:

> *"A lot of our training here, our mandatory training because we're linked to an acute trust it's very acute focused. I don't know whether there was any more that could be done that's more suitable for community services, community staff. It's just like the whole day you're talking about lines and pumps and things I never use"* (Healthcare Professional 4, lines 336-339).

Healthcare professional 4 suggests that the content of existing training opportunities offered to them do not reflect the nature of the community-based rehabilitation setting as they are more suitable for healthcare professionals who work within inpatient settings. As such, when developing interventions and training programmes for CR/PR, teams should ensure that intervention content is relevant to healthcare contexts and professionals, so that the key concepts can be readily translated into standard practice.

Additionally, the practical utility of existing CPD was also questioned because of its limited ability to affect the problematic patient group who do not attend:

> *"To be able to capture the patients that aren't motivated, they have to come. If they're not motivated, they're not coming. We just discharge them and we don't*

> *do anything with them. I think it's really important and it's really under-utilised within our service and it's something that we need to address"* (Healthcare Professional 5, lines 206-210).

In this instance, healthcare professional 5 highlights a population who would be outside the scope of a face-to-face intervention. These patients typically do not attend CR/PR, suggesting the programme is *"not for them"* (Healthcare Professional 6, line 63). Standard practice within Knowsley is to discharge these patients, however, this places them at greater risk of re-admission to CR/PR as they are unlikely to have made any lifestyle changes that CR/PR would equip them with the skills and level of understanding to achieve. Therefore, it is beneficial to investigate the process a patient progresses through into CR/PR, and the factors that may lead to them failing to uptake CR/PR. From an intervention development perspective, there is a better need to develop interventions that can influence the earlier stages of CR/PR, such as the inpatient stage where healthcare professionals may be better able to influence the likelihood of a patient attending CR/PR by exploring reasons for non-attendance or patients' levels of motivation for engaging in and self-initiating their rehabilitation.

6.5.5 Barriers and Facilitators to CPD

Healthcare professionals discussed different factors that acted as a barrier or facilitator of participating in CPD courses. For example, maintaining a work-life balance was perceived to be a barrier to engaging with CPD:

> *"my family life to be honest with you (prevented me from doing CPD), because people have said how about doing your Masters but I found it really hard studying and doing a degree and working full-time and having a young family, it is so so hard and draining and I've kind of hit a point where I've been there and done that, I'll do what I need to do to keep myself up to date and working, but I'm not gonna do any more long-haul stuff because I've got two young boys at home and it's absolutely draining"* (Healthcare Professional 2, lines 54-59).

Healthcare professional 2 demonstrates the potential of developing a 'short haul' behaviour change intervention that places less emphasis on the staff to complete work in their own time. In this instance, healthcare professional 2 demonstrates that it is essential that the intervention's value is clearly evident, in that it should be posed as a method of improving an already outstanding service, and aims to complement standard practice without being overly time-demanding on healthcare professionals. These sentiments in relation to time constraints preventing healthcare professionals engaging with CPD was highlighted in other interviews: *"the time it takes because everything- you're expected to do it. Ok you do the courses in the daytime, but all the work is in your own time. That is hard when you're working full-time to go home and do that"* (Healthcare Professional 3, lines 298-300).

In contrast to the *"long-haul"* (line 58) courses that healthcare professional 2 discussed, flexibility in courses and professional education made healthcare professionals more likely to engage: *"I've got the cardiology app on my phone, it's really good, it's quite boring, John's from America. Each week he'll do three topics. He's only on for 20 minutes but he'll do anything"* (Healthcare Professional 3, lines 265-267). This demonstrates the potential of an intervention that healthcare professionals can dip into in smaller chunks when they perceive the need to, without the need for an extensive formalised education programme. Therefore, the intervention's materials should meet this need.

Additionally, financial constraints made CPD inaccessible: *"I've tried to do leadership loads of times, I've tried to do advanced communication and it's we haven't got the money, haven't got the money, so sometimes you do get the knockback"* (Healthcare Professional 3, lines 288-290). Financial barriers to CPD were also reflected by another professional who suggested that *"it's not a cost to us but you've got to think of the service as well"* (Healthcare Professional 6, line 877). Again, these claims reinforce the need for the intervention to transparently demonstrate its value by making clear its value, why healthcare professionals should commit time to it, and clearly explaining how it is applicable to standard practice in Knowsley.

Collectively, this theme demonstrates that there is a perception that professionals are unable to access CPD courses that they believe would be beneficial, due to several factors such as finance and time constraints. Additionally, and most notably, existing CPD courses are not perceived to be tailored to community settings, meaning that healthcare professionals suggest that they have been unable to implement the topics discussed on these courses within their practice. This therefore demonstrates the necessity of training programmes that are tailored specifically to the community settings, that more readily address problems that community staff face, in contrast to acute or inpatient settings.

6.6 Discussion and Implications of Chapter 6

Within the policies that dictate how CR/PR is delivered, behaviour change is perceived to be a central component of an effective service and is key to developing a patient's ability to self-manage their condition with the aim of preventing readmission to the service (Cowie et al., 2019). However, chapter 6 highlights that the psychological aspects of CR/PR, such as behaviour change, are currently an under-developed component of Knowsley's services. Chapter 6 also demonstrates that healthcare professionals do not currently have the perceived competence to deliver effective behaviour change interventions as part of their standard practice, and do not readily have access to training programmes that could remediate this knowledge gap.

Central to the points within this chapter is the claim that there has thus far been a lag between behaviour change research being conducted and translating into routine practice. This claim has been elucidated within the broader applied health research field, where numerous publications have suggested that despite the importance of finding effective ways to encourage healthcare professionals to routinely embed high-quality clinical evidence into their everyday work, this translation has proved a major challenge (Johnson & May, 2015). This is probably best summarised by the 2006 claim that *"many researchers do not see it as their responsibility to think through the policy implications of their work"* (Brownson et al., 2006b, p. 164), suggesting that knowledge translation of research into practice is not a major concern of many researchers.

This chapter investigated healthcare professionals' understanding of, and competence in delivering, the psychological aspects of CR/PR. This largely comprised two main overarching topics: mental health and behaviour change. Healthcare professionals felt they were underequipped to deal with mental health concerns that many patients were experiencing upon their admission to CR/PR. This is concerning, given that there is considerable evidence that negative emotional states such as anxiety (Tully & Baumeister, 2015), depression (Dickens, 2015) and chronic stress are related to poor cardiac outcomes (Richards et al., 2017). A 2017 Cochrane review highlighted the effectiveness of different psychological interventions for individuals with CHD, such as improving awareness of cardiac risk factors, attempting to effect behaviour change, relaxation techniques, self-awareness and self-monitoring, emotional support and cognitive restructuring. The review demonstrated that none of the interventions were deleterious to health or wellbeing, but there was no evidence that compared to usual care, psychological interventions did not reduce total mortality or the risk of revascularisation in CHD patients (Richards et al., 2017). In relation to chapter 6's findings, there was little evidence that these interventions aimed to change healthcare professionals' practice or remediate the perceived knowledge gap of working with patients who are experiencing mental health concerns. Given the suggestion that an increasing number of patients within Knowsley would benefit from psychological intervention, upskilling the CR/PR workforce in delivering low-level psychological intervention to begin to remediate these issues could be a good investment for the NHS trust to further investigate.

The importance of behaviour change within CR/PR was discussed, and was perceived to be central to an effective CR/PR service. However, healthcare professionals demonstrated a limited understanding of how to effectively integrate behaviour change techniques into their practice. This finding is corroborated by previous research, which demonstrated that common barrier that prevent healthcare professionals from engaging in discussions with patients about health-related behaviour change include feeling unskilled in the area and lacking confidence to address behaviour change (Chisholm et al., 2020).

Similarly, healthcare professionals perceived training programmes and courses that would enable them to improve their understanding and practice of behaviour change to be largely inaccessible and lacking practical utility that would facilitate translation. The exception to this was motivational interviewing training, which a number of healthcare professionals had accessed. Previous research has demonstrated that the effects of motivational interviewing upon behaviour change and adherence to exercise in the context of CR/PR are currently unknown. Consequently, there is little current guidance to support the training of healthcare professionals, which is considered an essential component of motivational interviewing for intervention fidelity (Blackstock & Evans, 2019; O'Halloran et al., 2014).

There are limited research insights that can shed further light on the finding that behaviour change training is perceived to be inaccessible for healthcare professionals. However, a 2020 study demonstrated that theory-informed online training could improve healthcare professionals' engagement in health conversations with patients (Chisholm et al., 2020), perhaps offering a future direction for intervention development. Previous research has demonstrated that even though all NHS provider organisations in England are contractually obliged to train their staff in the *'Making Every Contact Count'* (MECC) approach to health behaviour change, there is no consistent approach to training and there is variation in implementation success (Public Health England & Health Education England, 2016). Despite MECC being a mandated training offer within NHS organisations, healthcare professionals levels of engagement with and awareness of MECC are low, and even when healthcare professionals perceive a patient benefit, they do not use MECC principles in 50% of cases (Keyworth et al., 2018). Additionally, there is a paucity of evidence to support MECC's effectiveness, both in terms of professional behaviour being changed by training (Chisholm et al., 2019) and patients making changes to their health-related behaviours (Chisholm et al., 2020). More worryingly, those responsible for designing and delivering health behaviour education for healthcare professionals feel unclear about what to include, and even because those who teach trainees about behaviour change may struggle with delivering behaviour change as part of their own practice (Chisholm et al., 2013).

By positioning chapter 6's findings within the broader health system context, it is clear that more work needs to be undertaken at a strategic level to understand the training needs of both healthcare professionals and those commissioning behaviour change training and interventions. Once this has been achieved, interventions can be developed that can properly affect healthcare professionals' clinical practice and competence in delivering behaviour change interventions. However, there is currently a paucity of research investigating existing behaviour change practice within services such as CR/PR, let alone understanding how best to optimise the use of behaviour change across the UK's CR/PR field. Therefore, research such as this chapter provide a useful starting point to understand healthcare professionals' understanding of behaviour change and the psychological aspects of CR/PR, from which interventions that can remediate these knowledge gaps and can optimise the psychological aspects of such services can be developed.

6.7 Implications for Intervention Development

Chapter 6 aims to work alongside chapters 3, 4 and 5 to facilitate intervention development. Specifically, chapter 6 aims to investigate the specific knowledge gaps that the intervention should aim to remediate. Chapter 6 demonstrates that despite acknowledging that behaviour change is important within CR/PR, healthcare professionals have limited understanding of how to integrate behaviour change theory into their routine practice. Therefore, the intervention will aim to provide healthcare professionals with a theoretically driven, contextually relevant understanding of what behaviour change is, and how it can be used within their routine practice.

By delivering the intervention as part of 'in-house' training, the intervention will aim to overcome the finding that training programmes that could remediate the behaviour change knowledge gap are perceived to be largely inaccessible to healthcare professionals. Through this inaccessibility of training programmes, healthcare professionals are reliant on experiential learning and learning from their colleagues. To overcome this, the intervention will be contextually-relevant and theoretically-driven to allow healthcare professionals to better understand where and how behaviour change can be integrated into their routine practice, as well as ensuring that any intervention is underpinned by empirical evidence as well as relevant health policies. Tailoring the intervention specifically to the CR/PR service also aims to overcome the finding that current in-house training is too acute-focused, meaning that it is relevant to ward-based healthcare professionals but not extensively relevant to community-based services.

6.8 Intervention Targets Arising from Chapter 6

The potential intervention targets identified throughout chapter 6 are as follows:

- Ensure that the topics covered in the intervention are applicable to a range of different disciplines evident in the CR/PR team.
- Equip healthcare professionals with the skills to encourage patients to uptake, adhere and change behaviour.
- Resolve conflict: is the healthcare professional a salesman for a product, and how can we get patients to understand CR/PR?
- Consider employing a psychologist or review referral pathway.
- Provide healthcare professionals with the skills to treat low level psychological issues.
- Provide a theoretical, practical and contextually-relevant understanding of behaviour change, and go beyond the rudimentary level of understanding.

- Revisit the use of HADS: is it really the best measure?
- How can we have difficult conversations? Tackling anxiety and depression.
- Provide a standardised model of psychology and behaviour change delivery.
- Provide a bank of resources if professionals identify a psychology/behaviour change knowledge gap.
- Use SMART and motivational interviewing as a starting point/common ground and build on this.
- Equip healthcare professionals with the confidence and competence to use behaviour change techniques so patients trust them.
- Challenge healthcare professionals' practice.
- Deliver behaviour change: how can we trigger someone to change?
- Make the aims of the intervention clear: why should I care and what value will this add?
- Consider the time pressures evident within practice.
- Investigate how the services can reach non-attenders.

6.9 Conclusions

Chapter 6 demonstrates that although psychology and behaviour change is a central component of an effective CR/PR service, healthcare professionals' level of understanding and perceived competence in delivering behaviour change interventions is low. Currently, training programmes that could enhance healthcare professionals' levels of understanding and competence in delivering behaviour change are perceived to be inaccessible. To exacerbate this, accessible training such as motivational interviewing was not perceived to equip healthcare professionals with an extensive appreciation of how to translate behaviour change into their routine practice within CR/PR.

Chapter 7: Intervention Development, Protocol and Preliminary Evaluation

7.1 Chapter Overview

Chapter 7 has two main aims. Firstly, it aims to describe how the intervention was developed, incorporating a triangulation of the literature and policy review (chapter 2), systematic review (chapter 3), and semi-structured interview data (chapters 4, 5, and 6). This led to the development of a logic model the intervention's anticipated mechanism of action within CR/PR, and a course handbook and accompanying resources that were used to deliver training sessions. Following this, the intervention's quality and the degree to which it is theory-based will be assessed using Michie et al.'s (2010) *Theory Coding Scheme*. Secondly, this chapter details healthcare professionals' reception of the intervention, highlighting its perceived acceptability within standard CR/PR practice, and any changes that could be made to make it more acceptable to current practice within the Knowsley CR/PR context.

As extensively discussed in previous chapters, best practice guidance demonstrates that behaviour change interventions should draw on psychological theory to understand both health behaviours and an intervention's hypothesised mechanism of action (Kislov, 2019; Prestwich et al., 2015). As detailed more broadly within chapter 2, and within the specific SDT domain in chapter 3, there is limited understanding pertaining to how why SDT is operationalised in a specific manner to develop interventions aiming to influence health related behaviours, such as PA. Therefore, there is a dearth of practical guidance or underpinning logic that would facilitate understanding of how theoretical constructs within SDT can be operationalised in the form of a behaviour change intervention.

To remediate these issues, chapter 7 aims to provide a contextually-nuanced understanding of behaviour change within CR/PR, with the aim of achieving a close match between intervention and CR/PR context, before evaluating the intervention in terms of its perceived acceptability to healthcare professionals working within CR/PR.

7.2 Synthesising Previous Findings

Intervention development was driven by a synthesis of previous chapters' findings and underpinned by MRC (2008) and intervention mapping. The steps taken to develop the intervention are as follows:

Table 5 Steps of Intervention Development

Step	Chapter of Thesis	Rationale
Understand the behaviour in context	Chapters 4-6	• Intervention mapping suggests it is important to establish a detailed understanding of the problem, the population at risk, potential behavioural and environmental conditions, and available resources that could remediate the problem. This is achieved by conducting a needs assessment to describe the context for the intervention.
How is SDT is relevant to CR/PR?	Chapters 3 and 5	• MRC (2008) suggests that the intervention should have a coherent theoretical basis to understand how the intervention causes change. This allows weak links in the causal chain to be identified and strengthened. • MRC (2008) also suggests that the evidence should be identified, and theory should be identified and developed during the intervention development phase.
How has SDT previously been operationalised?	Chapter 3	• Intervention mapping suggests it is important to identify theory- and evidence-based behaviour change methods that influence the determinants.
Develop intervention materials	Chapter 7	• Intervention mapping suggests it is important to combine the intervention components into a coherent programme that uses delivery channels that fit the context. • MRC (2008) suggests that processes and outcomes should be modelled during the intervention development phase.
Is the intervention theory-based?	Chapters 3,5,7	• MRC (2008) suggests that theory should be used systematically to develop the intervention.
Assess perceived acceptability	Chapter 7	• Intervention mapping suggests that process evaluations should assess programme implementation and efficacy.

		• MRC (2008) suggests that the intervention needs to be able to be implemented and replicated by others. Also suggests that a process evaluation is needed to identify implementation problems.
Refine intervention	Recommendations from chapters 7 and 8	• MRC (2008) suggests that the process of intervention development is a bi-directional process, allowing interventions to be improved on the basis of new information.

7.2.1 Stage 1: Understanding the behaviour in context

As highlighted in chapter 3, when developing behaviour change interventions there appears to be scant consideration of either patients' needs within the setting in which an intervention will be developed. Similarly, previous trials fail to extensively elucidate salient determinants of a health context that can be impacted by an intervention. This means that interventions may be a poor fit, demonstrate limited efficacy, and wash out of a context once the research process has been completed (Moore et al., 2019). In an aim to remediate this finding, stage one aimed to understand a patient's journey through CR/PR, and to understand the behaviours that occurred within each phase. Conceptualising a patient's journey through CR/PR in this manner facilitated mapping between the intervention targets highlighted in chapters 4 and 6 and the seven stages of the CR/PR pathway. This pathway is evidenced by figure 9:

Stage 1: Inpatient Care	**Stage 2: Discharge**	**Stage 3: Phone call**	**Stage 4: 1st Appointment**	**Stage 5: 1st Half of CR/PR**	**Stage 6: 2nd Half of CR/PR**	**Stage 7: Discharge**
• Within this phase, the patient suffers a cardiac event, is admitted to hospital for elective surgery (e.g. PCI or CABG to address atherosclerosis) or acute COPD exacerbation and is hospitalised. This does not happen in all instances, as some COPD patients are referred to PR by a general practitioner.	• As the patient is approaching the end of their inpatient care, they are informed about CR/PR and are instructed that the programme will be in contact.	• If contact has not taken place whilst the patient is an inpatient, Knowsley's CR/PR service's first contact with a patient. The phone call is the patient's formal invite to CR/PR, and during it they are informed about the service, and are given the option of choosing which of the four venues they will attend, or whether they will receive CR/PR in their homes.	• In the first session of CR/PR, the patient's medical history is discussed with them typically by a nurse, with an exercise capacity test typically conducted by an exercise physiologist or exercise instructor.	• During these sessions, the patient's blood pressure, heart rate and oxygen saturation is recorded. They then take part in a programme of physical activity in either a gym or a circuit, and then take part in an education session that covers topics such as health behaviours, diet, physical activity, physiology of the heart and lungs, or inhaler technique.	• These sessions follow the same structure as the first half of CR/PR.	• The patient's physiological capacity is recorded via the same exercise capacity test conducted in session one. Their progress is assessed and any questions or concerns they may have are discussed. They are then discharged from CR/PR, and may continue onto Activity for Life, or are expected to sustain PA of their own volition.

Figure 9 Stages of CR/PR

Using figure 9 as a starting point, figure 10 demonstrates where each intervention target identified within chapters 4 and 6 is perceived to be salient within the 7 stages. If they are perceived to be salient, they are highlighted in green within figure 10. This mapping allows central intervention targets (that are applicable across most stages) to be distinguished from more peripheral targets (applicable to some stages), and targets that are beyond the intervention's remit (not directly applicable to any stages but may be of interest to the NHS trust or service commissioners).

Although there is scant evidence supporting the identification of intervention targets in this way, a similar method is evident within Greaves et al. (2016) as part of the development phase of the REACH-HF intervention for patients with heart failure. Their paper differentiated core priorities that should receive strong, focused support from the intervention facilitator and intervention materials, from more peripheral or minor intervention targets that were not perceived to be integral to the success of the intervention but could be remediated on a case-by-case basis through signposting to sources of information or external agencies. A similar approach is therefore adopted within this thesis.

By describing the CR/PR context in this way, it is evident that the intervention can only exert an influence over stages 3-7, as this is the formal CR/PR programme. Therefore, any intervention targets that are applicable to stages 1 and 2 will be highlighted to the NHS trust as factors they may wish to consider as part of the continual improvement of services. However, these targets are beyond the scope of this thesis as they require higher level input, may require financial investment, or are outside the skill-set of this project's research team.

			Stage of CR/PR						
		Potential Intervention Target	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Chapter 4	**1**	Allowing patients to internalise health-related educational messages and increase health literacy.				Y	Y	Y	
	2	Develop patients’ confidence.		Y	Y	Y	Y	Y	Y
	3	Investigate patients’ perceptions of normality and plan how they can “get back to normal”.				Y		Y	Y
	4	Increase physical literacy so the patient understands how they can safely be physically active.					Y	Y	Y
	5	Investigate social roles and dynamics between patient and carer/spouse and how this may influence behaviour change and rehabilitation behaviours.				Y	Y		
	6	Increase patients’ attendance at the education component of CR/PR.				Y	Y	Y	
	7	Investigate alternative pedagogical techniques and modes of delivery that can be utilised within the education component of CR/PR.					Y	Y	
	8	Ensure that patients are aware that CR/PR is not solely synonymous with PA.	Y	Y	Y	Y			
	9	Satisfy patients’ social needs and provide reassurance.			Y	Y	Y		
	10	Ensure that a consistent message and definition of CR/PR is evident throughout the care pathway.	Y	Y	Y	Y			
	11	Understand the ideal extent of the merger between CR and PR and plan how this will occur.							
Chapter 6	**12**	Ensure that the topics covered in IPAiR are applicable to a range of different disciplines evident in the CR/PR team.			Y	Y	Y	Y	Y
	13	Equip healthcare professionals with the skills to encourage patients to uptake, adhere and change behaviour.			Y	Y	Y	Y	Y
	14	Resolve conflict: is the healthcare profefssional a salesman for a product, and how can we get patients to understand CR/PR?							
	15	Consider employing a psychologist or review referral pathway.							
	16	Provide healthcare professionals with the skills to treat low level psychological issues.			Y	Y	Y	Y	
	17	Provide a theoretical, practical and contextually-relevant understanding of behaviour change, and go beyond the rudimentary level of understanding.			Y	Y	Y	Y	Y
	18	Revisit the use of HADS: is it really the best measure?							
	19	How can we have difficult conversations? Tackling anxiety and depression.			Y	Y	Y		
	20	Provide a standardised model of psychology and behaviour change delivery.			Y	Y	Y	Y	Y
	21	Provide a bank of resources if professionals identify a psychology/behaviour change knowledge gap .	Y	Y	Y	Y	Y	Y	Y
	22	Use SMART and motivational interviewing as a starting point/common ground and build on this .		Y	Y	Y	Y	Y	Y
	23	Equip healthcare professionals with the confidence and competence to use behaviour change techniques so patients trust them.			Y		Y	Y	Y
	24	Challenge healthcare professionals’ practice.	Y	Y	Y	Y	Y	Y	Y
	25	Deliver behaviour change: how can we trigger someone to change?				Y	Y	Y	Y
	26	Make the aims of IPAiR clear: why should I care and what value will this add?	Y	Y	Y	Y	Y	Y	Y
	27	Consider the time pressures evident within practice.	Y	Y	Y	Y	Y	Y	Y
	28	How can we reach non-attenders?			Y	Y			

Figure 10 Potential intervention targets for the intervention mapped onto stages of CR/PR

Figure 10 demonstrates that targets 11 *(understand the extent of the merger between CR and PR and plan how this will occur),* 14 (*resolve conflict: is the healthcare professional a salesman for a product, and how can we get patients to understand CR/PR?),* 15 (*consider employing a psychologist or review referral pathway)*, and 18 (*revisit the use of HADS: is it really the best measure?)* are not directly applicable to specific phases of the 7-step pathway. For example, although some healthcare professionals highlighted disillusionment with using HADS as a measure of a patient's psychological health, this measure is dictated by BACPR and the NACR and therefore cannot be remediated on a local level if a CR service needs to demonstrate adherence to national guidelines. Each of these targets transcend the seven phase process of CR/PR, in that they are out of healthcare professionals' control and require managerial or more strategic input. As these targets are not able to be influenced by healthcare professionals working within CR/PR, the intervention will not aim to specifically remediate these issues. Instead, these targets will be addressed outside the work contained within this thesis as part of discussions and wider dissemination to the broader CVD/COPD system. This is in line with the conceptualisation of behaviour as part of a complex system (Hoddinott, 2015), of which this intervention primarily aims to impact the behaviour change component.

7.2.2 Stage 2: Understanding how SDT is relevant to CR/PR

According the MRC (2008), intervention mapping, and scholars such as Michie (e.g. Michie & Prestwich, 2010; Prestwich et al., 2014, 2015) and Kislov (e.g. Kislov et al., 2019), the use of theory to inform the development of interventions is considered best practice. Although MRC (2008) outlined theory identification and development as steps within intervention development, the systematic review within chapter 3 demonstrated that there are scant examples of how theory has been developed with the context in mind. To remediate this, figures 9 and 10 act as a starting point to map between SDT and Knowsley's CR/PR service, by providing a descriptive account of Knowsley's CR/PR service which can then be used to gauge where particular psychological needs are inherent within different intervention targets and phases of CR/PR.

As already extensively discussed, there are currently few research examples utilising SDT to generate a contextually-bound explanation of a target health behaviour with a view to intervene by developing an SDT-based theory. In a similar vein to the previous section, stage 2 of the intervention development process aims to define SDT's basic psychological needs in terms of the CR/PR context. For each basic psychological need, a working definition was created based on how and why each need was evident during the CR/PR process, and was utilised alongside existing and widely published definitions of autonomy, competence and relatedness. This approach was adopted to allow a more explicit mapping between SDT and Knowsley's CR/PR context, with a secondary aim of making theory more applicable to the CR/PR context and more comprehensible to healthcare professionals. In turn, this allows intervention targets to be identified and remediated in a manner that is clearly underpinned by theory and bespoke to the needs of the rehabilitation context. By combining all these steps together, an intervention logic model was developed that aimed to explicitly demonstrate how the intervention is anticipated to deliver its effect.

By taking such a transparent and rigorous approach to theory-driven intervention development, this step highlights a diversion from traditional approaches to SDT intervention development evident within trials in the systematic review where intervention targets are commonly rather vague, for example increase patients' PA levels, and there is limited, if any, mapping of SDT onto the intervention context. As is also evident in stage 1, stage 2 aims to further operationalise features of the intervention context with the aim of ensuring that the intervention closely aligns with and can operate within Knowsley's CR/PR context.

Figure 11 highlights how each basic psychological need has been defined in terms of the CR/PR context, with a conceptualisation of how the different components of each definition are important throughout CR/PR on the subsequent flowchart in figure 12. As previously discussed in chapter 4, figure 12 highlights how initially, relatedness is the most salient basic psychological need, with autonomy becoming increasingly important during the later PA sessions, and competence modulating the transition between a relatedness focus and an autonomy focus. The letters in figure 11 correspond to the letters in figure 12, demonstrating where each aspect of each basic psychological need is evident throughout the CR/PR pathway, and allowing a more nuanced and contextually-bound theoretical explanation of behaviour to be generated. Breaking each of SDT's basic psychological needs down in this way also aims to facilitate greater knowledge translation. This is important as chapter 6 suggested that healthcare professionals perceived previous courses they had undertaken to fail to adequately translate into their standard practice. Additionally, chapter 6 demonstrated that healthcare professionals demonstrated a limited understanding of how psychosocial theories and models of behaviour change are applicable to their practice. Therefore, operationalising SDT's basic psychological needs in a manner that includes the standard research definition, alongside a definition that is contextually-bound, aims to address these concerns around the limited knowledge translation of previous professional development courses.

The mapping between phases of CR/PR and the basic psychological needs evident in figure 12 challenges the research assumption that all three basic psychological needs are equally salient. Instead, a staged approach to psychological need satisfaction is proposed, positing that relatedness should be satisfied first, before moving onto autonomy need satisfaction, with competence need satisfaction acting as a vehicle to progress from a relatedness focus onto autonomy focus (see figure 13). This approach aims to remediate the finding within chapter 5 that patients whose adherence was primarily driven by relatedness were perceived to have less developed intentions and plans for how they would sustain their behaviour change into the post-discharge phase of CR/PR. Conversely, patients who demonstrated adherence that was driven by competence and autonomy could articulate more specific plans for post-discharge behaviour change, such as how they would translate what they had learned and achieved in CR/PR into the post-discharge phase. There is currently no other empirical evidence that suggests that basic need satisfaction could be staged in this manner or SDT-based research in CR/PR, but the BACPR Cardiac Exercise Instructor's training course suggests that competence should have been achieved towards by the end of the CR/PR programme (BACPR, 2018), indicated by:

1. Patients being able to self-monitor and control their exercise intensity.
2. Clear understanding of the minimum and maximum levels of exertion
3. Know what to do if during exercise they have different a type of physical sensation or symptom compared with when doing the supervised Phase III programme.
4. Be able to do all the exercises with correct form.

To supplement these suggestions, a more extensive discussion of how SDT was operationalised is evident in section 7.3.

Autonomy

- *"Individual feeling as if they have personal agency and volition".*

- Knowsley Definition:
- A: Patient is becoming able to intiate their own behaviour change and PA.
- B: Patient to develop a plan to continue to be active.
- C: Patient feels self-sufficient and able to be active without extensive input from healthcare professionals.

Competence

- *"Individual feeling effective when they are participating in an optimally challenging task".*

- Knowsley Definition:
- D: Patient is seeing and seeking progression in terms of their health behaviours and competence.
- E: Patient is experiencing affective benefits of behaviour change.
- F: Patient is developing a deeper understanding of their condition.
- G: Patient feels competent enough to initiate personally important health-related behaviours change in the long-term, without extensive healthcare professional input.

Relatedness

- *"Individual feeling as if they have a meaningful conection or sense of belonging with important others".*

- Knowsley Definition:
- H: Healthcare professionals providing reassurance and comfort.
- I: Healthcare professionals providing reassurance that the patient can continue their rehabilitation without consistent inpatient care.
- J: Healthcare professionals empathising with patients' concerns and having their best interests at heart.
- K: Family and healthcare professional's reassurance helps to alleviate potential psychological barrier preventing CR/PR uptake
- L: Patient feels part of a group, allowing them to share lived experiences and develop a sense of community.

Figure 11 **Operational defintions of SDT's three basic psychological needs, as applicable to Knowsley's CR/PR context.**
(References for Basic Psychological Needs definitions: Deci & Ryan, 2008; Gunnell, Crocker, Mack, Wilson, & Zumbo, 2014; Ryan & Deci, 2000)

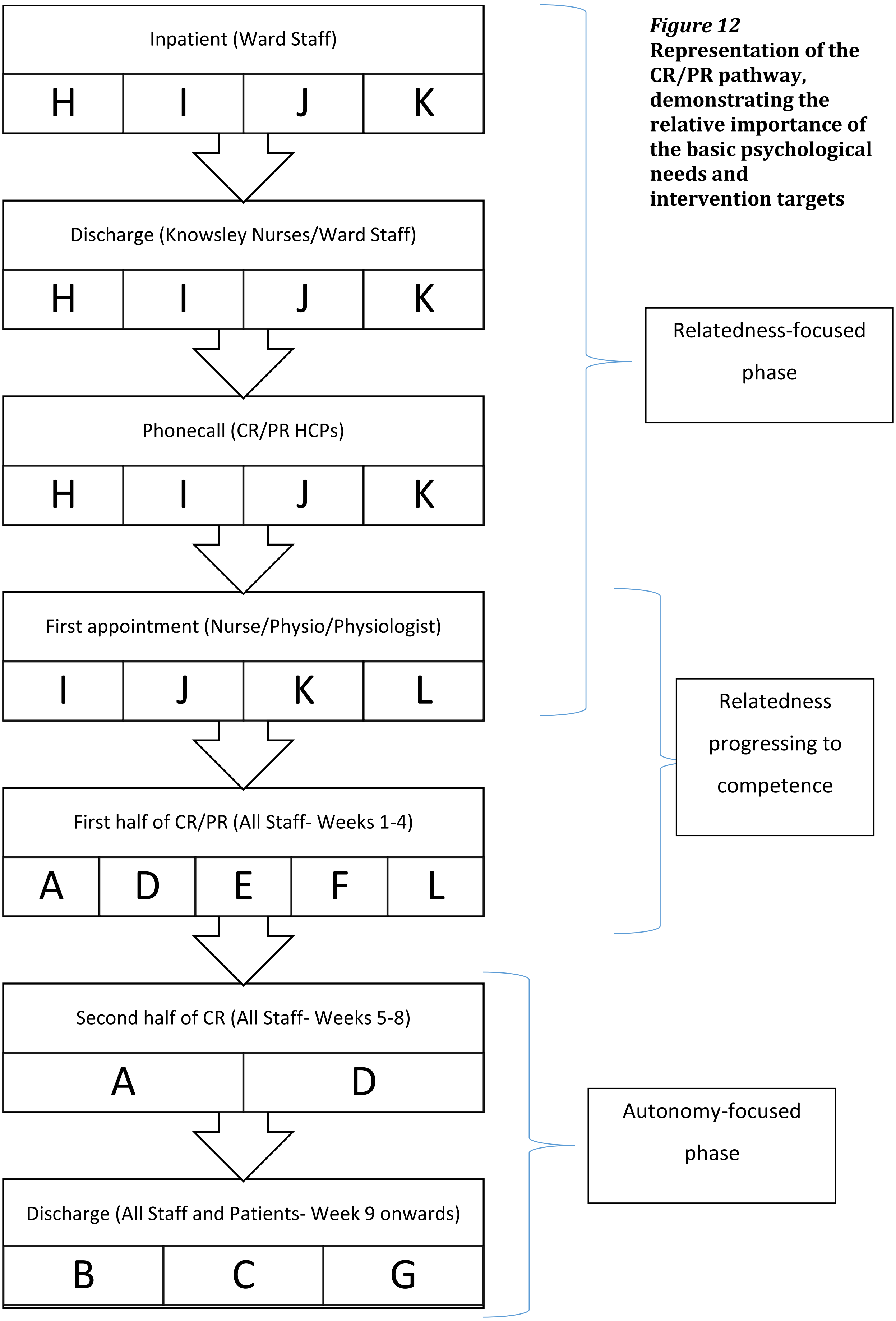


Figure 12
Representation of the CR/PR pathway, demonstrating the relative importance of the basic psychological needs and intervention targets

7.2.3 Stage 3: Operationalising SDT

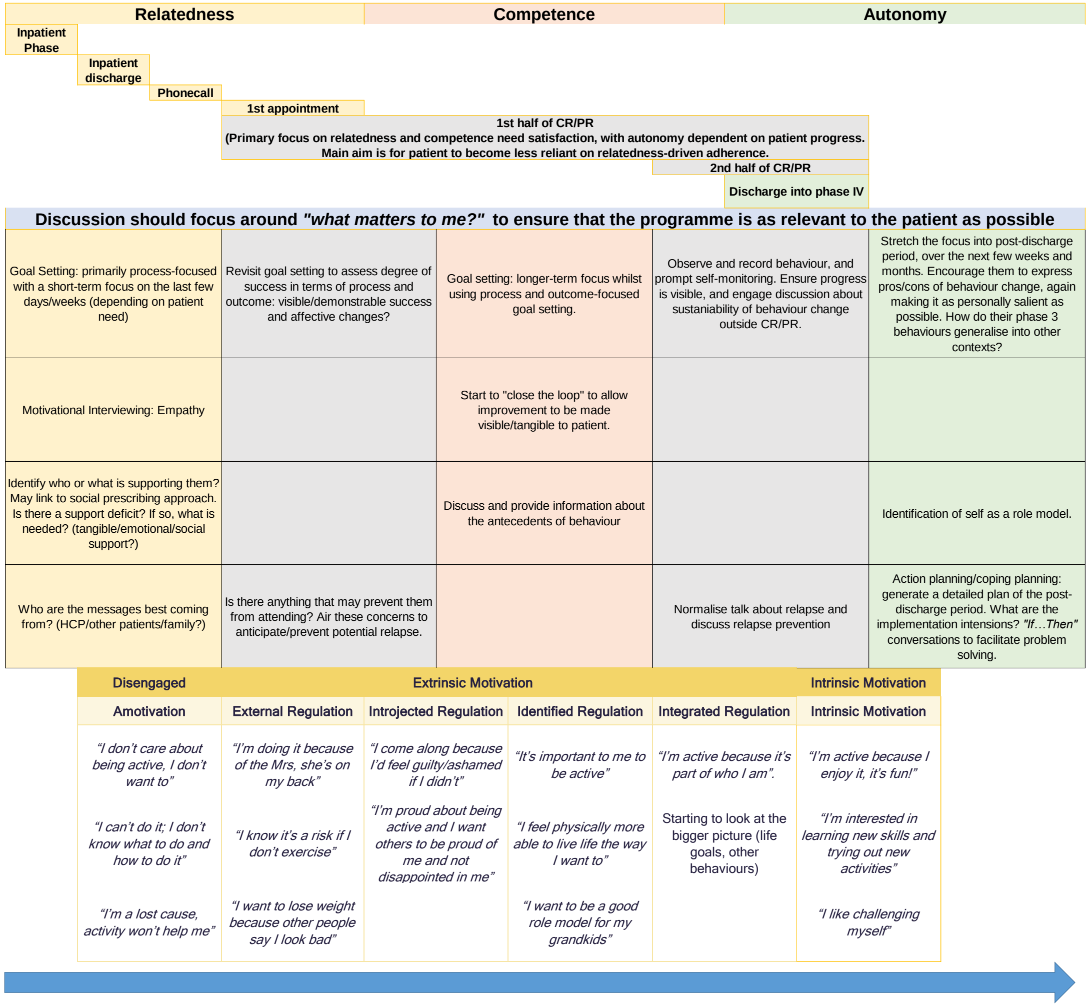
The overarching aim of this project is to design an intervention that is both relevant to Knowsley's CR/PR service and theoretically-based. Chapter 3 aims to provide the theoretical basis of the intervention by investigating how and why SDT had previously been used to develop PA interventions underpinned by SDT. Doing so would facilitate understanding of why specific BCTs and intervention components were selected when developing SDT-based interventions, and would assist with developing the intervention. However, chapter 3 failed to achieve this aim as the majority of previous interventions within the systematic review did not explicitly map between features of the intervention context and did not explain why specific intervention components were selected. Instead, the systematic review allowed existing interventions to be broken down into their component parts, to understand how the three basic psychological needs were operationalised.

The systematic review did not elucidate the logic that could explain why specific intervention components and BCTs were selected. Consequently, the intervention was primarily developed by qualitative insight (chapters 4, 5, 6), policy recommendations (chapter 2), and the mapping that took place between each basic psychological need and BCTs in previous interventions (chapter 3). Once an explanation of behaviour had been developed for each of the seven stages of the CR/PR pathway, qualitative insight allowed BCT operationalisation to be tailored to fit the CR/PR context that used figures 12 and 13 to map onto SDT. The mapping between the seven phases of the CR/PR pathway, differences in motivational regulation, basic psychological needs and BCTs/intervention components is summarised in figure 13. Grey areas highlight where there is overlap in terms of the targeted basic psychological need in each phase of CR/PR, positing that need satisfaction should be conceptualised as part of a continuum between relatedness and autonomy, with competence modulating the relationship between the two. This is supported by the claims that although there are clear conceptual differences between the three psychological needs, SDT also states that the needs are complementary, in that *"the three basic needs are interdependent because the satisfaction of one need supports the satisfaction of the other two needs"* (Ryan & Deci, 2017, p. 249). As such, this suggests that BCTs aligning with specific psychological needs are designed to be used interactively, as they may not provide need satisfaction alone, but will do so in collaboration (Teixeira et al., 2020). In conjunction, these claims support the phased approach to basic psychological need satisfaction throughout the whole CR/PR programme, rather than striving to simultaneously achieve the satisfaction of all three psychological needs.

Due to this conceptual overlap between SDT's basic psychological needs, the grey areas within the intervention's logic model demonstrate how healthcare professionals can tailor the intervention's delivery based on the phase of CR/PR, and which basic psychological need or type of behavioural regulation the healthcare professional feels they need to target at any given time. In this sense, competence need satisfaction works to remediate the claims evident within the qualitative insight that *"Anybody who's a hypochondriac would love it here! (In CR/PR), because you're pampered to your every whim"* (Patient 3, line 445-447) as patients received a high level of attention and were constantly reminded how to perform the requisite behaviours. This was a source of frustration for healthcare professionals, and indicates an over-reliance on relatedness need satisfaction within CR/PR, relative to the other two needs. This role of relatedness serves to help the patient feel secure within CR/PR, with limited attention paid to competence and autonomy need satisfaction, which have been previously demonstrate to promote longer-term behaviour change (Silva et al., 2008; Vansteenkiste et al., 2012). Theoretically, a context that is not autonomy-supportive or able to satisfy all three basic psychological needs is unlikely to facilitate or support long-term behaviour change. Consequently, the intervention aims to facilitate the transition between adherence that is driven primarily by relatedness, using competence need satisfaction, to wean the patient off relatedness with a view to them engaging in behaviour change of their own volition through the development of more autonomous forms of motivation to engage in their chosen behaviour.

Given the focus on intervention development within this thesis, this approach to using SDT to drive behaviour change and adherence has not been evaluated, with little research to date that has investigated the differential role of the three basic psychological needs in driving behaviour change. This may be through a reliance on the “empirical” literature base to justify and help develop SDT-based interventions (as documented in chapter 3), relative to the scant evidence base that utilises SDT to explain target behaviours or explains how basic psychological needs have been operationalised within a specific intervention. The anticipated mechanism of action for the intervention is evident discussed in section 7.2.3 is conceptualised by the intervention’s logic model in figure 13, and the way in which it was operationalised to form the intervention content is discussed extensively in section 7.3.

Figure 13 Intervention logic model, highlighting operationalisation of SDT's BPNT and OIT with specific behaviour change techniques



Relatedness	Competence	Autonomy

Inpatient Phase
Inpatient discharge
Phonecall
1st appointment
1st half of CR/PR
(Primary focus on relatedness and competence need satisfaction, with autonomy dependent on patient progress.
Main aim is for patient to become less reliant on relatedness-driven adherence.
2nd half of CR/PR
Discharge into phase IV

Discussion should focus around *"what matters to me?"* to ensure that the programme is as relevant to the patient as possible

Goal Setting: primarily process-focused with a short-term focus on the last few days/weeks (depending on patient need)	Revisit goal setting to assess degree of success in terms of process and outcome: visible/demonstrable success and affective changes?	Goal setting: longer-term focus whilst using process and outcome-focused goal setting.	Observe and record behaviour, and prompt self-monitoring. Ensure progress is visible, and engage discussion about sustaniability of behaviour change outside CR/PR.	Stretch the focus into post-discharge period, over the next few weeks and months. Encourage them to express pros/cons of behaviour change, again making it as personally salient as possible. How do their phase 3 behaviours generalise into other contexts?
Motivational Interviewing: Empathy		Start to "close the loop" to allow improvement to be made visible/tangible to patient.		
Identify who or what is supporting them? May link to social prescribing approach. Is there a support deficit? If so, what is needed? (tangible/emotional/social support?)		Discuss and provide information about the antecedents of behaviour		Identification of self as a role model.
Who are the messages best coming from? (HCP/other patients/family?)	Is there anything that may prevent them from attending? Air these concerns to anticipate/prevent potential relapse.		Normalise talk about relapse and discuss relapse prevention	Action planning/coping planning: generate a detailed plan of the post-discharge period. What are the implementation intensions? *"If…Then"* conversations to facilitate problem solving.

Disengaged	Extrinsic Motivation				Intrinsic Motivation
Amotivation	**External Regulation**	**Introjected Regulation**	**Identified Regulation**	**Integrated Regulation**	**Intrinsic Motivation**
"I don't care about being active, I don't want to" *"I can't do it; I don't know what to do and how to do it"* *"I'm a lost cause, activity won't help me"*	*"I'm doing it because of the Mrs, she's on my back"* *"I know it's a risk if I don't exercise"* *"I want to lose weight because other people say I look bad"*	*"I come along because I'd feel guilty/ashamed if I didn't"* *"I'm proud about being active and I want others to be proud of me and not disappointed in me"*	*"It's important to me to be active"* *"I feel physically more able to live life the way I want to"* *"I want to be a good role model for my grandkids"*	*"I'm active because it's part of who I am".* Starting to look at the bigger picture (life goals, other behaviours)	*"I'm active because I enjoy it, it's fun!"* *"I'm interested in learning new skills and trying out new activities"* *"I like challenging myself"*

7.3 Stage 4: Developing intervention materials

Section 7.2 outlines how findings within previous chapters were synthesised to generate a theoretical understanding of behaviour change within CR/PR, highlights specific intervention targets, and develops a logic model of the intervention's hypothesised mechanism of action that explicitly maps between the intervention and Knowsley's CR/PR service. Section 7.3 will build on the previous section to explain how the intervention content and materials were created in the form of a handbook and slide deck, as well as providing a commentary to justify how and why each feature of the intervention was designed as it was and how it relates to the evidence base. As discussed previously, this step aims to remediate the finding of previous chapters that the majority of previous research fails to transparently map between the theoretical basis of psychosocial interventions with the specific intervention components that were delivered, meaning the extent to which an intervention is theoretically-based (Kislov, 2019) is often poorly understood.

7.3.1 Intervention Focus and Aims

Chapters 4-6 demonstrated that a range of health-related behaviours, including PA, were important for patients to change during CR/PR patients. The most extensive discussion of this is evident within chapter 4 that CR/PR is not purely *"the exercise programme"* (e.g. Healthcare Professional 3, lines 108, 193) but instead is viewed as a holistic programme of rehabilitation, of which PA is an important component, but not the only component. Additionally, the intervention's focus on behaviour change stems from the finding within chapter 6 that behaviour change constitutes a major knowledge gap for healthcare professionals working within CR/PR, yet paradoxically is perceived to be a key component of an effective CR/PR service, as well as being a key component of BACPR's standards for CR within the UK (Cowie et al., 2019). Given the integrity of PA within CR/PR, the intervention aims to improve healthcare professionals' understanding of and competence in delivering the psychosocial/behaviour change element of CR/PR, by focusing on PA as an example of a health-related behaviour that is salient within CR/PR. Not only does this aim to increase healthcare professionals' understanding of the psychological aspects of CR/PR and how to deliver behaviour change within their practice, but it will align with BACPR, BTS and NICE guidance to ensure that the intervention aligns with both the PA research (evident in chapters 2 and 3) and practice evidence bases. Ensuring that the intervention is based on the best available evidence was also perceived to be important to healthcare professionals within chapter 6.

As such, this iteration of the intervention aims to change patients' PA behaviours as it is largely based on the PA evidence base, but is cognisant of the fact that future iterations of the intervention need to target other health-related behaviours to help optimise other components of CR/PR. Additionally, developing an intervention that is able to influence multiple health behaviours is ordinarily beyond the scope of a PhD programme as it is associated with large research teams and extensive resource. Therefore, PA was selected as the primary target behaviour of the intervention, whilst simultaneously increasing healthcare professionals' understanding of the wider behaviour change discipline. This approach may enable them to deliver interventions that could affect other health-related behaviours, yet it is acknowledged that the intervention needs to be refined before it could be classed as a multi-behaviour intervention.

The intervention's focus on enhancing healthcare professionals' understanding of behaviour change reflects the patient-centred nature of CR/PR, and aligns with the NHS initiative *"Making Every Contact Count" (MECC).* MECC *is "an* *approach to behaviour change that uses the millions of day to day interactions that organisations and people have with other people to support them in making positive changes to their physical and mental health and wellbeing"* (Public Health England & Health Education England (HEE), 2016, p. 6). MECC principles are incorporated within the intervention in two ways. Firstly, behaviour change is driven by the patient, meaning that it attempts to encourage the patient to self-direct their own care so they can enact personally-salient PA behaviour change. Secondly, MECC suggests that healthcare professionals should utilise every contact they have with patients as an opportunity to improve health. MECC training typically includes training in having brief, meaningful conversations about health behaviour change and signposting to relevant public health services (Byrne-Davis et al., 2018). Although some healthcare and public health professionals initially report that having conversations about health was initially challenging (Tinati et al., 2012), training has been shown to improve the knowledge, confidence and practice of the public sector workforce in having brief conversations about health (Chisholm et al., 2020; Swanson et al., 2011). However, research has demonstrated that there is limited awareness of MECC, and even when healthcare professionals are aware of it, they fail to opportunistically utilise MECC techniques in half of their clinical encounters with patients (Keyworth et al., 2018).

To build on these findings, the intervention embraces MECC principles by aiming to embed behaviour change throughout the CR/PR pathway, with the aim of clarifying to healthcare professionals how behaviour change can be readily incorporated into their standard practice at all stages of CR/PR. By aligning with the MECC model of delivering personally-salient behaviour change interventions, the intervention aims to deliver a professional development programme, underpinned by SDT, that will equip healthcare professionals with the skills to deliver PA behaviour change interventions within CR/PR in a manner that is driven by a patient's current conditions, needs, and existing PA behaviours. The integrity of behaviour change within CR, and thus the potential for the intervention to be able to impact other behaviours is demonstrated by figure 14 below:

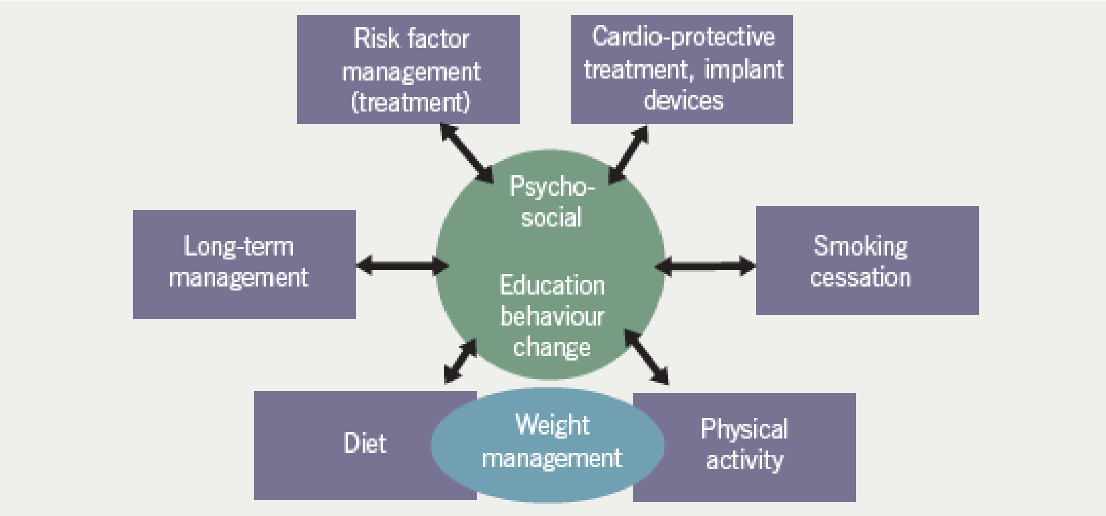


Figure 14 BACPR key components of cardiac rehabilitaiton, demonstrating how behaviour change impinges on a range of health behaviours (Source: Buckley, 2011)

As well as aligning with BACPR (2017), the decision to develop an intervention that aims to enhance the behaviour change component of CR/PR reflects the complex system perspective in public health, where an interventions' effect on behaviour is conceptualised as an event within a broader system (Hawe et al., 2009). Since the MRC guidelines were published in 2008, there has been a shift towards a complex system approach to social intervention research, demarcated by a growing appreciation that interventions should be considered as part of a broader series of events, all of which impinge on a target behaviour. Although an agreed definition of what constitutes a complex system is yet to be decided, Moore suggests that:

> *"Hospitals represent examples of bounded ecological systems, via which many social interventions to improve population health are delivered. However, in turn, these bounded social systems are a part of broader networks of agents, whose interactions influence health. For example, the youth tobacco system includes industry, retailers, scientists, public health professionals, governments, media, communities, schools, families and children; the dynamic interplay among these groups of actors serves to maintain or disrupt the status quo in smoking prevalence over time"* (Moore et al. 2019, p.26).

Although this example is not taken from CR/PR, it demonstrates how an intervention's behaviour change focus, using PA as an example of a target behaviour, aims to improve the quality of the behaviour change component of CR/PR, which is at the heart of the wider CR/PR system, as demonstrated by figure 14. Through a systems approach, advocated by Hawe et al. (2009) amongst others, this is hypothesised to positively affect the quality of other programme components within figure 14. As such, the intervention is conceptualised as part of the wider complex system of components within CR/PR, where the aim is to deliver long-term PA behaviour change that is driven by patient's goals. This demonstrates how the intervention fits the needs and requirements of the CR/PR context.

7.3.2 Key aims of the intervention

To deliver the intervention, a handbook and accompanying PowerPoint slide deck was developed. The finalised product can be found in the thesis' accompanying documentation. Within sessions, it was made clear that this version of the handbook and PowerPoint constituted a preliminary version of the intervention, and the aim of these sessions was to assess levels of acceptability of both the intervention content and mode of delivery. Therefore, this approach aligns with the feasibility aspect of MRC (2008) guidance, as well as other best practice recommendations.

The handbook aims to contextualise the intervention content in terms of CR/PR. On pages 3 and 4, the *"you told us…"* section aims to demonstrate clear mapping between the qualitative needs analysis evident in chapters 4-6 and the intervention content. This acts as a starting point to begin to remediate the finding that there is limited mapping between psychological and psychosocial models of behaviour change and the intervention context that they aim to operate within (see chapter 3). In turn, this approach of transparently demonstrating how SDT is applicable to CR/PR aims to increase healthcare professionals' level of understanding of how the intervention can be readily utilised within their standard practice, as it provides a range of techniques that can be utilised throughout the different stages of CR/PR.

The introductory pages of the handbook start broadly, with a section on *"how and why psychology is relevant".* The inclusion of this section is based on the finding that healthcare professionals perceived the psychological elements of CR/PR to be important to a patient's success within the programme, but were unsure what specifically constituted psychology, what their roles were in addressing psychological issues, and were unsure in how they would incorporate psychological principles within their standard practice. To address this, the handbook draws upon BACPR's Standards and Core Components (2017) which identifies the role of goal setting within CR, the interrelatedness of behaviour change to all components of CR, and the importance of patient-centred care.

To demonstrate how the intervention considered existing CR/PR policy, it was important to consider an evidence base that is broader than the SDT domain.

Accordingly, some content was taken from BACPR's Level 4 Cardiac Exercise Instructor Training Module (2018), which was used as there is not a formalised training module for phase three (the 8-12-week programme). These were the 5 components of Leventhal's Common Sense Model of Self-Regulation (identity, cause, consequences cure/control, timeline), which has been demonstrated to account for a large proportion of initial presentation to health services (Farquharson et al., 2011). Although Leventhal's model is not explicitly related to SDT, the inclusion of this material is in-keeping with the systems approach discussed in previous sections, as well as beginning to remediate the claim within chapter 6 that healthcare professionals had a limited understanding of psychology. Additionally, information of this sort serves to introduce healthcare professionals to the broader psychological aspects of CR/PR so they can consider its relevance within their current practice. Therefore, the components of Leventhal's model served as discussion points within session 1 to allow healthcare professionals to identify patients who one or more of these components may be applicable to, begin to remediate the limited understanding of how and why psychology was related to their practice, and understand how these principles could be utilised.

In a similar vein, information relating to *"having difficult conversations"* was included in the intervention. This acted as more of a signpost to resources that healthcare professionals could utilise if they wished to, rather than forming a central component of the intervention. Although it is recognised that this is not a key component of SDT, it was included as part of the wider psychological 'system', as well as in support of the suggestion that it is important to recognise aspects of practice that are not specifically theoretical but are still relevant to healthcare professionals' practice and can remediate identified knowledge gaps. A number of the principles within this section overlap with principles of motivational interviewing, therefore remediating healthcare professionals' claim that although a number of them had attended motivational interviewing courses, they did not comprehensively understand how the principles could be applied within CR/PR. Therefore, this section aims to begin to increase healthcare professionals' understanding of how, why and when motivational interviewing principles could be used within their practice more broadly, and not just to facilitate behaviour change.

Although topics such as Leventhal's model and having difficult conversations is beyond the scope of SDT, it is important to consider how the aim of the intervention is not purely to develop a SDT-based intervention to change behaviour, but additionally to increase healthcare professionals' understanding of psychological principles within CR/PR. It is hoped that the inclusion of both of these components will enhance healthcare professionals' understanding of psychology beyond a pure SDT-focus, in turn benefiting the broader psychological component of CR/PR.

7.3.3 Behaviour Change Section

As BACPR (2017) suggests that behaviour change is a central component of an effective CR service, the majority of the intervention is focused around this topic. However, chapter 6 suggested that healthcare professionals did not feel competent in delivering behaviour change as part of their standard practice. Therefore, the intervention covered both how the intervention could be delivered in terms of intervention techniques, as well as the theoretical basis of the intervention to allow healthcare professionals to understand why the intervention comprised these components. Within the early stages of intervention delivery, definitions of behaviour change interventions and techniques are provided, before contextualising behaviour change within the cardiovascular disease domain using NICE (2014) guidance that highlighted the three types of BCTs that were most effective in modifying cardiovascular risk factors (Heron et al., 2016; NICE, 2014). On the basis of their demonstrable impact in remediating cardiovascular risk factors, each of these BCTs (goals and planning, feedback and monitoring, and social support), are included within the intervention.

Given the importance of ensuring that health interventions are theory-based, SDT was introduced within the behaviour change section of the intervention. To begin to contextualise SDT within CR/PR, MI was used to act as a middle ground between behaviour change and standard clinical practice (Vansteenkiste et al., 2012). Given that a number of healthcare professionals had previous training in motivational interviewing, a refresher on its principles was provided within session 1. The rationale for this was to establish a middle ground between their current practice and a component of CR/PR that healthcare professionals perceived themselves to poorly understand (psychology and behaviour change). A number of trials within chapter 3 utilised MI techniques within SDT-based interventions (Fortier et al., 2012; Lonsdale et al., 2012a). However, none of them made the case for this to be partially because MI training is often accessible to a range of different healthcare professionals through a range of professional development courses (see chapter 6). Additionally, portraying MI as a middle ground between standard practice and the lesser-understood behaviour change aims to allow healthcare professionals to feel more competent from an early stage of the intervention. This is achieved by demonstrating to them how they are already experienced in an aspect of behaviour change, which in turn challenges their suggestion that they have a limited understanding of how they can incorporate behaviour change into their standard practice.

As healthcare professionals understood motivational interviewing and utilised it to varying degrees within their practice, the intervention was conceptualised as an opportunity to build on their existing skills. As such, the intervention utilised healthcare professionals' existing skills in motivational interviewing principles as a starting point that could be built on to deliver more effective behaviour change interventions. By doing so, the intervention aimed to elucidate precisely how their existing MI skills could be better utilised in standard practice, as well as 'boosted' through the application of SDT. Additionally, chapter 6 demonstrated how motivational interviewing was perceived to be to be too onerous in terms of time demand, and several healthcare professionals failed to understand how it could be readily incorporated into their standard practice. Therefore, the intervention focused on how aspects of MI could be integrated into different aspects of CR/PR, to remediate the time constraints that healthcare professionals felt would prevent them from using MI extensively in their practice.

Chapter 6 demonstrated that healthcare professionals believed motivational interviewing to be synonymous with behaviour change, and some could explain behaviour change through the stages of change aspect of Prochaska's (1985) Transtheoretical model. However, they could not explain how motivational interviewing and the stages of change model could be used to affect their practice. Given the critique of the TTM (Armitage, 2009), the introductory behaviour change section of the intervention was used to challenge these assumptions and to propose SDT as a more suitable model of delineating the psychological and behaviour change component of CR/PR.

7.3.4 Goal Setting Section

As highlighted within the policy analysis in chapter 2, goal setting was portrayed as a central component of delivering PA behaviour change within CR/PR in almost all of the policies and guidelines that are relevant to CR/PR. For example, BACPR guidelines (2017) dictate that healthcare professionals are required to set goals with patients at the first appointment that *"should be reviewed regularly".* In Knowsley, patients' goals and the progress they are making are discussed at a weekly multidisciplinary team meeting, with the aim of identifying where any problems may arise or where external input may be needed. Within chapter 6, healthcare professionals demonstrated some understanding of principles of goal setting by discussing the SMART acronym and how they already employed goal setting to varying degrees with patients. However, chapter 6 revealed that behaviour change, including goal setting was employed inconsistently across CR/PR, suggesting that healthcare professionals may not see the value in setting goals and frequently reviewing them. Additionally, goals were often vague, for example *improve diet*, or *increase physical activity*, with scant attention paid to how a patient may achieve their goal. This suggests that despite their knowledge of the SMART approach to goal setting, the degree to which these principles are implemented is minimal. Additionally, it demonstrates little use of concurrent outcome and process goals.

As goal setting is already employed to varying degrees in CR/PR, and is advocated by organisations such as BACPR and NICE, the intervention aimed to improve the goal setting element of CR/PR by providing healthcare professionals with a more extensive framework for working alongside patients to set goals in a manner that aligns with principles of SDT. For example, the finding that healthcare professionals tended to pay limited attention to process goal setting to scaffold a plan of how a patient may achieve their outcome goal, the intervention focused on how process and outcome-focused goals could be used in collaboration. When applied to SDT, relatedness need satisfaction was posited to lend itself to setting shorter-term goals with the aim of ensuring that patients' concerns about the immediate future to increase their feelings of social support. Conversely, as a patient approaches discharge from CR/PR and competence and autonomy need satisfaction is hypothesised to become more important, process-focused goals are used to prepare the patient for discharge when the support afforded to them by healthcare professionals will not be as readily available to them. As such, longer term outcome goals became more salient during the competence and autonomy-focused part of CR/PR, where patients are making preparations and plans for how they will maintain or engage in behaviour change in the longer-term following their discharge.

7.3.5 SDT Basic Psychological Needs Section

SDT was proposed as a basis from which healthcare professionals could enact behaviour change interventions in collaboration with their existing MI skills. As well as being able to explain behaviour change within CR/PR (as demonstrated by chapter 4), SDT was selected on the basis of its well-documented philosophical overlap with motivational interviewing (Pietrabissa et al., 2015; Resnicow et al., 2012; Vansteenkiste et al., 2012), therefore providing a 'middle ground' between healthcare professionals' current practice, and the more poorly understood concept of behaviour change. In addition to the practical application of the theory, SDT's use was rationalised through its previously identified effectiveness in informing interventions that were successful in changing health behaviours (Teixeira, Carraça, et al., 2012). However, this thesis differentiates itself from previous research projects as it is the most extensive attempt to contextualise SDT and demonstrate how it can be incorporated into standard clinical practice within CR/PR. This could be seen to contradict previous work, where the intervention content is typically not reflective of standard practice, but instead is a more highly controlled version of reality. To achieve this, and begin to remediate some of the issues levelled at SDT-based research, in particularly how they typically fail to elucidate how SDT is relevant to the intervention context, figures 12 and 13 were used within the intervention materials to contextualise SDT's basic psychological needs and types of motivational regulation (OIT) within CR/PR. This also attempts to facilitate greater knowledge translation, by making SDT more accessible to healthcare professionals.

The conceptualisation of SDT's basic psychological needs in terms of CR/PR aimed to increase healthcare professionals' level of understanding of how SDT was applicable to CR/PR, and aimed to remediate the finding that psychosocial theories are not readily accessible to non-psychologists, which may contribute to healthcare professionals' perceived limited understanding of psychosocial theory and behaviour change. To remediate this, these definitions aimed to facilitate the translation of existing theory into practice, and acted as a discussion point to identify how the basic psychological needs and forms of motivational regulation could be evident within different patients in CR/PR, as well as facilitating a more nuanced mapping between SDT/BPNT and the CR/PR context. During session one, the definitions were assessed for accuracy and to evaluate whether any changes or additions needed to be made. No changes were proposed by healthcare professionals, and their level of understanding was high.

Figure 13 demonstrates a staged approach to basic need satisfaction, in that despite the overlap in need satisfaction, as supported by Deci & Ryan (2017), and Texieira et al. (2020), relatedness satisfaction is prioritised before competence and autonomy need satisfaction. This staged approach to need satisfaction is flexible to allow the intervention to work synergistically with healthcare professionals' clinical experience and judgement to facilitate the development of behaviour change interventions that are tailored to patients' needs. For example, although figure 13 highlights how the psychological needs are proposed to map onto each of the seven stages of a patient's pathway through CR/PR, clinical judgement can be used to assess which basic need is currently most salient to a patient's adherence. By using this judgement as a starting point, a healthcare professional can then select specific BCTs on the basis of which need satisfaction is most salient at any given time.

For example, if during the phone call or at their first CR/PR session a patient demonstrated a limited understanding of their condition, limited experience of being active and a poor understanding of how they might change their health behaviours, and a limited social support network, a relatedness-focused approach might be more applicable. Such a focus would aim to increase the patient's level of comfort within the CR/PR context, would take a short-term focus to ensure that they are coping with their condition or acute event, and would allow the healthcare professional to provide reassurance and comfort and empathise with any concerns the patient may have in relation to their condition or their participation in CR/PR. Conversely, if a patient present at their first appointment or within the early stages of CR/PR with a relatively more detailed understanding of their condition, feels comfortable in suggesting potential behavioural changes they could make, is experiencing success in changing their existing behaviours, and is satisfied with the levels of social support they have access to, the healthcare professional could select BCTs that facilitate competence or autonomy need satisfaction.

As such, the intervention's use of SDT in this manner allows healthcare professionals to tailor their chosen techniques to patients' perceived level of need, underpinned by a framework that is based around SDT's basic psychological needs. This feature of the intervention is important, given that Michie et al.'s (2010) Theory Coding Scheme suggest that theory should be used to select and develop intervention techniques, as well as how theory should be used to tailor the intervention's techniques. A more thorough evaluation of the intervention through the Theory Coding Scheme is available later in this chapter.

Through this flexible use of the basic psychological needs, the intervention aims to increase healthcare professionals' ability to generate a SDT-based behavioural diagnosis of the patient in terms of their salient psychological needs and form of motivational regulation underpinning their health behaviours at any given time point within CR/PR. Using this behavioural diagnosis as a starting point, the intervention utilised systematic review evidence to develop intervention components and behaviour change techniques that aligned with each of the basic psychological need. This step this allows the healthcare professional to generate a personalised intervention by selecting BCTs that specifically target the most salient need. This aims to progress the patient towards competence and autonomy need satisfaction, which manifests as a patient engaging in personally-salient behaviour change of their own volition through increasingly autonomous forms of motivation. This remediates the claims within chapter 5 that it was perceived to be problematic if a patient's adherence to CR/PR was driven by relatedness. It would not have been possible to develop this contextually-relevant application of SDT without the qualitative insight discussed in chapters 4-6, and therefore demonstrates the value of engaging in extensive development work that informs the development of an intervention. Over sections 7.3.6, 7.3.7, and 7.3.8, specific BCTs and guidance given to healthcare professionals to satisfy each psychological need is highlighted in bold and italics, aiming to clarify how and why each technique or component was included within the intervention.

7.3.6 Basic Psychological Needs: Operationalising Relatedness

Within the intervention, the guidance provided to healthcare professionals to allow them to deliver relatedness-focused care is as follows:

- **Keep a short-term focus**
    - Goal setting should be mainly process focused, and focused around what is important to them.
    - Scaffold a plan of how they will attain any long-term (outcome) goals.
    - How can you work together to overcome the challenges they're currently facing?
- ***"What matters to you?"***
    - To ensure the patient understands what is on offer to them and the holistic nature of rehabilitation.
    - Try to avoid judgement and listening out for what you think you 'should' hear.
    - Show their opinions matter.
- **Ask how their last few days/weeks have been**
    - Find out what concerns they have: do they understand what's happened and why they have been referred?
    - What sort of support they have, and do they need further information, support or guidance?
    - What are they thinking/feeling about the immediate future?
- **How can we ensure that from the start, their programme is as relevant to them as it possibly can be?**
    - Find out as much about their lives and what is important to them as possible
    - Demonstrate empathy.
- **Is there anything that they think could prevent them from coming to sessions?**
    - Openly discuss these and identify plans to overcome.
- **Who is the message best coming from?**
    - Is there anything they could learn from other patients?
    - Is there anyone in the group that may be able to help them or share similar experiences?

- **Identify who or what is supporting them**
    - What sort of support are they receiving (tangible/emotional/social)?
    - Would social prescribing be beneficial? Can you signpost them to any groups or sessions that might be beneficial?

As discussed previously, the degree to which a patient is demonstrating relatedness need satisfaction is hypothesised to be the first assessment a healthcare professional should make when initiating the intervention. The aim of relatedness-focused need satisfaction is to demonstrate patient-centred care and increase patients' feelings of social support and comfort within the CR/PR context. Relatedness-focused care aligns with NHS-endorsed *'Making Every Contact Count'* (Public Health England & Health Education England (HEE), 2016), and is centred around the discussion of *"what is important to you?".* When applied to CR/PR, discussions of this sort embraces the multi-component nature of CR/PR by challenging the assumption that CR/PR is a multicomponent intervention, rather than simply an opportunity for patients to be active.

From a behaviour change perspective, this allows a patient to identify personally-salient targets for behaviour change or barriers that are currently inhibiting their engagement in adaptive health-related behaviours. By taking this approach, the patient is encouraged to set the agenda for discussions to determine ***"what matters to you"***, and the healthcare professional's role is to learn as much as possible about the patient and to ensure that ***from the outset, CR/PR is made as personally salient to the patient as is possible***. The aim of goal setting of this nature is to ensure that CR/PR is closely tailored to the patient's needs and interests, therefore aligning with the definition of CR proposed by BACPR (2017) standard three *'Early initial assessment of individual patient needs which informs the agreed personalised goals that are reviewed regularly'* (p.5).

Within the intervention, a distinction can be made between the basic needs in terms of the temporal focus underpinning basic need satisfaction. For example, relatedness-focused care is synonymous with a ***short-term focus*** that is centred on remediating and allowing the patient to overcome challenges that are currently emotionally salient to the patient's current state and immediate future. To achieve this, the relatedness-focused stage of the intervention is underpinned by a stronger focus on process goals relative to outcome goals. This aligns with qualitative insight that suggests that healthcare professionals need to initially focus on pertinent issues such as *"you've got a 42-year-old bloke who isn't even picking up his cup of tea because he's terrified",* prior to setting longer-term behaviour change goals such as increasing levels of PA or improving diet.

The focus on making CR/PR as personally salient to the patient as is possible and recognising who or what is providing support to them could be seen to align with the proliferation of social prescribing initiatives that aim to facilitate health-related behaviour change. A range of health organisations are *"advocating social prescriptions as an important way to expand the options available for GPs and other community-based practitioners to provide individualised care for people's physical and mental health through social interventions*" (Husk, 2019, p.1). If a patient's relatedness need satisfaction is perceived to be lacking, healthcare professionals may introduce them to other patients within CR/PR so that they can ***share experiences of living with similar conditions***, or signpost them to community groups within Knowsley that will increase their feelings of social connectedness, with the aim of allowing the patient to feel more confident to change behaviour.

The inclusion of social prescribing as a potential mechanism to provide relatedness need satisfaction is cognisant of the fact that relatedness need satisfaction is not purely contingent on healthcare professionals' ability to provide social support in a two-hour per week session. Instead, signposting to other opportunities that a patient can experience relatedness need satisfaction aims to achieve an additive effect on top of healthcare professionals' actions, in that social support attained through a patient's engagement with socially prescribed initiatives will work alongside levels of need satisfaction emanating from CR/PR. Within Knowsley, the potential impact of relatedness need satisfaction is particularly salient given that 48.6% of adult social care users and just 24.5% of adult carers suggest they have as much social contact as they would like (PHE, 2020). This degree of social isolation was particularly evident within the majority of interviews and my own field notes from CR/PR, where a number of patients reported that attending CR/PR was the only social contact they would receive all week. The impact of the social determinants of health is well documented, recognising the interconnectedness between social connectivity, mental health and engagement in adaptive health behaviours such as PA (Husk et al., 2020), and therefore addressing these factors is perceived to act as a starting point to enact behaviour change interventions that are underpinned by increasingly autonomous forms of motivation. Additionally, a focus on relatedness aims to partially remediate the public health concerns with social isolation that PHE (2020) indicate is a growing problem within Knowsley *(proportion of adult carers who have as much social contact as they would like: 2012/13= 43.5%, 2018/19=24.5%).*

Therefore, once healthcare professionals ***have identified who or what is supporting the patient,*** healthcare professionals could use the intervention to socially prescribe initiatives aiming to reduce a patient's feelings of social isolation. By considering the social determinants of health in this manner, such an approach aims to satisfy a patient's need for relatedness by increasing their social connectivity and provide greater access to a wider support network, which it is hypothesised can act as a starting point for developing competence and autonomy need satisfaction. Given the conceptual overlap between the three psychological needs (e.g. Ryan & Deci, 2017), social prescribing may be more suitable to discuss within the later stages of the relatedness-focused phase, when a patient has overcome short-term yet emotionally-charged challenges they are facing, and are demonstrating a degree of comfort and competence within the CR/PR context. Alternatively, if a patient's adherence to behaviour change is perceived to be contingent on relatedness need satisfaction, socially prescribed initiatives may provide longer-term relatedness satisfaction for patients who have not fully progressed onto competence or autonomy-driven adherence at the point of discharge. Therefore, this intervention component aligns with the intervention's conceptualisation of basic need satisfaction over a longer time period than purely within an 8-12-week CR/PR programme.

In summary, the relatedness-focused phase serves to identify relevant information, support and guidance that may be needed to allow the patient to better understand their condition and will allow them to make better-informed plans for behaviour change. Theoretically, this demonstrates the grey area between relatedness and competence where relatedness need satisfaction may enable a patient to better understand their condition, hence demonstrating their increased competence. Additionally, the key question of *"what matters to you?"* that is suggested to act as a vehicle of developing a personally-salient care package could be seen to also be working to satisfy patient's need for autonomy, as they are setting goals based on what they perceive to be important to them. Theoretically, this demonstrates that relatedness, competence and autonomy are not mutually exclusive needs, but instead overlap in terms of how and when they are perceived to be most salient to a patient's rehabilitation. However, relatedness can be differentiated from the other basic psychological needs as the predominant focus of this intervention component is to adopt a short-term temporal focus to allow the patient to feel understood by important others, connected to potential sources of support, and encouraging the healthcare professional to actively engage with the patient to find out what is important to them. Collectively, relatedness need satisfaction to ensure that CR/PR can be made as personally salient as possible to the patient, they feel supported to adhere to the programme, and any short-term problems that may act as a barrier to adherence or are initially extremely emotionally salient have been, or are in the process of being remediated.

7.3.7 Basic Psychological Needs: Operationalising Competence

The guidance provided to healthcare professionals to allow them to deliver competence-focused care is as follows:

- **Goal setting: Revisit every week if possible**
    - Continue to make sure goal setting is driven by the question *"what is important to you?"*
    - Are they meeting, not meeting, or exceeding the goals?
    - How easy is it for them? Consider stretching the goals so they are attainable but more challenging.
- **Observe and record behaviour, and prompt self-monitoring**
    - Like with goal setting, use process (how do they feel before/during/after behaviour change attempts), and outcome focus (what did they achieve?) to track behaviours.
    - You could choose to focus on one of more of: the context where they perform the behaviour, frequency, and techniques they used to change behaviour.
- **Discuss and provide information about the antecedents of behaviour**

    - What sort of situations and events, emotions or thoughts predict or prevent behaviour change? (E.g. high stress, prevent physical activity. Is this controllable?)
- **Start to *"close the loop".***
    - Encourage the patient to paraphrase and demonstrate their levels of understanding and competence.
    - How can improvement be made visible/tangible to them?
- **Start to talk longer-term**
    - Gauge their perceptions about moving into phase IV.
    - Do they think their existing behaviour change is attainable without your input?
    - How can they start preparing for discharge as early as possible?
- **Make it normal to talk about relapse**
    - It is not a catastrophe if everything doesn't go 100% to plan.
    - What has helped them to change behaviours, how can they learn from this?
    - "If… Then…"

The focus on satisfying competence within this aspect of the intervention acts as the middle ground that allows a patient's adherence to move from being primarily relatedness-driven to being driven by autonomy. In this case, the role of competence is to build on a patient's achievements within the relatedness-focused stage with the aim of evidencing their progression towards achieving their personally salient goals. As is evident in the relatedness-focused stage, this is achieved through the collaborative use of outcome and process-focused goals and measures of behaviour to evidence progress, ***underpinned by the key question "what is important to you?"*** to continue to ensure that any goals set are personally salient to the patient. In terms of the temporal focus of the competence phase, healthcare professionals are encouraged to ***start to talk in the longer term***. This aims to stretch and challenge patients by focusing not just on the immediate future, but into a temporal period that is longer term but remains attainable and tangible for the patient. This means that the period of time that a competence-focused intervention may focus upon is determined by individual differences between patients, and may be represented a week or two, or a month ahead rather than the day-to-day focus that is evident in a relatedness-focused intervention.

Although potentially more important within the autonomy-focused phase, stretching the temporal focus aims to progress a patient towards action and coping planning for how they will sustain behaviour change post-discharge, as well as ***normalising the discussion of potential relapses*** in behaviour change they may experience as they continue to attempt to change behaviour. Although the temporal focus is stretched, a process-focused approach is utilised to help patients ***become accustomed in self-monitoring their behaviour***, in that they are encouraged to document and discuss affective changes they have recognised during attempts to change behaviour, as well as physiological and behavioural outcomes of their behaviour change attempts. For example, if a patient's outcome goal is to move from 20 minutes of PA per day to 30 minutes of PA, they would record how successful they were in achieving this goal (outcome), as well as documenting any physiological (e.g. heart rate) and affective (e.g. level of enjoyment) changes that they experienced during the activity. Doing so aims to partially ***provide potential information about the antecedents of behaviour*** that could guide future goal setting as it allows patients to understand their behaviour change more deeply. Information of this sort can also be used to appraise the goals a patient has set to identify whether they should ***continue to progress towards a certain goal or whether they need to change focus***. Additionally, information about the antecedents of behaviour allows patients to highlight scenarios that may potentially contribute to relapses, therefore encouraging them to pre-empt these conditions before they may occur in future attempts to change behaviour.

The discussion of the process and outcomes of behaviour change between patients and healthcare professionals' attempts also aims to allow the patient to ***observe and record behaviours, as well as providing feedback and monitoring,*** which is recommended within NICE (2014) guidance as a BCT that is most effective in modifying cardiovascular risk factors. As such, its inclusion demonstrates how policy recommendations have been incorporated into the development process to ensure the intervention is based on both empirical and policy evidence. The opportunity to record behaviours and be provided with feedback about performance is already evident in CR/PR as patients are provided with an exercise prescription by exercise physiologists during the weekly PA component of CR/PR. This therefore demonstrates how the intervention aligns with current practice, and serves to act as a booster that makes explicit the ways in which healthcare professionals' existing practice can serve to achieve basic need satisfaction.

To further reflect the view that the basic psychological needs are not mutually exclusive, ***closing the loop*** encourages healthcare professionals to encourage patients to demonstrate or explain different aspects of their condition or how they plan to engage in certain behaviours in the future. By doing so, ***closing the loop*** enables the patient to recognise progress and how they are developing a deeper understanding of their condition and how to engage in adaptive behaviours in the long-term by encouraging the patient to demonstrating their increasing competence and understanding of their condition and how they may enact behaviour change attempts. In turn, this allows the healthcare professional to identify knowledge gaps or factors that may inhibit a patient's future behaviour change attempts.

In summary, the intervention's competence-focused phase aims to stretch the focus of the behaviour change intervention away from purely focusing on a patient's level of day-to-day functioning towards a longer-term focus that is increasingly looking towards their discharge from the 8-week programme of CR/PR (NICE, 2014). As is evident in the relatedness-focused phase, a consideration of *"what is* *important to you?"* is integral to the development of the behaviour change intervention, aiming to ensure that the patient's care package is as personally salient as possible. The intervention aligns with empirical and policy-based recommendations by suggesting that goal setting should be reviewed regularly (ideally weekly) to ensure that the manner in which a patient is progressing (or failing to achieve their goals) is discussed through both outcome and process-focused measures. The inclusion of measuring behaviour using both process and outcome measures aligns with the BCT observe and record behaviour, as previously attempts to record behaviour only focused on outcome measures, with scant attention paid to how a patient felt when making such attempts to change behaviour.

By incorporating both outcome and process-focused measures, a patient's understanding of their potential antecedents of behaviour can be increased, in that factors that may inhibit or facilitate behaviour change attempts can be highlighted and incorporated into their future plans to change behaviours. Additionally, this information may highlight factors that may make future behaviour change relapses more possible, hence acting as a starting point to make discussion about relapse or failing to make the anticipated levels of progress more normal and less of a taboo subject within CR/PR.

7.3.8 Basic Psychological Needs: Operationalising Autonomy

The guidance provided to healthcare professionals to allow them to deliver autonomy-focused care is as follows:

- **Move towards a long-term focus**
    - Again, centred on *"what is important to you?"*
    - In the next few weeks and months, where would you like to get to?
    - Encourage them to express pros and cons of behaviour change, to get to what is most important to them.
- **Action planning/ Coping planning**

    - Encourage them to develop detailed plans of what they're going to work towards once they are discharged. Anticipating relapses before they happen and how to cope with them.
    - Considerations could include context (where?), frequency (how often?), duration (for how long?), and intensity.
    - If they are to change behaviour, why are they doing it, and how will they implement these intentions?
- **Identification of self as a role model**
    - *"Contrast yourself when you arrived to now, what sorts of differences do you see in yourself?"*
- **Problem solving**
    - How likely are they to change behaviour once they have been discharged?
    - What sorts of strategies enable them to overcome any perceived barriers?
- **How can they generalise what they have achieved in phase 3 into other contexts?**
    - What has worked for them?
    - What have they enjoyed the most?
    - What can they take forward and how can they replicate these behaviours?
- **Thinking of the future**
    - Where do I want to be, and how will I get there?
    - How committed are they to change?
    - Imagine changed vs unchanged behaviour: what do you think is feasible to achieve?

As previously discussed, there is a degree of overlap in the way in which each psychological need has been operationalised to form the intervention. This is reflected by how ***"what is important to you?"*** is again a key consideration for discussions between healthcare professionals and patients. Again, this aims to ensure that a patient's CR/PR programme is as tailored to behaviours that they perceive to be personally salient as is possible, but within the autonomy-focused stage will reflect behaviours that may take longer for the patient to achieve. This approach of ensuring goals and planning have a ***long-term focus,*** underpinned by the question ***"where do I want to be and how will I get there?"*** aims to ensure that the patient is being encouraged to use the support available to them in the 8-12-week CR/PR programme to help them set and achieve their longer-term goals in a manner that is driven by what is important to the patient. To ensure that goals set are as personally salient and well-thought through as possible, motivational interviewing principles have been incorporated (***encourage the patient to express the pros and cons of behaviour change***), with the aim of mitigating the risk that patients will set goals that they think they should aim for, but are of little personal significance to them. This aims to ensure that consider ***how committed a patient is to their selected behaviour change goals,*** with the rationale of ensuring that a patient is more likely to work towards and achieve goals if they can recognise the personal significance of them.

In a similar vein, healthcare professionals are encouraged to facilitate ***action and coping planning***, with the aim of a patient being discharged from CR/PR with a detailed pan of what they will work towards once they are discharged. This is further facilitated through the use of ***implementation intentions***, as discussed in a number of trials within the systematic review. Building on the competence-focused stage, ***relapse prevention is discussed within coping planning*** with the aim of normalising the fact that attempts to change behaviour are extremely likely to not run entirely to plan, and to equip the patient with a plan to get back on track. To achieve this, patients are encouraged to contrast themselves when they arrived into CR/PR with themselves at the point of discharge, in order to recognise their achievements and the techniques they have used to achieve their behavioural outcomes, as well as recognising how these techniques may be useful to facilitate future attempts to change behaviour.

Breaking down behaviour change in this way demonstrates overlap with the concurrent process and outcome focus of the relatedness-focused and competence-focused stages, again demonstrating the utility of previous conversations and goal setting attempts if they are broken down in this way, rather than the historic focus on only outcome-focused goals. Doing so also works to achieve ***problem solving,*** as the patient will be equipped with strategies to overcome perceived barriers that may inhibit future attempts to change behaviour, which may become apparent during relapse prevention conversations between the healthcare professional and patient. Additionally, the concurrent process and outcome focus of the intervention, and the manner in which it is able to achieve a record of behaviour change, patient's affective experiences of behaviour change attempts, and the techniques, settings and nature of support that facilitated successful or unsuccessful outcomes allows ***behaviour within CR/PR to be generalised or extrapolated to other contexts.*** Doing so facilitates further action planning about the specific nature of a patient's future attempts to change behaviour, as well as elucidating additional resources that a patient may need to consider to achieve future behaviour change.

In summary, the autonomy-focused phase of the intervention utilises a longer-term focus and builds on techniques utilised in the relatedness-focused and competence-focused stages, specifically the process and outcome-focused nature of discussions around behaviour change. This aims to ensure that a patient is discharged from their CR/PR programme with a clear well-developed idea of what they want to achieve in the future, accompanied by a detailed action plan of how they will achieve these goals using methods and techniques that they have demonstrated success with within CR/PR or other aspects of their life. In recognition of the fact that behaviour change attempts are extremely unlikely to run perfectly to plan, relapse prevention and coping planning is incorporated to ensure that even if a patient feels as if they have failed to adequately change behaviour, they have a plan that will help them 'get back on the wagon'. Given the lack of prior understanding of how they would embed a process- and outcome-focused conversation within consultations, healthcare professionals were equipped with conversation frameworks to further guide these conversations (see appendix B), in addition to the techniques discussed within this section.

7.4 Assessment of the Intervention Using Theory Coding Scheme

Initially, the project aimed to utilise the TIDieR checklist (Hoffman et al., 2014) to provide an intervention protocol that would describe the intervention. However, given the strong focus and perceived importance on developing a theory-based intervention (Kislov, 2019; Kislov, Wilson, et al., 2019), and TIDieR's limited efficacy in assessing the extent to which an intervention is evidence-based, alternative approaches to objectively assess the intervention's quality were deemed necessary. Instead, The Theory Coding Scheme (TCS; Michie & Prestwich, 2010) is a 19-item coding tool with good reliability that assesses interventions on the basis of the extent to which they are theory-based. Its creation aimed to remediate the suggestion that *"where a theoretical base for an intervention is stated, there is seldom reference to a method describing how the theory informed the design of the intervention, or how the evaluation tests theory"* (Michie & Prestwich, 2010 p.4; Rothman, 2004), as demonstrated by the systematic review within chapter 3.

The TCS can be used to assess the extent to which both intervention development and evaluation is theory based, and therefore an abridged version was used to exclude items that concern how theory has been used to evaluate an intervention. The excluded items can be found in Table 6 below.

Table 6 Excluded Theory Coding Scheme Items

13	**Quality of Measures**	a) All of the measures of theory relevant constructs/predictors had some evidence for their reliability b) At least one, but not all, of the measures of theory relevant constructs/predictors had some evidence for their reliability c) All of the measures of theory relevant constructs/predictors have been previously validated d) At least one, but not all, of the measures of theory relevant constructs/predictors have been previously validated e) The behaviour measure had some evidence for its reliability f) The behaviour measure has been previously validated
14	**Randomization of participants to condition**	a) Do the authors claim randomization? b) Is a method of random allocation to condition described (e.g., random number generator; coin toss) c) Was the success of randomization tested? d) Was the randomization successful (or baseline differences between intervention and control group statistically controlled)?
15	**Changes in measured theory-relevant constructs/ predictor**	The intervention leads to sig. change in at least one theory relevant construct/predictor (vs. control group) in favour of the intervention.
16	**Mediational analysis of construct/s / predictors**	In addition to 14, do the following effects emerge?: a) Mediator predicts DV? (Or change in mediator leads to change in DV) b) Mediator predicts DV (when controlling for IV)? c) Intervention does not predict DV (when controlling for mediator)? d) Mediated effect statistically significant?
17	**Results discussed in relation to theory**	Results are discussed in terms of the theoretical basis of the intervention
18	**Appropriate support for theory**	Support for the theory is based on appropriate mediation OR refutation of the theory is based on obtaining appropriate null effects (i.e. changing behaviour without changing the theory relevant constructs).
19	**Results used to refine theory**	The authors attempt to refine the theory upon which the intervention was based by either: a) adding or removing constructs to the theory, or b) specifying that the interrelationships between the theoretical constructs should be changed and spelling out which relationships should be changed

Table 7 highlights that the intervention aligns closely with the guidance that the TCS provides for developing interventions as it satisfies all bar one of the relevant items, and therefore can be classed as 'theory-based' rather than 'theory-inspired'. The sole item that the intervention is not perceived to satisfy *(item 4: Theory/ predictors used to select recipients for the intervention)* is an inappropriate measure of quality in this instance. This is because the intervention aims to be applicable to all participants within CR/PR, rather than inappropriately excluding participation on the basis of a SDT-based measure.

Table 7 Assessment of The intervention's Quality Based on Theory Coding Scheme

Item No	**TCS Item**	**Item Description (Taken verbatim from Michie & Prestwich, 2010)**	**Evident in The intervention?**	**Justification**
1	**Theory mentioned?**	Models/theories that specify relations among variables, in order to explain or predict behaviour (e.g., TPB, SCT, HBM) are mentioned, even if the intervention is not based on this theory	Yes	Throughout thesis, and rationalised specifically (chapter 2, chapter 3, chapter 5, chapter 7).
2	**Targeted construct mentioned as predictor of behaviour**	"Targeted‟ construct refers to a psychological construct that the study intervention is hypothesised to change). Evidence that the psychological construct relates to (correlates/predicts/causes) behaviour should be presented within the introduction or method (rather than the Discussion).	Yes	Chapter 2 provides background evidence that demonstrates potential constructs that can be targeted to produce behaviour change. Thesis builds on this evidence specifically within the intervention's logic model in chapter 7.

3	**Intervention based on single theory**	The intervention is based on a single theory (rather than a combination of theories or theory + predictors)	Yes	The intervention is purely based on theory. Anything that is not derived from SDT is a feature of the clinical setting and is discussed (see Ch7), however no other theories have been used.
4	**Theory/ predictors used to select recipients for the intervention**	Participants were screened/selected based on achieving a particular score/level on a theory-relevant construct/predictor	N/a	It is perceived to be inappropriate to exclude patients given that the intervention is proposed to encompass patients at all stages of CR/PR. Clinical judgement will instead be used to assess the extent to which and how the intervention will be utilised with different patients.
5	**Theory/ predictors used to select/develop intervention techniques**	The intervention is explicitly based on a theory or predictor or combination of theories or predictors	Yes	See figures 11 and 12 to see how the intervention was tailored to CR/PR, and sections 7.3.6-7.3.8 for information regarding specifically how the intervention is explicitly based on SDT.
6	**Theory/ predictors used to tailor intervention techniques to recipients**	The intervention differs for different sub-groups that vary on a psychological construct (e.g., stage of change) or predictor at baseline	Yes	The intervention aims to train healthcare professionals to make a behavioural diagnosis of patient's capacity for behaviour change on the basis of BPNT and OIT, therefore using SDT to generate this outcome.
7	**All intervention techniques are explicitly linked to at least one theory-relevant construct/ predictor**	Each intervention technique is explicitly linked to at least one theory-relevant construct/predictor	Yes	See sections 7.3.6- 7.3.8 for a commentary of how the intervention's content explicitly maps onto SDT.

8	**At least one, but not all, of the intervention techniques are explicitly linked to at least one theory-relevant construct/ predictor**	At least one, but not all, of the intervention techniques are explicitly linked to at least one theory-relevant construct/ predictor.	N/a	Answer for item 7 is yes, therefore item 8 is not applicable.
9	**Group of techniques are linked to a group of constructs/ predictors**	A cluster of techniques is linked to a cluster of constructs/ predictors.	Yes	Each basic psychological need has a cluster of techniques attributed to them, see sections 7.3.6-7.3.8 and the handbook/slide deck.
10	**All theory-relevant constructs/predictors are explicitly linked to at least one intervention technique**	Every theoretical construct within a stated theory, or every stated predictor (see item 5), is linked to at least one intervention technique	Yes	Each basic psychological need has been operationalised to form the intervention. This has then been linked to OIT to develop a logic model.
11	**At least one, but not all, of the theory relevant constructs/predictors are explicitly linked to at least one intervention technique**	At least one, but not all, of the theoretical constructs within a stated theory or at least one, but not all, of the stated predictors (see item 5) are linked to at least one intervention technique.	N/a	Answer for item 10 is yes, therefore item 11 is not applicable.

7.5 Intervention Development Step Two: Healthcare Professional Feedback

7.5.1 Aims and Rationale

Acceptability has become a key consideration in the design, evaluation and implementation of healthcare interventions, as intervention developers need to design effective healthcare interventions that guarantee the best clinical outcomes achievable with the resources available (Sekhon et al., 2017). Acceptability is important to assess as part of the intervention development process, as if healthcare professionals do not find an intervention acceptable, it may not be utilised at all or not delivered as intended, which may have an impact on the overall effectiveness of the intervention (Proctor et al., 2009). As the concept of acceptability of interventions in healthcare has historically been poorly defined, relatively recent research has attempted to define acceptability with a view to constructing a theoretical framework of acceptability that can be applied to assess prospective (i.e. anticipated) and retrospective (i.e. experienced) acceptability from the perspective of both intervention developers and recipients (Sekhon et al., 2017). Using Sekhon et al.'s (2017) theoretical framework of acceptability, this section aims to assess the prospective acceptability of the intervention. Specifically, the study aimed:

- To identify if the intervention achieves it aims, and to understand changes that could be made prior to wider dissemination to make it more acceptable to healthcare professionals.
- To assess how effectively the intervention was able to remediate the knowledge gaps identified in the previous qualitative chapters.
- To assess the extent to which healthcare professionals felt able to incorporate the intervention into their standard practice.

7.5.2 Methods

Data Collection

The intervention was delivered through 2x2 hour sessions with healthcare professionals working within Knowsley's CR/PR service. Eight healthcare professionals working in Knowsley's CR/PR service received the intervention. Turnout was voluntary and was dependent by factors such as healthcare professional's annual leave and clinical commitments. Each healthcare professional received a handbook and copy of the PowerPoint slides used over both sessions to facilitate reflection and sharing across the wider multidisciplinary team. A copy of the resources that were used to deliver the intervention can be found in the documentation that accompanies this thesis.

Focus groups and opportunities for discussion were embedded within sessions to facilitate reflection on the intervention components as they were delivered, and the prospective acceptability of the intervention, based on Sekhon et al.'s (2017) theoretical framework of acceptability. Additionally, healthcare professionals' level of understanding of the intervention content was assessed throughout the sessions, with a primary focus on how readily they were able to incorporate the intervention content within their standard practice. Sekhon et al. (2017) suggest that acceptability studies should focus on seven key areas, as highlighted in table 8 below. As such, the discussions were largely focused on affective attitude, burden, ethicality, intervention coherence, opportunity costs, perceived effectiveness and self-efficacy, whilst affording healthcare professionals an opportunity to add other information that they felt important to highlight.

Ethics

The research was given favourable ethical opinion by the North West - Greater Manchester West Research Ethics Committee (REC reference: 17/NW/0332; IRAS project ID: 226025) on the 9th June 2017. Given that the majority of healthcare professionals had participated in study one, they were aware of the project and the nature of the research. Following both sessions, participants were debriefed about the rationale of the study, and received a copy of the research team's contact details for any participant concerns that may arise, such as if a they wished to withdraw their data. As the aim of this study was to assess the intervention's prospective acceptability, informed consent was sought from all healthcare professionals, meaning that their feedback could be used in future dissemination, improvements, or iterations of the intervention's training materials.

Data Analysis

Data analysis followed Braun & Clarke's (2006) thematic approach, including data familiarisation, coding, searching for and defining themes. A deductive approach to TA was adopted, as Sekhon et al.'s (2017) framework for acceptability acted as a pre-existing coding frame. The areas of focus of Sekhon et al.'s (2017) framework are evident in table 8 below.

Table 8 Key areas of focus for acceptability studies (Source: Sekhon et al., 2017)

Area of Focus	**Description**
Affective Attitude	How an individual feels about the intervention.
Burden	The perceived amount of effort that is required to participate in the intervention.
Ethicality	The extent to which the intervention has good fit with an individual's value system.
Intervention Coherence	The extent to which the participant understands the intervention and how it works.
Opportunity Costs	The extent to which benefits, profits or values must be given up to engage in the intervention.
Perceived Effectiveness	The extent to which the intervention is perceived as likely to achieve its purpose.
Self-efficacy	The participant's confidence that they can perform the behaviour(s) required to participate in the intervention.

7.5.3 Results and Discussion

This is the first study to pilot Sekhon et al.'s (2017) theoretical framework of intervention acceptability to examine healthcare professionals' perceptions of the prospective acceptability of a SDT-based clinical PA behaviour change intervention within CR/PR. Based on Sekhon et al.'s (2017) theoretical framework of intervention acceptability, several important findings emerged. Firstly, the intervention was perceived to be acceptable to healthcare professionals, and strongly aligned with the existing CR/PR programme. Healthcare professionals reported satisfaction with the intervention's content and structure, perceived it to enhance their standard clinical practice within CR/PR, and wanted it to be included as part of their trust's programme of professional development. These findings demonstrate the benefit of developing an intervention in a manner that is cognisant of the healthcare context that it aims to operate within, and the healthcare professionals who operate within it.

Healthcare professionals understood how the intervention content was applicable to and could be integrated into their standard practice. For example, much discussion centred on how integration could be achieved with the aim of enhancing healthcare professionals' self-efficacy in embedding the intervention and behaviour change into their practice. The intervention was effective in overcoming healthcare professionals' concern that innovations of this sort are associated with a large additional burden which renders them unfit for standard practice. Instead, the intervention was perceived to represent a different way of approaching conversations with patients and utilising information already collected in their assessments in a different way. Subsequent sections of section 7.5.3 utilise Sekhon et al.'s (2017) framework of intervention acceptability to evaluate the intervention.

Affective Attitude and Perceived Effectiveness

Affective attitudes refers to how an individual feels about the intervention. For the purpose of data analysis, this was combined with perceived effectiveness, defined as the extent to which the intervention is perceived to be likely to achieve its purpose (Sekhon et al., 2017, 2018). The intervention was positively received by healthcare professionals. Written feedback regarding healthcare professionals' opinions of the intervention suggested that *"Sessions were very informative, interesting, very useful"*, and *"Thank you very much, you're doing a very good job!".* Healthcare professionals also welcomed the manner in which the intervention provided a model of behaviour change that was bespoke to CR/PR, as previous courses were suggested to have limitations because they were too generic: *"I've done one of the general ones (courses), but once you get into all the facets of what a patient's got, it doesn't quite work".* This suggests that the intervention overcame previously made claims that existing courses are not tailored to fit the CR/PR service and healthcare professionals therefore struggle to integrate the course content into their everyday practice. The importance of aligning with standard practice has been demonstrated by previous literature (Hawkins et al., 2008), as this tailoring increases the likelihood of the intervention being adopted into routine practice.

The broad focus of the intervention and how it aimed both to impact PA behaviour whilst increasing healthcare professionals' level of understanding of behaviour change was highly acceptable to healthcare professionals. This is because the intervention remediated their skill and knowledge deficits whilst allowing them to plan how to deliver behaviour change interventions to change patients' PA behaviours. These three components are important, as previous research has demonstrated that remediating a skill and knowledge deficit is necessary, but not sufficient, in changing behaviour (Arlinghaus & Johnston, 2018; Michie, van Stralen, et al., 2011). A specific example of how healthcare professionals made plans to integrate the intervention into their practice is evidenced by a discussion of how the intervention could be tailored to suit a patients' specific goals. For example, healthcare professional 2 suggested she would look to influence *"any of the risk factors to be honest with you because everyone's unique and different and they've all got things going on, so in general them"*. Additionally, at the start of the first session, healthcare professionals tended to perceive behaviour change to be synonymous with models such as stages of change and motivational interviewing. In contrast, the intervention provided a much more in-depth understanding of behaviour change*:*

> *"The stages of change when you look at what you've just done there, (SoC) is just a heading, this (the intervention) has got so much more to it. It makes it seem like an 8 week course (of CR/PR) isn't very long when you think about it like that!".*

Healthcare professionals also welcomed the diversion from the stages of change, *"which was around 30 or 40 years ago wasn't it? I've come from an exercise* *programme and it was around then”.* Instead*, “It’s nice to have something new to be honest and get away from the Stages of Change that’s been around for years”,* suggesting that the diversion away from the Stages of Change model which appears to dominate similar courses for healthcare professionals was welcomed and could be adopted by other interventions. The theoretical basis of the intervention and the presentation of a viable alterative to the Stages of Change model enhanced the intervention’s credibility, again reinforcing the importance of evidence based practice within healthcare settings (Chauhan et al., 2017; Kislov, Wilson, et al., 2019).

The theme ***affective attitudes and perceived effectiveness*** demonstrates the importance of behaviour change courses being based on the best available and most up-to-date evidence, and the need for an intervention to demonstrate alignment with the healthcare context. Additionally, the depth to behaviour change was surprising to healthcare professionals, suggesting that it is important that courses enable professionals to understand both how to deliver behaviour change, as well as the theoretical underpinnings of the intervention and why they are being asked to deliver an intervention in a certain way. The intervention was both positively received by healthcare professionals, and was perceived to be effective in that it remediated a significant knowledge gap and greatly enhanced healthcare professionals’ knowledge of behaviour change. Therefore, this study extends a small body of previous research (Chisholm et al., 2016) that has outlined the benefits of training that draws on existing behaviour change frameworks to equip healthcare professionals with behaviour change skills, a topic currently lacking in routine practice.

Burden and Opportunity Costs

Burden refers to the perceived amount of effort that is required to participate in the intervention. For the purpose of data analysis, this was combined with opportunity costs, defined as the extent to which benefits, profits, or values must be given up to engage in the intervention. (Sekhon et al., 2017, 2018). In terms of burden, the intervention was perceived to be relatively easy to implement into the existing CR/PR programme through minor adjustments in healthcare professionals' communication style. This was strongly facilitated by the way in which the intervention was tailored to the CR/PR context (see figures 11 and 12), which was perceived to represent a diversion from the generic nature of other similar training that healthcare professionals had participated in such as motivational interviewing. The focus on the process that the intervention advocates, moving from a relatedness focus to an increasingly autonomous focus, was suggested to be able to be achieved by a minor shift in communication style. More specifically, this could be achieved by utilising the information healthcare professionals already collected in a different manner:

> *"At the moment we're just looking at the bigger picture, because they could be saying things to us like the wife's helping me get dressed, when we could say well how about trying to get dressed yourself. I wouldn't look at that as a goal. That might be coming out in our assessments but we're not looking at it like that".*

This demonstrates that the intervention has encouraged healthcare professionals to approach their consultations with patients differently. Rather than confining goal setting to outcome goals largely defined as the CVD risk factors (PA, diet etc.), the intervention has encouraged them to listen to what the patient perceives to be important to them, such as *"trying to get dressed yourself",* which they previously would not perceive to be an acceptable goal. By taking a concurrent process- and outcome-focused approach, the intervention has encouraged healthcare professionals to listen to what the patient perceives to be important to help drive goal setting. Such an approach also aligns with the MECC principles of ensuring that any goal setting is based around what is personally salient to the patient (Public Health England & Health Education England, 2016). The relatively small burden that implementing the intervention would produce was further reinforced by a colleague who suggested that:

> *"They're telling them stuff well I would like… and then I'm asking them if there's anything they want to achieve reasonably soon, and they go no, but they've just told you that in the last 15 minutes of being sat in front of you".*

This quote corroborates the previous claim that healthcare professionals perceived themselves to be collecting information that would enable them to help patients set process-focused goals, but prior to this intervention would not have perceived these to constitute acceptable goals. This finding that healthcare professionals are more likely to set outcome-focused goals is corroborated by previous studies investigating the goal setting practice of physiotherapists. This study advocates for there to be a shift away from the biomedical model where the healthcare professional is in charge, perhaps indicative of the focus on the *"bigger picture"* such as the CVD risk factors, towards a patient-centred biopsychosocial model in which the patient drives the direction of an intervention through setting personally salient goals (Gardner et al., 2018) such as *"trying to get dressed yourself"*. In practice, this means that healthcare professionals felt able to utilise the process-focused nature of the intervention by facilitating a discussion of what is important to the patient. This was perceived to not constitute a significant shift in practice or additional burden. As there are currently no studies that have extensively investigated goal setting practice amongst CR/PR healthcare professionals, future research could build on these with a view to understand how concurrent process and outcome-focused goal setting can be incorporated into routine CR/PR practice.

Much discussion focused around healthcare professionals could easily integrate the intervention into existing CR/PR assessments with a minor shift in focus and practice that was not perceived to constitute a significant addition to workload. Discussions of this sort may help to further elucidate and overcome the claim that there may be important opportunities missed during routine practice for healthcare professionals to offer brief, opportunistic advice about behaviour change (Keyworth et al., 2018, 2019) by allowing healthcare professionals develop implementation intentions regarding how they can incorporate behaviour change into their routine practice. As such, not only should interventions equip healthcare professionals with the skills to deliver behaviour change, but should facilitate an opportunity for them to plan how to implement them. Doing so may help to increase healthcare professionals' perceived competence and self-efficacy of delivering behaviour change in routine clinical practice, in turn boosting the impact of such interventions on patients' health behaviours. Additionally, this may help to overcome the claim in chapter 6 that healthcare professionals reported that they had developed a range of different behaviour change techniques through experiential learning or by observing other healthcare professionals as behaviour change training programmes were largely inaccessible. As such, the focus placed on how to integrate the intervention into routine practice helps to overcome the issue that techniques were often selected arbitrarily, without having any clear understanding of why the techniques used with patients may be effective (Chisholm et al., 2012).

To better embed components of the intervention within standard practice, suggestions were made for how methods of assessments could be altered, where goal setting and other facets of behaviour change were often perceived to be an afterthought:

> *"I think some of the process is at fault though because if you look at the way we do assessments, everything is clinical and it's whittled down and then the goals are at the very end and it's almost like oh by the way… one of the problems is, when we do a MDT on a Wednesday, it's oh they've got no goals, it's almost ok to leave the goals, whereas you wouldn't leave the medication".*

The perception of behaviour change in this way may be reflective of the counter-intuitive nature of the suggestion that psychology is perceived to be an important component of CR/PR, yet healthcare professionals do not have a concrete grasp of what it is and how it should be incorporated into CR/PR. As a result of this, the psychology and goal setting component of CR/PR is *"almost ok to leave"* compared to than a component of CR/PR such as medication titration that would never be overlooked. Although this study investigated the prospective acceptability of the intervention, future research could investigate the retrospective acceptability of the intervention once healthcare professionals have attempted to use it in practice, in order to investigate whether these intentions to change their practice translated into behaviour change across the CR/PR service.

Other ways in which the intervention could be incorporated into CR/PR was to change the wording of questions within the existing assessment template to ensure that the process and outcome focused nature of the intervention would be evident. This was not perceived to constitute a significant burden and would afford healthcare professionals greater opportunities to engage in the intervention within their standard practice:

> *"How about going back to our first question (in the assessment), what's your view on your current health, maybe we could look at that and maybe say is there anything that you think may have contributed towards, maybe we need to start looking at how we ask certain questions, and look at the template and go through it and see how we can maybe rethink the wording a little bit so we can (do that)"*

As healthcare professionals recognised that the intervention remediated a knowledge gap, was perceived to be beneficial, and could be integrated readily into their service, they began to generate ideas to investigate how it could be incorporated into their care. Doing so acted as a starting point for these more specific discussions regarding how the intervention's components could be readily implemented onto their clinical computer systems, as well as within healthcare professionals' patient assessments. If the intervention was perceived to be too difficult to implement, such discussions probably would not take place. Therefore, the theme ***burden and opportunity costs*** demonstrates that healthcare professionals formed implementation intentions regarding how they could utilise the intervention in standard practice. Further, this theme demonstrates how there were minimal perceived opportunity costs and burden associated with utilising the intervention, again demonstrating a high level of acceptability.

Ethicality

Ethicality refers to the extent to which the intervention has good fit with an individual's value system (Sekhon et al., 2017, 2018). There was strong demand for a behaviour change intervention of this sort, as it demonstrated a good fit with and built on healthcare professionals' existing practice. To further elucidate this, healthcare professionals suggested that the intervention should be integrated into their professional training programme, as it both remediated a large knowledge gap and was developed in a manner that was bespoke to Knowsley's service and their own value systems through the use of formative research in chapters 4-6. This comment is taken from written feedback: "*Keep this going every 6-12 months, I feel this should be done regularly and annually as a refresher and for new staff, especially as it involved our trust and service".* The expectation that healthcare professionals will deliver behaviour change interventions opportunistically is relatively new, and so may not be a core part of professional training programmes (Chisholm et al., 2012; Keyworth et al., 2019), meaning that healthcare professionals may rely on interventions like this and experiential learning to develop their competence in behaviour change. However, chapter 6 demonstrated that to date, healthcare professionals had been unable to readily access training programmes that would enable them to improve the behaviour change components of their practice. Clearly, healthcare professionals found the intervention to be a worthwhile undertaking and appreciated how it was centred on their particular hospital and service. Tangentially, it is important that interventions of this sort are readily accessible to healthcare professionals, to enable the discipline of behaviour change to fulfil its potential within services such as CR and PR by being better integrated into their clinical training.

As well as aligning with healthcare professionals' value structure, the intervention was perceived to challenge healthcare professionals' understanding of what specifically constituted a topic that could be set as a goal. As discussed previously, the intervention challenged what healthcare professionals classed as goals and goal setting by suggesting that they should deliver process and outcome-focused goals concurrently. For example, a senior healthcare professional suggested that current practice dictated that goals tended to be something that was achievable within the 8-week CR/PR programme:

> *"(At the minute) we try to set something that's achievable in the 8 weeks, some of them obviously do have long-term goals, like I want to climb Snowdon next year, but we try and make them something that's doable in the 8 weeks, but you're right I think we need to bring it even closer in and say yeah that's great, but what about in the next couple of weeks and just focus it in".*

This suggests that the relatedness-focused stage of the intervention, where a short-term focus is adopted through the use of process-focused conversations, challenges healthcare professionals’ current practice where outcome focused goals such as increase physical activity or lower cholesterol are set. By doing so, the intervention both aligned with and extended current practice, and allowed healthcare professionals to work with patients to develop personally salient PA goals in the short, medium and long-term, scaffolded by a plan of how a patient will change behaviour.

Through a discussion of the relatedness section of the intervention, and how providing social support and reassurance lends itself to a short-term and process focus, healthcare professionals demonstrated understanding by reflecting on how increasing a patient’s level of understanding of their condition could be a process goal:

> *“Some of them (patients) just want to know what has happened, why has it happened, even though they sort of know what has happened and why has it happened, but they’re not too sure. So could that (education and understanding their condition) be a goal? And then at the end they do want to lose weight, but at the moment let’s focus on that first”*

In this instance, healthcare professional 3 suggests that she would traditionally set weight loss as this patient’s goal, despite recognising that the patient is struggling to understand the condition. Instead, after participating in the intervention, healthcare professional 3 suggests that she would set the patient the goal of becoming more educated, scaffolding a plan of the ways in which the patient could better understand their condition, before progressing onto weight loss if this was personally salient to the patient.

This demonstrates that the intervention appears to have engendered a shift away from solely considering the traditional CVD risk factors (such as PA, blood pressure, smoking, cholesterol) as outcome goals. Instead, the intervention encouraged healthcare professionals to work with patients to set process-focused goals that could benefit their progression to outcome goals. This diversion from purely setting outcome goals towards a focus on the shorter-term and what is presently emotionally salient to the patient (such as if the patient is concerned about walking the dog or walking alone) is highlighted by healthcare professional 3:

> *"We do it (goal setting) to certain extents but we don't use that process bit do we? I know I don't anyway, I've never thought of it, if someone said to me. I know sometimes I do write sometimes for education, I'm not looking at that as a specific goal, I'm looking at that as the bigger picture, that's what I thought the goal was. I've been doing that for years! Now I'll bring it in and make it a little bit smaller (short term), because their goals could be a big deal to them, just like walking the dog, it's nothing to us is it?"*
>
> *"That makes sense because if they come on the initial session and the goal is to lose weight they're still dealing with what's happened, they're still dealing with 'am I alright to go for a walk on my own', and we're going right this is what you're going to do, come the gym (to do PA) …. Yeah I get that, I like it"*

In summary, the intervention demonstrates ethicality as it aligns with healthcare professionals' value systems and standard practice, as well as seeking to challenge and enhance their routine practice. Additionally, this theme demonstrates a need for more extensive training in behaviour change to be better integrated into healthcare professionals' training programmes, as advocated by previous research in the field of medical education (Chisholm et al., 2012).

Self-Efficacy and Intervention Coherence

The self-efficacy component of Sekhon et al.'s (2017) framework aims to assess participants' confidence that they can perform the behaviours required to participate in the intervention. For the purpose of data analysis, this was combined with intervention coherence, defined as the extent to which the participant understands the intervention and how it works (Sekhon et al., 2017, 2018). As discussed across the previous themes, healthcare professionals discussed how they could incorporate the intervention into their clinical systems and conversations with patients. To evidence and enhance their self-efficacy throughout both sessions of intervention delivery, healthcare professionals generated action plans of how they could incorporate principles in their one-to-one work with patients, such as *"I will start talking to patients about relapse".* Another example is provided by healthcare professional 2, who suggested that:

> *"The one that's hit home to me is just keeping it narrow and keeping the focus on the here and now, and (colleague's) right we do say we know about goals and stuff, but we need to say ok what about the next couple of weeks what comes next, what do you want to achieve and how can we help you, and let's move forward. And it's all the templates we use each week in the check ins, and again it's the time thing. It's all about adherence as well, it's looking a bit more how we can keep them going that that all contributes towards, but it's that first stage isn't it? It's making every question just a little bit more purposeful".*

In this instance, healthcare professional 2 demonstrated how she would endeavour to keep a short-term focus, rather than looking too far ahead at an early stage. Additionally, she reflected on how she could change the templates all healthcare professionals used to deliver coherence with the intervention, demonstrating how she was planning how to best incorporate the intervention into the service's routine practice. Similarly, healthcare professional 7 suggested that:

> *"It's making me think about 5 little things already. Where you're saying with that process, I think this week I'll just focus on the first one (relatedness), and then more gradual rather than oh what's your goal in 3 months, 6 months, bit more in the moment".*

This demonstrates healthcare professionals' satisfaction with the intervention's theoretical framework, where relatedness is prioritised before the other psychological needs, and as such this healthcare professional is planning to incorporate this principle into her practice immediately. As well as previous research advocating the use of theory in intervention development (Kislov, 2019; Kislov et al., 2018; Prestwich et al., 2015), the use of a solid theoretical framework lends itself to the evidence-based practice domain that is dominant across health services, and may therefore help to give the intervention more credibility (Bull et al., 2019). Another healthcare professional suggested that rather than using SDT to guide conversation, he would use the techniques differently:

> *"With these techniques what I prefer to use them the other way round. Rather than to extract, I prefer to listen and use these techniques to take in what they've said to try and build on them, I prefer it like that. Rather than preaching what PA is, pull out things that they're saying, in that comfort zone, and then build on that".*

This quote, within the first session and therefore prior to the basic psychological needs had been operationalised into their component BCTs, demonstrates a degree of flexibility in how the intervention's components can be tailored to suit healthcare professionals' preferred method of service delivery. Again, this demonstrates the benefits of developing an intervention that can be used flexibly within healthcare contexts and affords healthcare professionals the autonomy to decide how best to use these techniques. In summary, the theme self-efficacy and intervention coherence demonstrates that healthcare professionals understood the intervention and how it was hypothesised to operate, based on SDT. Additionally, they were able to form action plans and implementation intentions regarding how they could integrate the intervention content into their existing practice. As such, based on this section of Sekhon et al.'s (2017) framework, the intervention was highly acceptable to healthcare professionals and could be developed further with a view to conducting future pilot and feasibility work in line with MRC (2008).

7.6 Limitations

Chapter 7 demonstrates that the intervention was perceived to align with healthcare professionals' standard practice, and that it could be readily implemented into the existing CR/PR service with a relatively small burden. To further enhance this study, alternative and complementary approaches could have been utilised to investigate how the intervention could and did translate into routine clinical practice. For example, Chisholm et al. (2020) advocate the use of the COM-B framework to identify mechanisms of action accounting for how training might work to influence health professionals' clinical practice. Additionally, follow-up studies such as observations and interviews could have been conducted to investigate barriers and facilitators to utilising the intervention within routine CR/PR practice. Doing so would enable the retrospective acceptability of the intervention to be assessed, as advocated by Sekhon et al. (2017), and may provide a more extensive evaluation of the barriers and facilitators of implementing the intervention into routine practice once healthcare professionals had had the opportunity to attempt to utilise it.

Within the acceptability study, there was a lack of control and likely selection bias within the sample as the recruitment strategy potentially led to a self-selected group of healthcare professionals who could have been particularly engaged in the intervention. However, given the small number of healthcare professionals within this service who could have potentially been recruited, it is difficult to overcome this limitation.

7.7 Conclusion

Chapter 7 explains how the previous chapters within this thesis were synthesised to develop the intervention's logic model, intervention components and intervention materials. These components are accompanied by a commentary that justified why they were designed in this manner, attempting to address the claim that there is limited evidence that explains how interventions that are purported to be theory-based are developed.

Using Michie &Prestwich's (2010) Theory Coding Scheme, the intervention was found to be strongly theory-based. By delivering the intervention to healthcare professionals in Knowsley's CR/PR service and using Sekhon et al.'s (2017) theoretical framework of intervention acceptability, the intervention received positive feedback and was perceived to be strongly acceptable, in that it was fit for purpose and remediated the behaviour change knowledge gap that healthcare professionals previously identified in the previous chapters.

Chapter 8: General Discussion

8.1 Summary of Main Arguments and Original Contribution of Each Chapter

The adoption of pragmatism as an epistemological stance necessitates a focus on the practical relevance of research conducted as part of this thesis. To achieve this, chapter 8 will discuss the original contribution to knowledge of the thesis from a research, theoretical and practical perspective. Additionally, I will reflect upon the successes, failures, and improvements I would make if I were to be starting the project again. By doing so, recommendations for academics, healthcare professionals and policymakers will be made, with the relative value and potential challenges and considerations of these future directions discussed.

The systematic review in chapter 3 highlights that intervention contexts appear to be rarely considered during the intervention development phase of SDT-based interventions aiming to affect PA behaviour in clinical settings. The justification for SDT to inform the development of such interventions is largely based upon cross-sectional evidence (Duda et al., 2014; Ng et al., 2012; Silva et al., 2010) conducted upon non-clinical samples, meaning there is scant understanding of precisely how and why SDT is applicable to clinical health care contexts and populations. Additionally, each intervention within the systematic review operationalised SDT differently, largely underpinned by a reliance on motivational interviewing, with limited development of a theoretically-underpinned logic model. For these reasons, the mapping between SDT and the intervention context was limited, and it was typically ambiguous why each intervention component or technique was included, as a rationale was generally not provided.

Chapter 3 is the first systematic review that attempts to understand how and why SDT-derived PA interventions aiming to operate within healthcare settings are developed in the manner they are. The chapter highlights several potential implications and future research directions. Arguably, the most notable recommendation is that researchers should invest more time in conducting a thorough needs assessment by conducting studies that offer a theoretical explanation of target behaviours that can subsequently inform intervention development. Insight of this sort can help to inform the development of a logic model that can highlight theoretically-relevant intervention targets, as well as ensuring that interventions are theoretically driven, rather than 'informed' by theory (Kislov, 2019; Michie & Prestwich, 2010; Prestwich et al., 2015).

Chapters 4, 5 and 6 report the findings of semi-structured interviews and collectively form an in-depth understanding of Knowsley's CR/PR context, and how SDT can be used to explain patients' behaviour change within and beyond the programme. Whereas chapter 5 analyses the interview data from an SDT-lens, chapters 4 and 6 consider the semi-structured interview data in a pragmatic sense. This approach aims to highlight potential intervention content and logistical factors that should be considered during the intervention development phase. Most notably, these chapters highlight a lack of formalised training pertaining to how healthcare professionals should deliver behaviour change within the CR/PR setting. Additionally, much discussion within chapter 4 centred on how ward-based and community CR/PR-based healthcare professionals describe CR/PR differently, with a dichotomy arising from how integral the PA component of CR/PR is perceived to be. The finding that healthcare professionals perceived CR/PR to be *"more than just exercise"* led to the development of an intervention that aimed to equip healthcare professionals with a deeper understanding of how to embed behaviour change within the constraints of standard clinical practice, but used PA as an example of how behaviour change interventions can be delivered. Such an approach recognises that multiple health behaviours are important within CR/PR, and that future iterations of this intervention could be developed that can be used to change a range of health behaviours, on the basis of what is personally salient to the patient. However, for this to occur, further development and evaluation would be required to ensure that the intervention is relevant to other health behaviours, and that SDT could be applied in a similar manner to the approach that is advocated within this thesis.

Chapter 5 implements some of the recommendations from chapter 3, and analyses semi-structured interview data through an SDT-lens to generate an understanding of patients' uptake and adherence of PA behaviours that is informed by SDT. Chapter 5 highlights that during the early stages of CR/PR, healthcare professionals should aim to satisfy the basic psychological need for relatedness to drive patients' uptake and adherence of PA behaviours and enable them to feel comfortable within the environment. Once patients' need for relatedness has been satisfied, healthcare professionals should work to satisfy patients' need for autonomy and competence. By offering an example of how SDT can be utilised to explain PA behaviour within CR/PR, chapter 5 highlights how the salience of the basic psychological needs evolves as a patient progresses through CR/PR.

Chapter 5 suggests that an overreliance on relatedness is problematic in terms of PA adherence, as patients whose adherence was solely perceived to be driven by relatedness were less likely to report specific plans to change behaviour in the long-term. Conversely, patients whose PA behaviours appeared to be driven by autonomy and competence were more likely to provide examples of how they planned to embed these changes to their behaviour within their lifestyle. By proposing an evolving salience of the basis psychological needs, chapter 5 led to the development of the intervention’s logic model and demonstrates how the limitations of previous SDT research, highlighted in chapters 2 and 3, can be remediated by developing a theoretically-based and contextually-relevant explanation of behaviour to assist with the intervention development process.

Chapter 7 explains how the previous chapters within this thesis were synthesised to develop the intervention’s logic model, intervention components and intervention materials. These components are accompanied by a commentary that justifies why they were designed in this manner, which attempts to address the aforementioned claim that there is limited evidence that explains how interventions that are purported to be theory-based are developed, and that there is limited understanding of how interventions are developed with the context in mind.

Using Michie and Prestwich’s (2010) Theory Coding Scheme, the intervention was found to be strongly theory-based. An evaluation of the prospective acceptability of the intervention was conducted by delivering the intervention to healthcare professionals in two face-to-face sessions and assessing the perceived acceptability of the intervention’s content, and how it could be incorporated into healthcare professionals’ standard clinical practice. Within the prospective acceptability study, the intervention received extremely positive feedback, was perceived to be strongly fit for purpose, remediated the behaviour change knowledge gap that healthcare professionals suggested that existing professional development courses had failed to do, and could be readily incorporated into CR/PR.

8.2 Recommendations for Practice

Stakeholder interviews highlighted a large knowledge gap in terms of healthcare professionals' explicit knowledge of behaviour change, which they largely perceived to be synonymous with motivational interviewing, with their competence based upon experiential learning. The 2018 NACR (British Heart Foundation, 2019) highlighted that only around 10% of CR services within the UK have a practitioner psychologist as part of their staffing model. Additionally, behaviour change is a central component of the BACPR definition of CR (Cowie et al., 2019), and the perceived increase in patients experiencing psychological distress (British Heart Foundation, 2019; Hinde et al., 2019), there appears to be a need for healthcare professionals working within CR/PR to receive training on behaviour change and the psychological elements of rehabilitation and illness. Chapter 6 demonstrated that healthcare professionals perceived training programmes of this sort to be inaccessible, and previous research has demonstrated that healthcare professionals often do not opportunistically deliver behaviour change interventions, such as MECC, as part of their routine clinical practice (Keyworth et al., 2018).

To remediate this, undergraduate training programmes on nursing, physiotherapy and other allied healthcare professionals should consider developing a behaviour change and psychology component that is bespoke to the needs of each profession's role. These components of healthcare professionals' training programmes should equip them with the skills and knowledge to deliver behaviour change interventions, as well as discuss specifically how such interventions can be routinely integrated into practice. This aligns with the COM-B model of behaviour change, by demonstrating that remediating the knowledge and skill deficit alone is insufficient to change behaviour (Michie, van Stralen, et al., 2011).

If research such as this thesis where a ‘bottom-up’ philosophy is adopted could continue to grow, a consensus of how different behaviour change theories and techniques can be operationalised in healthcare practice can be created. In turn, this may allow behaviour change to be considered as ‘the next’ EiM or PA in the sense that there will be increasing attempts to incorporate it into medical education discourses. EiM and PA are now increasingly incorporated into medical training and undergraduate healthcare professional training programmes (Pugh et al., 2020). However, there is an extremely strong evidence base for why patient should be physically active, and an increasingly detailed understanding relating to the types and intensities of PA that different clinical populations should engage in (Rhodes et al., 2017; Warburton et al., 2006). Clearly, the evidence base for delivering PA messages within healthcare settings is unquestionable. However, behaviour change interventions to date have only achieved equivocal findings, suggesting that currently research is failing to adequately explain how and why different theories that can be used to change behaviour are applicable to different clinical populations and settings.

The interest in the work contained within this thesis reflects the increasing interest in behaviour change within the field of cardiovascular disease (Suls et al., 2020), the need for interventions to be tailored to clinical settings so that they can be readily utilised by healthcare professionals (O’Cathain, Croot, Duncan, et al., 2019; Sekhon et al., 2018), as well as the need for an approach to dissemination that makes the findings as accessible to as broad a professional audience as is possible (Presseau et al., 2021). In relation to this thesis, future directions currently under discussion involve working in partnership with the British Heart Foundation to conduct a more rigorous pilot and feasibility study across CR services across the UK with the aim of refining the intervention so it is properly evaluated with a view to being improved further before being disseminated more widely. Additionally, given the impact of the COVID-19 pandemic on health services such as CR/PR, future interventions should consider how the behaviour change components of these services can be optimised during a time where remote service delivery is increasingly becoming the norm (Greenhalgh et al., 2020).

As behaviour change is perceived to play a key role in the treatment of a range of non-communicable diseases (Kelly & Barker, 2016), future research should consider behaviour change intervention development and implementation across a range of health contexts. For example, the BPS Obesity green paper (Perriard-Abdoh et al., 2019) was well-received and generated extensive interest across the public health domain. This is because it provided concrete practical recommendations, demonstrating to commissioners how best to improve obesity services that consider the psychological determinants of health (such as behaviour change) against a backdrop of widespread cuts to public health spending and increasingly stretched healthcare services (Kirchhelle & Dougan, 2020). As a research team, we are in talks to develop an e-learning package in partnership with Health Education England with the aim of beginning to remediate the currently growing concern that healthcare professionals in a range of health and care settings are perceived to be ill-equipped to deliver behaviour change in an evidence-based manner. However, a *"disruptive system change"* as Moore (2019, p.28) advocates is needed if we are to effectively remediate this behaviour change knowledge and skill, and potential motivational gap that appears to be endemic across a range of healthcare professions.

8.3 Future Research Directions

There are several potential future directions emanating from this thesis. Firstly, when commencing intervention work, teams should pay more attention to the intervention development stage, embracing ethnographic principles to ensure that theory is built productively in a way that is intimately related to the context that the intervention will operate within. Although ethnographic principles have been highlighted in relation to understanding the implementation of complex interventions and conducting process evaluations (Morgan-Trimmer & Wood, 2006), they appear to be infrequently used when developing interventions.

This thesis ended with an investigation into the perceived prospective acceptability of the PA intervention within a single CR/PR service. Given the evidence that PA should not be the sole focus of CR/PR programmes, future iterations of the interventions need to investigate the best way to develop and deliver behaviour change interventions that can impact multiple health behaviours. Additionally, future work needs to investigate the acceptability and feasibility of the intervention in other CR/PR services, highlighting changes that may be required to increase the acceptability of the intervention into services other than Knowsley's. In line with MRC (2008) guidance, pilot studies and RCTs could be used once iterative improvements have been made through these insights. Doing so aims to investigate the effectiveness of the intervention on healthcare professionals' level of competence in delivering behaviour change, as well as the effect on patients' levels of behaviour change throughout CR/PR and in the longer-term following discharge. From there, feasibility work could be conducted prior to a RCT with concurrent process evaluation, to investigate the effectiveness of the intervention as well how the intervention is able to exert an influent on patients' behaviours such as PA.

This thesis did not investigate how to investigate factors associated with the socioeconomic status of patients and how this may affect behaviour change. Given the finding that CR uptake is poorer in more deprived groups (Hinde et al., 2019), potentially reflective of the social gradient of cardiovascular disease, with higher rates of cardiovascular disease evident in more deprived groups (British Heart Foundation, 2019), this is important to investigate in future research. For example, future research could investigate how factors associated with increased deprivation may influence levels of PA behaviour change, and how interventions could be developed and implemented to counteract these health inequalities.

8.4 Reflection and Limitations

A key limitation of this research was in balancing the needs and expectations of an outstanding NHS foundation trust, an ever-evolving PhD project, academic research standards and practical delivery. This necessitated extensive reflection on how best to balance the demands of academia, healthcare professionals and patients. As discussed extensively at earlier stages of the thesis in relation to the MRC (2008) and other frameworks for intervention development, it was not feasible or ethically viable to conduct a randomised trial, as the same members of staff conduct CR/PR across the four centres in Knowsley. Upon commencing the PhD, the only conceivable methodology was perceived to be a randomised design, given the then-standard research methodologies in the trust associated with randomised designs, rather than adopting an in-house bottom-up approach to intervention development. This is understandable given that the research unit within this NHS trust has a world-leading reputation in leading multi-centre RCT trials of drug or surgery trials, and did not have extensive experience in hosting psychosocial or qualitative research. Therefore, there was initially some concern about how such a developmental piece of research would benefit the trust in the same way that a multi-centre RCT would.

Given my lack of experience in leading research projects, and certainly in leading projects in such a research-intensive organisation, this tension between what the trust perceived to constitute ‘good’ research, and what the intervention development scholars considered ‘good’ research contributed to some existential angst regarding how I could satisfy both parties. On reflection at the end of this PhD journey, I believe that the project would look entirely different if I were to do it again. Firstly, I would conduct a more extensive stakeholder engagement phase, with a more holistic method of sampling adopted to ensure that the perceptions of caregivers, spouses, the wider family network, consultants, and the wider CR/PR healthcare professional community were captured. This would enable a more diverse portfolio of views to be captured, and I believe would develop an even deeper understanding of the factors that the intervention should aim to target. My views are informed by the intervention development phase of REACH-HF (Greaves et al., 2016) which consulted each of these groups using a mixed-methods approach. I believe this is one of the strongest intervention development studies and should be replicated or used as an example of good practice more extensively.

Similarly, a mixed-methods approach to intervention development could have been adopted to further enhance the theoretical underpinnings of the thesis, by assessing how patients’ behavioural regulation changed throughout CR/PR. Doing so would further elucidate the claims in chapter 5 that initially, relatedness is the most salient psychological need in driving adherence to the programme, before competence and autonomy need satisfaction become increasingly important as the patient progresses through CR/PR. For example, if the Treatment Self-Regulation

Questionnaire (TRSQ) were used in this instance, it would be possible to understand why patients engage in PA. Such an approach has been used in numerous studies investigating a range of health behaviours by Williams and Colleagues (Williams et al., 1998), and is validated for use in healthcare settings (Levesque et al., 2007). In addition to the TSRQ, the Health Care Climate Questionnaire (HCCQ; Williams et al., 1998) could be used to provide to complement the findings within chapter 5 by providing a baseline measure of the level of autonomy support provided by healthcare professionals to patients through their communication behaviour. This would enable standardised measures to be used to aid understanding of if and how patients' behavioural regulation towards PA changes as they progress through CR/PR, and may also elucidate if certain patterns in behavioural regulation are synonymous with attrition from CR/PR, or readmission to the service.

I believe a real strength of this PhD is that it is both unashamedly contextually-relevant to the healthcare context, but theoretically-driven, with the aim of ensuring that it has high practical utility and acceptability to healthcare professionals. The importance I placed on ensuring that the views of Knowsley's healthcare professionals and patients are at the core of intervention development was beneficial as it was perceived to enhance the acceptability and relevant of the intervention to Knowsley's team. Practically, attempting to understand the service through both formal data collection and spending time shadowing clinics further enhanced the project by allowing me to build and maintain a positive working relationship with Knowsley's healthcare professionals. However, this could be considered a limitation of the project as data from a single CR/PR service was collected, meaning the extent to which the intervention is applicable and able to be translated into other settings is currently unknown. Although largely anecdotal, I have discussed the content of this thesis with healthcare professionals involved in CR/PR across the UK, as well as delivering professional development to other CR services outside Knowsley. In the vast majority of these conversations, the intervention was received positively, with several comments about how the research was extremely valuable and timely. I believe this bodes well for future feasibility work that could aim to investigate the extent to which the intervention could be delivered within other CR/PR services, as well as highlighting any modifications that need to be made to make the intervention more applicable to other CR/PR services.

8.5 Thesis Conclusions

The overarching aim of this programme of work was to develop and assess the acceptability of a physical activity behaviour change intervention aimed at healthcare professionals working in cardiac and pulmonary rehabilitation in Knowsley, UK. The project was perceived to be extremely successful in developing an intervention that evidenced a rigorous approach to intervention development, was strongly theory-based, and closely aligned with routine clinical practice in CR/PR. As previously demonstrated within chapter 3's systematic review, examples of work that satisfy all of these criteria appear to be the exception to the norm. The success of the project is further evidenced by the external interest in the project from the British Heart Foundation and CR/PR healthcare professionals across the UK who suggest that this project is extremely timely and would be beneficial if it could be further disseminated beyond Knowsley.

The project was conducted in a systematic manner to understand the existing policy recommendations (chapter 2), evidence base (chapters 2 and 3), evaluate and understand current practice within Knowsley's CR/PR service (chapters 4-6), rigorously develop the intervention, and assess its prospective acceptability (chapter 7). It is evident that although behaviour change is perceived to be a key component of CR/PR, healthcare professionals do not currently have the competence or experience in delivering optimised behaviour change interventions, and perceive opportunities to remediate this knowledge deficit to be largely inaccessible. Although this thesis provides an example of how healthcare professionals can be trained to deliver behaviour change interventions, work needs to be undertaken at a strategic level to understand how behaviour change can be integrated into undergraduate training programmes, as well as mitigating the barriers that are currently perceived to prevent healthcare professionals from remediating their psychological knowledge gap.

Novel interventions, such as this project, require significant time and financial investment and therefore need to be underpinned by theory and stakeholder engagement. However, given the high levels of acceptability of this project to healthcare professionals, similar approaches should be utilised if research is to challenge the currently dominant approach to research where knowledge translation is currently perceived to be an afterthought (Brownson et al., 2006). Given the high levels of acceptability and external interest in this project and intervention, there is potential for this intervention to be sustainable in Knowsley's service and delivered in other CR/PR programmes across the UK. However, before this can happen, future research should continue to refine the intervention, especially for wider health behaviours beyond PA, assessing how well it can change both healthcare professionals and patients' behaviours and how readily it can be incorporated into standard clinical practice. Most importantly, future research needs to be conducted in a similar manner to this thesis to begin to ensure that behaviour change interventions can finally fulfil their potential in improving the health of the population as far as possible.

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