Developing an intervention to enhance the engagement and motivation of stroke patients with cognitive impairment in physiotherapy rehabilitation programmes in Saudi Arabia

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Abstract

Introduction

Globally, a stroke occurs every two seconds, making it the second leading cause of death after ischemic heart disease. Strokes reduce quality of life and increase disabilities and are often associated with cognitive impairment (CI) with an increased dependency, risk of mortality, development of depression and poor quality of life. Indeed, the incidence of CI after stroke is relatively high, reported to affect 40-70% of stroke survivors, therefore CI after stroke is an important research priority as agreed by stroke patients, caregivers, as well as health professionals.

Post-stroke rehabilitation promotes functional recovery and independence of stroke survivors but CI after stroke is negatively associated with poorer functional outcomes. The presence of CI after a stroke can also affect the rehabilitation process as such stroke survivors may be less motivated and interested in rehabilitation programmes and engage in fewer therapy sessions. The concept of engagement and motivation is identified as a cognitive state, therefore, motivation and engagement in the physiotherapy treatment programme tend to be insufficient in stroke survivors with CI.

This thesis aimed to develop an intervention to improve engagement and motivation in physiotherapy treatment for stroke survivors with CI in the Kingdom of Saudi Arabia.

Methods

A mixture of methods approach with three interlinked studies was conducted within the development stage of the Medical Research Council (MRC) framework for the development of complex interventions. A scoping review (study one) was conducted to explore the engagement and motivation strategies used in physical therapy practice for stroke patients with cognitive impairment. Qualitative interviews (study two) with physiotherapists were conducted to identify the individuals and environmental facilitators and barriers to applying engagement and motivation strategies in the Saudi physiotherapy rehabilitation context.

These findings were combined with the use of a theoretical domain framework to develop a behaviour change intervention. The intervention was presented in programme theory using a logic model to demonstrate the visual pipeline consequence, highlighting the evidence-based findings, facilitators and barriers, selected behaviour change techniques, mechanism of action and intervention outcomes. After designing the logic model and explaining the intervention components, stakeholders were engaged using the nominal group technique (study three) to discuss the applicability of the behaviour change intervention in the local rehabilitation context and refine the logic model.

Results

The scoping review included 17 studies and indicated a lack of robust evidence on strategies used in physical therapy practice and how these strategies were applied and improved the level of engagement and motivation of stroke patients with CI during treatment. The engagement and motivation strategies identified were therapeutic interactions and communication, an enriched environment, the use of technology, and applying strategy training. The qualitative interviews conducted with twelve physiotherapists identified five facilitators, “Promising impacts”, “Professional responsibilities and treatment priority”, “Positive connections with patients and their families”, “Training and educational support”, and “Physiotherapists self-attitude” and four barriers, “Information and case identification”, “Organisational culture”, “Patient belief and circumstances”, and “Physiotherapists` awareness and self-confidence”. The stakeholder engagement activity was conducted with fifteen stakeholders including physiotherapists, heads of departments, quality managers and clinical researchers. The participants agreed that educational workshops and restructuring the physiotherapy department environment were extremely important (67%) or important (33%) behaviour change techniques to enhance professionals' skills and improve stroke rehabilitation services. Regarding changing protocols, more than a quarter of the participants (27%) were not sure that changing protocols would be an effective strategy to enhance physiotherapists' skills and stroke patient outcomes. They attributed this to physiotherapists'

negative attitude regards using the rehabilitation protocols, the long process to change protocols, frequent changes in the rehabilitation protocols and organisational pressure to develop protocols for accreditation purposes. These responses were used to amend the logic model and intervention.

Conclusion

This thesis highlighted the complexity of patient engagement and motivation, as well as the role of individual and environmental factors in supporting stroke patients with CI engagement and motivation in rehabilitation programmes. The study explored the facilitators and barriers to applying engagement and motivation strategies in the Saudi rehabilitation context and acknowledged the individual and organisational barriers. Consequently, a theoretically driven behaviour change intervention was developed to improve the engagement and motivation of stroke patients with CI in physiotherapy rehabilitation programmes. The thesis concluded with recommendations and suggestions regarding improving the rehabilitation services for stroke patients with CI, considering engagement and motivation and further researching different strategies to support them. It also provided recommendations for policymakers in the Saudi rehabilitation context to improve the services provided for stroke patients with CI and the importance of multidisciplinary collaboration to support patients' outcomes and treatment services.

Following the intervention development, research is needed to deliver and evaluate the behaviour change intervention for improving the engagement and motivation of stroke patients with CI.

Poster presentations

- Alshaibani, F; Logan, P; Yates, J; Robinson, K: *What are the facilitators and barriers to implementing strategies to enhance the engagement and motivation of stroke patients with cognitive impairment with a physiotherapy treatment programme? A qualitative study*; Welsh stroke Virtual conference 2022.

- Alshaibani, F; Logan, P; Yates, J; Robinson, K*: Strategies to improve stroke survivors with cognitive impairment engagement and motivation to Physical Therapy programmes: A scoping review;* Welsh stroke Virtual conference 2022.

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Declaration

I declare that this thesis is my original work and has not been submitted for any other degrees.

Table of Contents

Abstract II
Poster presentations V
Acknowledgements VI
Declaration VII
Table of Contents VIII
Table of figures XIV
Table of tables XIV
Abbreviations XV
1 Literature review 1
1.1 Stroke 1
1.1.1 Background 1
1.1.2 Types 3
1.1.3 Risk Factors 4
1.1.4 Stroke recovery and rehabilitation 5
1.2 Cognitive impairment 7
1.2.1 Definition 7
1.2.2 Post-stroke cognitive impairment 7
1.2.3 Prevalence 8
1.2.4 Cognitive impairment assessment tools 9
1.2.5 Impact of cognitive impairment on stroke recovery 10
1.2.6 Reversibility 11
1.3 Engagement 11
1.3.1 The nature of engagement in rehabilitation 13
1.3.2 Facilitators and barriers to engagement in post-stroke rehabilitation 16
1.3.3 Cognitive impairment as a barrier to patient engagement 17
1.3.4 Engagement level according to specific cognitive domains 18
1.3.5 Engagement outcome measurements in physiotherapy programmes 19
1.4 Motivation 20
1.4.1 Ways to improve patient motivation 23
1.4.2 Motivation outcome measurements in stroke physical therapy programmes 24
1.5 Theory for engagement and motivation 26
1.6 The link between engagement and motivation 28

1.7 Summary 28

1.8 Healthcare in Saudi Arabia 29

1.9 Study rationale 31

1.10 Research questions 32

2 Research Methodology 34

2.1 Medical Research Council (MRC) framework 34

2.2 Research Approach 37

2.2.1 Criticisms of MMR 39

2.2.2 MMR designs 41

2.3 Research Paradigms 43

2.3.1 Paradigms used in this research 46

2.4 Justification for using a mixture of methods research approach and research objectives 48

2.4.1 Exploring the research topic 49

2.4.2 Qualitative interviews 50

2.4.3 Development of the programme theory 51

2.4.4 Stakeholder engagement 51

2.5 Conclusion 52

3 Strategies to improve motivation of stroke survivors with cognitive impairment to engage with physical therapy programmes: A scoping review 54

3.1 Introduction 54

3.2 Background 55

3.3 Method 57

3.3.1 Stage 1 Research question 57

3.3.2 Stage 2 Identifying relevant study 58

3.3.3 Stage 3 Study selection 59

3.3.4 Stage 4 Data charting 59

3.3.5 Stage 5 Collating, summarising, and reporting the results 61

1.1 Identification 62

2.1 Screening 62

3.1 Eligibility 62

4.1 Included 62

3.4 Discussion 75

3.4.1 Implications 78
3.4.2 Strengths and limitations 80
3.5 Conclusion 80

4 Theoretically driven behaviour change frameworks 82
4.1 Introduction 82

4.2 Behavioural change interventions 83

4.3 Behaviour change techniques 86

4.4 Frameworks to identify behavioural facilitators and barriers 88

4.5 Behaviour change intervention in stroke rehabilitation 96

4.6 Conclusion 99

5 Physiotherapists' perspectives of the facilitators and barriers of applying engagement and motivation strategies with stroke patients with cognitive impairment in the Saudi rehabilitation context: A qualitative descriptive study 100
5.1 Introduction 100

5.2 Methods and methodology 103

5.2.1 Qualitative study approach 103
5.2.2 Theoretical frameworks 106
5.2.3 Study design 109
5.2.4 Interview topic guide 113
5.2.5 Reporting guidelines 116
5.2.6 Ethical considerations 117
5.2.7 Study sample 118
5.2.8 Data collection 120
5.2.9 Data analysis 121
5.2.10 Study quality and rigour 127
5.3 Results 129

5.3.1 Participant characteristics 129
5.3.2 Findings 130
5.3.3 Barriers 134
5.3.4 Facilitators 140
5.4 Discussion 147
5.4.1 Increasing educational support 147
5.4.2 Patients not valuing physiotherapy 150
5.4.3 Organisational culture impact on physiotherapists' practice during stroke rehabilitation 152
5.4.4 Physiotherapists' beliefs and attitudes can facilitate applying engagement and motivation strategies 155
5.4.5 Study strengths and limitations 155
5.5 Conclusion 156
6 A logic model design for planning the intervention 157
6.1 Introduction 157
6.2 Background 157
6.2.1 Programme theories 157
6.2.2 Logic models 158
6.3 Methods 163
6.3.1 The logic model development 164
6.4 Results 165
6.4.1 Implementation Research Logic Model Elements 167
6.4.2 The selected behaviour change techniques and implementation strategies in the intervention planning 172
6.4.3 Mechanism of change development 174
6.4.4 Outcomes development 177
6.5 Discussion 178
6.6 Conclusions and the next steps 180
7 A study to explore stakeholders' views regarding the use of Behaviour Change Interventions to improve rehabilitation engagement: a nominal group technique design ... 181
7.1 Introduction 181
7.2 Background 181

7.3 Methods 183
7.3.1 Ethical approval 183
7.3.2 Stakeholder recruitment 184
7.3.3 Sample 184
7.3.4 Consent 185
7.3.5 The Nominal Group Technique 186
7.3.6 Data analysis 191
7.4 Results 197
7.4.1 Voting findings 198
7.4.2 Nominal group findings 199
7.5 Discussion 206
7.5.1 Logic model update 208
7.5.2 How will SE impact the intervention design and delivery? 210
7.6 Conclusion 210
8 Thesis Discussion and Conclusion 211
8.1 Introduction 211
8.2 Summary of the findings 211
8.2.1 Scoping review findings 214
8.2.2 Qualitative study findings 215
8.2.3 Stakeholder engagement findings 216
8.3 Role of the TDF in exploring the determinants and developing an intervention 216
8.4 PSCI in physiotherapy rehabilitation programmes 218
8.5 The complexity of the patient engagement and motivation concepts in stroke rehabilitation programmes 220
8.6 Behaviour change interventions and their role in supporting patient engagement and motivation 223
8.6.1 Educational workshops 224
8.6.2 Restructuring and changing policies 225
8.7 Implications 226
8.7.1 Achieving the Ministry of Health Vision 226

8.7.2 Implications for practice 226
8.7.3 Tailoring behaviour change interventions to specific cultural contexts 227
8.8 Future research 228
8.9 Covid-19 impact statement on research activities 229
8.10 Strengths and limitations 230
8.11 Conclusion 232
9 References 233
10 Appendixes 266
10.1 Appendix 1: Scoping review search strategy: 266
10.1.1 AMED search strategy last update 31.03.2023 266
10.1.2 Madeline and EMBASE search strategy last updated 31.01.2023 267
10.1.3 CINAHL search strategy last update 31.03.2023 268
10.2 Appendix 2: Study eligibility form 269
10.3 Appendix 3: CASP tool checklist 271
10.3.1 CASP checklist for qualitative studies: 271
10.3.2 CASP checklist for RCTs 277
10.4 Appendix4: COREQ checklist 282
10.5 Appendix 5: ethical approval University of Nottingham 284
10.6 Appendix 6: Ethical approval from local health affairs department 285
10.7 Appendix 7: Participant's information sheet: 286
10.8 Appendix 8: Qualitative study consent form: 291
10.9 Appendix 9: Example of qualitative study initial codes: 292
10.10 Appendix 10: qualitative study data analysis (searching for themes) 293
10.10.1 Example 1 of qualitative analysis categorisation process 293
10.10.2 Example 2 of qualitative study categorisation process 293
10.10.3 Example 3 of categorisation process 294
10.11 Appendix 11: BCTs taxonomy 295
10.12 Appendix 12: Implementation strategies taxonomy (n= 73) 296

10.13 Appendix 13: Stakeholder engagement study PowerPoint presentation..... 297

10.14 Appendix 14: Stakeholder engagement voting question..... 302

Table of figures

Figure 2-1: MRC framework for developing and evaluating complex intervention..... 37

Figure 2-2: The phases in developing the intervention to enhance engagement and motivation in physiotherapy rehabilitation programmes..... 49

Figure 3-1: PRISMA flow chart for search strategy findings..... 62

Figure 6-1: The implementation research logic model used in this study..... 164

Figure 6-2: The logic model research study 166

Figure 6-3: Behaviour change techniques and implementation strategies linked with lack of knowledge and skills determinants..... 171

Figure 6-4: Behaviour change techniques and implementation strategies linked with organisational culture and policies determinants. 171

Figure 7-1: Voting results for the applicability of delivering educational workshops, changing stroke rehabilitation protocols and the physiotherapy department environment..... 198

Figure 7-2: Refined logic model 209

Table of tables

Table 1-1 Stroke risk factors 4

Table 2-1 Research paradigms..... 45

Table 3-1 The characteristics of included studies and quality assessment scores..... 63

Table 4-1 TDF domains, definitions, and domains construct 92

Table 5-1: Interview structure continuum..... 110

Table 5-2: Interview question guide..... 115

Table 5-3: Participant characteristics 130
Table 5-4: Barriers to applying engagement and motivation strategies 131
Table 5-5: Facilitators of applying engagement and motivation strategies..... 132
Table 6-1: Types of logic model 160
Table 6-2: Behaviour change techniques and their potential mechanism of action..... 175
Table 7-1: Nominal group technique phases 187
Table 7-2: A topic guide for the physiotherapists and stakeholders meeting 188
Table 7-3: Example of the developed analytical framework..... 195
Table 7-4: Example of the developed analytical matrix..... 196
Table 7-5: Participant's characteristics..... 197
Table 7-6: Identified themes of applying behaviour change intervention to rehabilitation settings from participants` perspectives 200
Table 8-1: Key actions of developing a complex intervention and their achievement in this study 212

Abbreviations

BCI	Behaviour Change Intervention
BCTs	Behaviour Change Techniques
CASP	Critical Appraisal Skills Programme
CI	Cognitive Impairment
HCPs	Health Care Professionals
IRLM	Implementation Research Logic Model
KSA	Kingdom of Saudi Arabia
MMR	Mixed Methods Research
MRC	Medical Research Council
NGT	Nominal Group Technique

PT	Physiotherapy
PSCI	Post Stroke Cognitive Impairment
RCTs	Randomised Controlled Trials
SDT	Self Determination Theory
SE	Stakeholder Engagement
TA	Thematic Analysis
TDF	Theoretical Domain Framework
UK	United Kingdom

1 Literature review

This chapter provides a broad overview of stroke and its types, risk factors, rehabilitation, and recovery, followed by a discussion of Post Stroke Cognitive Impairment (PSCI), including its definition, prevalence, assessment tools, impact on stroke recovery, and reversibility. This is followed by an overview of engagement by highlighting the engagement concept in rehabilitation, the impact of PSCI in rehabilitation outcomes, and engagement level according to specific cognitive domains.

This chapter also discusses motivation by highlighting its definition, sources, connection with cognition, the role of motivation in the rehabilitation process and factors affecting the level of motivation, as well as the ways to improve motivation and outcomes used to measure motivation in rehabilitation programmes. The theory of engagement and motivation and the reasons for linking engagement and motivation in this research are also highlighted. Finally, the research project rationale is highlighted by relating to the current gap in stroke services and rehabilitation in the Kingdom of Saudi Arabia (KSA) and the research gap in the engagement and motivation for PSCI.

1.1 Stroke

1.1.1 Background

Stroke or Cerebrovascular Accident (CVA) is clinically defined as "a neurological deficit attributed to an acute focal injury of the central nervous system by a vascular cause" (Sacco et al., 2013).This is the chosen definition for this research as it encompasses all scenarios of stroke that are related to thrombotic and haemorrhagic causes, and also captures the acute focal injury and vascular origins of the condition. Although some critics have pointed out that this definition does not account for certain key aspects like

pathology, nature and duration of symptoms (Cheung, 2014, Coupland et al., 2017) , it remains clinically relevant and comprehensive in covering all types of strokes. Stroke is the second cause of death worldwide and a major cause of disability (GBD, 2015). There has been a significant increase of around 70% in stroke incidence in the last two decades (1999-2019), with an estimated 12.2 million people experiencing stroke annually (Feigin et al., 2022). Stroke has a huge socioeconomic impact due to stroke-related disabilities, which are costly on healthcare, family and societal levels (Carod-Artal and Egido, 2009). In the United Kingdom (UK), the annual cost of stroke in 2015 was £25.6 billion per year, including health care, social care, informal care, and lost productivity costs, however, this cost is expected to rise to £43 billion by 2025 (Patel, 2017).

There is a lack of data on stroke prevalence in the KSA (Alahmari and Paul, 2016, Memon et al., 2019), with no recent nationwide data on the prevalence and incidence of stroke. The available evidence indicates that stroke incidence in the KSA occurs at a rate of 28.9 per 100000 people based on data from two decades ago (Al-Rajeh et al., 1998) and the estimated rate of first stroke occurrence is around 50.9 per 100,000 person/years based on the current population distribution (Al-Senani et al., 2019a). Considering the ageing population and higher stroke risk among older individuals, the number of first strokes is anticipated to rise from 16,900 to 28,400 in the coming decade (Al-Senani et al., 2020), suggesting the prevalence of stroke in the KSA is low compared with Asian and Western countries (Alahmari and Paul, 2016) possibly due to the predominance of a younger population. However, to provide stroke services and rehabilitation that match the increasing number of stroke survivors in KSA, it is necessary to have current data regarding stroke incidence to inform an awareness of the workforce required

for stroke services, infrastructure, and policies to ensure high-quality care for the stroke population.

1.1.2 Types

Stroke is divided into three main types ischaemic, haemorrhagic stroke, and transient ischaemic attack.

1.1.2.1 Ischaemic (infarction) stroke

Ischaemic stroke is caused by a blockage in the blood supply to the brain. The infarction may be thrombotic, embolic, or lacunar cerebral. Thrombotic cerebral infarction results from atherosclerosis obstructions of large cervical or cerebral arteries. The embolic cerebral infarction is caused by a blood clot(s) coming from another arterial system, such as a result from a cardiac lesion. Lacunar cerebral infarctions are caused by a small deep infarct in an artery, usually caused by hypertension (Feske, 2021). Ischaemic stroke is considered to be the most widely known type of stroke with approximately 85% of all stroke injuries being due to ischaemic stroke (NICE, 2016).

1.1.2.2 Haemorrhagic stroke

This type of stroke is caused by bleeding in or around the brain. Intracerebral haemorrhages are the most common, mainly caused by arterial hypertensive disease. Subarachnoid haemorrhage (SAH) rarely occurs, being caused by a rupture of the large arteries at the inferior surface of the brain. Approximately 10% of strokes are due to intracerebral haemorrhage, and 5% are due to subarachnoid haemorrhage (NICE, 2016).

1.1.2.3 Transient ischaemic stroke

Transient ischaemic attack (TIA) is defined as similar to a stroke - except that the signs and symptoms last less than 24 hours. A recent imaging-based definition of a TIA is an event that lasts less than an hour without causing any

cerebral infarct (Easton et al., 2009). The estimation of the frequency of occurrence of TIA in the UK is that 50 out of every 100,000 members of the population each year experience from it (NICE, 2016). There is a risk with TIA that it can develop into an ischaemic stroke, especially in the short term. An estimated 10% of TIA cases develop into strokes within 90 days or, within a longer period, during the first year (Easton et al., 2009). It has also been reported that around 30% of all strokes occur in people who previously experienced TIA (Rothwell et al., 2011). Therefore, urgently diagnosing and treating a TIA is essential - before it develops into a stroke.

1.1.3 Risk Factors

According to American Stroke Association (2023) , 80% of stroke incidence can be preventable. Therefore, managing the factors causing strokes is essential to minimise stroke occurrence. The risk factors are divided into those which are modifiable and those which are not. Hypertension is the most important modifiable risk factor associated with two third of all strokes (Hennerici, 2013). Age is the most important non-modifiable risk factor - only an estimated 10-15% of strokes occur in people under 50 years old (Ekker et al., 2019)— Table 1-1 adapted from (Hennerici, 2013),which provides a list of all the risk factors.

Table 1-1 Stroke risk factors

• **Non-Modifiable risk factors**	
Age	Family history
Sex	Genetic diseases e.g. (Moya-moya disease)
Race	

- **Modifiable risk factors**

Hypertension	Sodium intake >2.300 mg
Physical inactivity	Cardiovascular diseases Potassium intake <4.700 mg
Diabetes mellitus	High cholesterol
Diet	Cerebral artery disease
Smoking	Coronary artery disease
Dyslipidaemia	Sickle cell disease
Cerebral artery disease	Obesity
Peripheral artery disease	Non-valvular atrial fibrillation
Environmental and social life-style factors	Excessive alcohol consumption
Arteritis/vasculitis	Arterial dissection
Drug abuse	

1.1.4 Stroke recovery and rehabilitation

Stroke can cause various levels of disability. Motor functions are considered to be the most recognised impaired functions which affect the control of movement of the face, arm, and leg of one side of the body and affect about 80% of patients (Langhorne et al., 2009). Stroke also causes a significant range of non-motor disabilities, including sensory, cognitive, psychological, and visual impairment

(Brewer et al., 2013, Kouwenhoven et al., 2011, Hunter and Crome, 2002, Sun et al., 2014). Stroke recovery is a complex process. Several factors were reported to influence stroke recovery. For instance, a review by Alawieh et al. (2018) has mentioned a range of factors affecting stroke motor recovery: including patient age, type of stroke, patient gender, socioeconomic status (e.g. educational level and income), stroke severity, post-stroke-depression, co-morbidities, timing and dosage used in rehabilitation programmes, and genetic factors. Moreover, post-stroke fatigue, depression, anxiety, vascular CI (Lanctôt et al., 2019), dysphasia and incontinence (Lawrence et al., 2001) are all common consequences of strokes which impede recovery. Referring to all possible disabilities that might occur prior to the stroke and providing appropriately structured and equipped healthcare settings is essential to manage stroke-related impairments better (Wasti et al., 2021).

Post-stroke rehabilitation is an essential component of stroke management. Stroke rehabilitation is defined by Hebert et al. (2016) as a progressive, dynamic, goal-oriented process to enable stroke survivors to reach their optimal physical, emotional, communicative, cognitive, social and functional activity levels. Stroke rehabilitation is provided by a multidisciplinary team: including nurses; occupational therapists; physiotherapists; speech and language therapists; consultant physicians; clinical psychologists; social workers, and rehabilitation assistants ((NICE), 2019). Physiotherapy (PT) is a major component of stroke rehabilitation; this involves practising exercises and therapeutic physical activities in order to regain motor control and functional performance (Van Peppen et al., 2004). The PT treatment for stroke survivors` may well decrease spasticity and joint stiffness, increase range of motion, increase muscle strength, enhance balance, decrease pain, and enhance gait parameters (Van Peppen et al., 2004), thereby enhancing functional independence and quality of life after stroke.

1.2 Cognitive impairment

1.2.1 Definition

Cognition has been defined as an individual's ability to acquire, store, transform, and use knowledge (Matlin and Farmer, 2017). The Institute of Medicine (2015) defines cognition as the mental functions that involve attention, thinking, remembering, understanding, learning, solving problems, and making decisions. This definition is particularly relevant to this thesis as it represents the nature of cognition and the use of cognitive functions during the rehabilitation process. Cognitive functions represent a fundamental attribute of individuals, allowing them to engage in activities, achieve goals, and successfully negotiate with the surrounding world (Institute of Medicine, 2015). Cognitive functions normally start to decline with increasing age. They may also decline due to several, more specific, causes such as stroke, depression, and cancer (Institute of Medicine, 2015). CI can be defined as a decline in one or more functions within the cognitive domains such as memory, attention and executive functions (Allen and Loughan, 2018). CI may well lead to a reduced quality of life, and physical and social dysfunction (Kurz et al., 2003, Frank et al., 2006).

1.2.2 Post-stroke cognitive impairment

There are several terms used to describe CI after stroke, such as Post Stroke Cognitive Impairment (PSCI), multi-infract dementia, poststroke dementia, and vascular dementia (Gorelick et al., 2011b). One of each has different criteria for diagnosis. The term Vascular Cognitive Impairment (VCI) is also used for PSCI. VCI is a broad term that covers all forms of VCI, from Mild Cognitive Impairment (MCI) to VaD and includes cases with various differing pathologies, such as vascular and Alzheimer disease pathologies (Gorelick et al., 2011a, Skrobot et al., 2016). VCI is defined as a syndrome associated with CI which affects at least one cognitive domain, such as attention, language or memory, where there is

evidence of stroke or brain injury (Lanctôt et al., 2019). Therefore, the PSCI is combined as all cognitive problems occur following stroke (Rost et al., 2022).

1.2.3 Prevalence

The prevalence of PSCI varies due to divergences in terminology, assessment criteria, and timing (Brainin et al., 2015). In a systematic review conducted by Sexton et al. (2019), the prevalence of PSCI was 39% within the first year following a stroke. This study incorporated 21 articles and a total of 1680 participants who had non-dementia cognitive impairment, which was defined similarly to VCI. The review employed studies that used different terms that fit the criteria of cognitive impairment non-dementia, such as MCI. In another systematic review by Lo et al. (2019), the prevalence of PSCI within two to six months after a stroke was 44%. This review consisted of 13 studies from 8 countries and a total of 3146 participants who had experienced a stroke or TIA, including participants with MCI and dementia criteria in the data analysis for PSCI prevalence. These studies demonstrated a high prevalence of PSCI in their participants, however, these examples reflect the difficulty of determining PSCI prevalence due to the terminology and assessment criteria disparities.

Regarding assessment timing, the prevalence of PSCI is higher (62-70%) in acute stroke (3-6 months after stroke) (Rasquin et al., 2004, Yu et al., 2013) compared to approximately 35% prevalence in chronic stroke (one year after stroke) (Arba et al., 2017, Pendlebury and Rothwell, 2019). Overall, the evidence from existing literature indicates that the CI prevalence among stroke survivors is relatively high but some studies argue that the frequency of PSCI has been underestimated (Bour et al., 2010, Sun et al., 2014), underdiagnosed in clinical practice and has not been sufficiently searched (Quinn et al., 2021), and may sometimes have been ignored (McKevitt et al., 2011). Thus, the Canadian post-stroke recommendation states that all stroke and TIA survivors should be

considered as being at risk of VCI and therefore, should be screened for it (Lanctôt et al., 2019).

1.2.4 Cognitive impairment assessment tools

CI can be diagnosed via a number of different tools. Neuroimaging, including Computerised Tomography (CT) and Magnetic Resonance Imaging (MRI) is one of the medical tools most used to detect PSCI; both techniques can provide anatomical and structural information about brain lesions and can help in tracking the changes in the brain (Wattjes et al., 2009, Heiss and Kidwell, 2014). Both diagnostic imaging tools accurately detect cognitive impairment after stroke through identifying biomarkers in the brain such as white matter changes and cerebral atrophy (Casolla et al., 2019, Ball et al., 2022). Furthermore, clinical assessment tools such as Montreal Cognitive Assessment (MoCA) and Mini-Mental State Examination (MMSE) are widely used to detect PSCI. MoCA is a patient reported screening instrument used with older patients to diagnose MCI and its 30-point scoring test evaluates several cognitive domains, including executive functions, attention, visuospatial abilities, short-term memory recall, working memory, language, concentration, and orientation to time and place (Nasreddine et al., 2005). MMSE is also a similar screening tool used to assess CI. It consists of 11 questions evaluating seven cognitive domains, including the registration of three words, the recall of three words, orientation in time, the use of language, attention and calculation abilities, visual construction, and orientation in terms of place (Folstein et al., 1975). Both MMSE and MoCA have high sensitivity and specificity concerning detecting PSCI: MMSE: 82%,76%; MoCA: 92%, 67% - sensitivity and specificity respectively (Cumming et al., 2013). Therefore, both MMSE and MoCA are suggested as suitable tools for detecting PSCI (Shen et al., 2016, Shi et al., 2018).

These measurement tools are examples of the most reported tools in the literature used to assess PSCI but they have some limitations. For instance, the MMSE and MoCA assessments are less feasible in the acute stroke stage (Pendlebury et al., 2015) and do not assess all cognitive domains. For example, MoCA assessed cognitive functions only when a stroke patient did not have language and visuospatial impairments (Pendlebury et al., 2015), whereas the MMSE tool does not provide a detailed assessment of executive functions and language (Lees et al., 2012). Moreover, CT and MRI scans are limited by accessibility and cost. Therefore, the limitations of the screening tools must be considered because there is no standard tool recommended, instead cognitive screening should be based on aspects such as accessibility, cost, feasibility, and training (Quinn et al., 2021).

1.2.5 Impact of cognitive impairment on stroke recovery

PSCI also has a negative impact on the rehabilitation process. Stroke PT rehabilitation practice is based on task-specific training, goal setting and planning (Wade, 2009, Langhorne et al., 2011). Therefore, patient involvement is essential as the PT session requires skills, knowledge, and learning from stroke patients. It should involve cognitive tasks such as attention, memory and executive functions, including decision-making, planning, and switching between tasks (Pyöriä et al., 2007). The impact of PSCI in the rehabilitation process has been recognised in several studies. For instance, PSCI has been reported to decrease the ability of stroke survivors to participate in rehabilitation sessions (Skidmore et al., 2010a, Spitzer et al., 2011, Viscogliosi et al., 2011a). Therefore, the cognitive abilities of stroke survivors should be considered as these affect their abilities in terms of understanding, applying, and remembering set tasks.

1.2.6 Reversibility

PSCI may be reversible in the case of around 20% of stroke survivors and it mostly occurs in the acute stages of a stroke (Rasquin et al., 2005). However, PSCI may well remain longer even when a good functional recovery is made (Ballard et al., 2003, Schaapsmeerders et al., 2013). Therefore, managing CI after stroke is necessary in order to overcome further cognitive decline. Unfortunately, no cure is available which can stop the deterioration of cognitive functions after stroke (Brainin et al., 2015, Sun et al., 2014). However, many interventions have been suggested: such as pharmacological treatment (e.g. Donepzil) (Román et al., 2010); physical training, e.g., aerobic and resistance training (Cumming et al., 2012, Oberlin et al., 2017); and cognitive training (Wentink et al., 2016). These interventions are all intended to enhance cognitive functions and so minimise the cognitive decline experiences by stroke survivors.

1.3 Engagement

Patient engagement in rehabilitation sessions is essential for the support of recovery. Several studies have argued that the benefit yielded by rehabilitation programmes is limited when patients are not fully engaged in the therapeutic tasks (Kortte et al., 2012, Medley and Powell, 2010, Skidmore et al., 2010a). Low engagement or disengagement in acute stroke is also indicative of an increased length of stay in hospital and can lead to poor functional recovery (Paolucci et al., 2012, Lenze et al., 2004b).

The World Health Organisation (WHO, 2016) defined patient engagement as "the process of building the capacity of patients, families, carers, as well as healthcare providers, to facilitate and support the active involvement of patients in their care, in order to enhance safety, quality and people-centeredness of health care service delivery". Improving patient engagement in healthcare services is suggested to increase patient satisfaction and achieve positive

outcomes (Prey et al., 2014). Engagement in rehabilitation, as defined by Lequerica and Kortte (2010a), is the commitment of effort to working toward a rehabilitation programme's goals; this should naturally be achievable through active, effortful participation and cooperation in treatment sessions. This definition focused on engagement as a concept related to patient behaviour. In this thesis, the concept of engagement is considered to be a complex phenomenon that goes beyond just the behaviour of the patient. Therefore, the thesis adopts the definition of engagement proposed by Bright et al. (2015) as a co-constructed process encompassing the relationship between the patient, the clinicians, and the health service. Rehabilitation engagement is demonstrated by adherence, compliance, attendance, and participation in treatment sessions (Lequerica and Kortte, 2010a), as well as body language and nonverbal actions (Simmons-Mackie and Damico, 2009). Therefore, rehabilitation engagement can be observed as the patient's behaviour and communication throughout the rehabilitation process.

Engagement in rehabilitation can include the rehabilitation professional's communication and interaction. According to Bright et al. (2015), engagement has two core components which can be represented as a process (engaging with) and a state (engaging in). From the process (engaging with) prospective, the concept of engagement is focused on the mutual relationship between the patient, clinician, and the health service setting. This concept highlights the importance of the clinician's attitude and behaviour, the correct performance of which requires having communication skills, showing empathy, and having the ability to encourage and help patients achieve rehabilitation goals through listening, asking, and advising. The state (engaging in) prospective is the concept of engagement as related to patient actions and behaviours in terms of therapeutic tasks, including active participation, energy and effort, enthusiasm,

interest in activities, and relationships with other patients. Active engagement in this concept has been suggested through several markers such as patient attendance to the therapy session, willingness to participate, contribution to the sessions, the quality of relationship with the rehabilitation therapists and other patients, attitude toward help and therapy, and collaboration in rehabilitation planning. These engagement components describe engagement as a complex concept highlighting the importance of environmental and personal factors to achieve better engagement for stroke survivors.

1.3.1 The nature of engagement in rehabilitation

The nature of engagement in rehabilitation is addressed in the rehabilitation literature. For instance, King and colleagues investigated the nature and concept of engagement. King et al. (2021) conducted an ethnographic study to investigate the paediatric clients, caregivers and rehabilitation practitioners' engagement in rehabilitation sessions, suggesting that rehabilitation practitioners' engagement was higher than the youth in the therapeutic sessions. The themes identified for the engagement-related constructs were engagement and disengagement influenced by expectations. The expectations in this construct were mainly relevant to rehabilitation practitioners, highlighting the engagement influenced by expectations of rehabilitation practitioners' own and others' roles and their beliefs of how the outcomes are achieved. This construct focused on engagement as a cognitive mindset. The other theme is related to positive affect and relationships, reflecting that rehabilitation team engagement and enthusiasm as a facilitator of patients and their caregivers' engagement led to building a positive relationship. This construct represented the engagement as affective and interpersonal in nature. The last theme related to engagement as strongly associated with relationships and collaboration. This theme described the relationships (trust, comfort) as facilitators to the cooperation, which developed

into a mutual engagement where the client and rehabilitation providers work together. This theme constructed the engagement in a behavioural sense. Moreover, another study by King et al. (2020b) examined different stakeholders' (youth, caregivers, rehabilitation providers) perspectives of the nature, value, and experience of engagement in paediatric rehabilitation programmes, supporting engagement as connections, engagement as working together, and engagement as an effective and motivational process. These studies suggest the engagement in paediatric rehabilitation as a complex system of psychosocial constructs conducted in the rehabilitation sessions, as well as highlighting the rehabilitation professionals as facilitators to initiate the active engagement of patients and their caregivers. However, these studies did not highlight how other factors could link to the process of engagement such as environmental, policy and patient factors (e.g., intelligence, independence).

Other studies emphasised the engagement concept as the therapeutic interaction and communication during the rehabilitation process. For instance, a study in physiotherapy by Miciak et al. (2018) discussed engagement from the perspective of therapeutic relationships between patients and physiotherapy providers. The study described the conditions necessary to establish therapeutic relationships that enhance the engagement of patients and physiotherapy providers. These conditions were present, receptive, commitment, being genuine. Present focused on physiotherapists and patients being in the moment and concentrating on the session time to facilitate engagement as the physiotherapist can have awareness of the treatment process and patient practice and interaction. Receptive focused on physiotherapists and patients to have an open attitude to discuss the treatment plans and activities and identify the important needs and issues in the treatment sessions. The open attitude encounters physiotherapists offering their knowledge and skills to listen to patient

stories, including their fears and issues during rehabilitation tasks. It also involved physiotherapists` concentration on patient’s verbal and non-verbal cues to foster deep engagement and understanding of their physical and psychological struggles and have a sense of their behaviours and actions during rehabilitation sessions.

Commitment focused on the physiotherapist's and patient's commitment to their roles in the therapeutic relationships. It includes the physiotherapist's and patient’s commitment to understanding the patient's situation and rehabilitation programme process, as well as the physiotherapist's commitment to action by making efforts and applying all personal and professional skills to support patients to achieve the desirable outcomes. The last condition discussed was the physiotherapists and patients being genuine during the rehabilitation sessions. Being genuine and accepting of patients' values, personalities, and backgrounds helps create a safe space for them to be themselves during physiotherapy sessions. This can lead to a more successful recovery as patients feel at ease and are more likely to open up. It also includes patients and physiotherapists to ensure honesty. The study refers to transparency and directness as the main qualities in describing honesty. Transparency reflects patients and therapists sharing necessary information such as outcome expectations and the physiotherapist’s role and responsibilities for safe and meaningful progress and involves patients being honest about their condition and progress. Directness allows physiotherapists to communicate clearly and directly, even in difficult situations.

These findings supported engagement in physiotherapy as related to therapeutic interaction, which focused on the engagement concept as social interactions and behaviours. The study showed the importance of physiotherapists' knowledge, communication skills and personalities to initiate the therapeutic connection and

support patient engagement in rehabilitation. However, this study focused on the physiotherapists as a centre for therapeutic interaction and engagement and did not focus on the patient's role in engagement. Furthermore, the study was conducted in a private clinic, so the findings may not be generalisable to other clinical settings such as hospitals and rehabilitation centres where the practices, roles and systems are different. Overall, all provided evidence about the concept of engagement in rehabilitation highlighted that engagement is a complex process encompassing professional, environmental, and personal involvement to achieve active engagement.

1.3.2 Facilitators and barriers to engagement in post-stroke rehabilitation

Several facilitators and barriers to engagement in stroke rehabilitation were highlighted in systematic reviews (MacDonald et al., 2013, Forgea et al., 2021) which can be grouped into two categories, patient-related and rehabilitation programme planning and delivery-related facilitators and barriers. Regarding stroke patients, the barriers suggested to patient engagement were the stroke impact and associated complications such as age spasticity, communication deficits, CI, visual deficits and physical impairment. These barriers related to the stroke severity were a key barrier to predicting patient engagement, as well as patients' educational levels as stroke patients engaged better in the rehabilitation when they understood the rehabilitation goals and process.

Regarding rehabilitation programme planning and delivery, goal setting was suggested as an important factor which encourages stroke patient engagement and motivation. Goal setting in rehabilitation is defined as the process by which the rehabilitation professional (e.g., physiotherapist) makes a collective decision, after informed discussion with patients, of how and when to resume rehabilitation activities to achieve the planned goals (Rosewilliam et al., 2011). The goal setting should relate to the patient's needs, experience, values, and expectations

(Plant and Tyson, 2018). The most effective goal setting is based on mutual understating, negotiation and interaction between the stroke patient and rehabilitation therapist. Therapeutic connection is essential in rehabilitation and involves the therapist supporting and involving the patient in the rehabilitation process. Personalised rehabilitation, the rehabilitation programme also needs to fit personal abilities as patients unfamiliar with the training programme are less engaged and motivated. Stroke patients engage more in rehabilitation when they have autonomy and independence in practising their therapeutic tasks, with patient-centred practice encouraging their engagement and providing specific treatment goals and plans. Positive feedback is also suggested to enhance patient motivation and engagement.

These examples were provided with various facilitators to support engagement in rehabilitation and focused on the therapeutic relationship and motivating factors such as goal setting and patient education. However, these studies did not provide much information on the barriers to affect engagement such as healthcare systems, healthcare setting environments and cultural barriers. Due to the complex process of the engagement, more reviews highlighting the barriers to rehabilitation engagement could be valuable to help gain a wider view of the associated impact of cultural, environmental and systems on the engagement process.

1.3.3 Cognitive impairment as a barrier to patient engagement

CI is a common factor influencing patient engagement in rehabilitation programmes (Nygard and Kottorp, 2014; Lowder et al., 2022) in various ways because many skills are needed to navigate healthcare systems and using healthcare services relies on cognitive abilities (Lovett et al., 2020). CI can make it difficult for patients to understand medical needs, remember appointments and instructions, communicate with clinicians and care teams, or solve problems

related to care and self-management skills (Lovett et al., 2023). In addition, individuals with CI may experience psychological effects such as stigma, worry, fear, or shame related to their diagnosis and losses of functional abilities or independence. These psychological effects can interfere with important health-seeking behaviours such as communication with Health Care Professionals (HCPs) and adherence to treatment programmes (Dolezal, 2022). Chronic conditions such as stroke are often associated with CI (Control and Prevention, 2020), which can complicate patient engagement, as various physical and cognitive symptoms are linked to stroke. Thus, CI after stroke is seen as a key predictor of rehabilitation functional outcomes (Skidmore et al., 2010a, Wagle et al., 2011, Kapoor et al., 2019b), as it significantly impacts rehabilitation engagement.

1.3.4 Engagement level according to specific cognitive domains

Since the concept of engagement is presented as a cognitive state (Lequerica and Kortte, 2010b, Franken, 2007), CI can be considered one of the main barriers which could impede stroke survivors` active engagement (Longley et al., 2019, Viscogliosi et al., 2019, Viscogliosi et al., 2011b). Low engagement in rehabilitation programmes by stroke survivors could possibly be related to specific cognitive domains. For example, executive functions and visuospatial abilities were found to be correlated with levels of engagement (Kringle et al., 2018, Skidmore et al., 2010b). Executive function deficit is common especially with acute stroke and it is significant in terms of rehabilitation because executive functions are what enable patients in rehabilitation sessions to switch between tasks, plan, utilise working memory within problem-solving, and inhibit other behaviours while learning new skills and exercises (Poulin et al., 2012, Zinn et al., 2007). Furthermore, Viscogliosi et al. (2011b) examined the participation level in ADL activities and the social roles taken by stroke survivors` in relation to

cognitive domain deficits. It was found that memory dysfunction is the main cognitive domain affecting stroke survivors` communication (p=.006) and leisure (P=.03). It was also found that visuospatial deficits and language impairment were predictors of patient participation. Hence, examining specific cognitive domains seems essential in order to predict the engagement of stroke survivors with CI. Also, to provide rehabilitation therapists with awareness of what cognitive domain is affected, thus, assessing in the planning and implementing interventions based on the patient's cognitive needs.

1.3.5 Engagement outcome measurements in physiotherapy programmes

Engagement in rehabilitation sessions can be measured via various different assessment scales, such as the Pittsburgh Rehabilitation Participation Scale (PRPS) and the Hopkins Rehabilitation Engagement Rating Scale (HRERS). PRPS is a 6-item scale where the lowest score, 1, indicates that the patient did not participate in and indeed refused the treatment, and the maximum score, 6, indicates full participation, interest, and completion of the therapy session. This scale focuses on patient effort, interest, and therapeutic task completion and is used by both physical and occupational therapists. This tool has high inter-rater reliability for use by physiotherapists (ICC= 0.96) in relation to inpatient samples with neurological and orthopaedic conditions (Lenze et al., 2004a). HRERS is a 5-item scale focused on patients` attendance; their attitudes toward the therapy; the need for verbal and physical prompts to ensure completion of therapeutic tasks; the acknowledgement by the patients of the need for, and the benefits to be derived from, the rehabilitation services; and active participation by them in the therapy session. The scale has a 6-point rating system ranging in meaning from *never* to *always*. HRERS has high inter-rater reliability (ICC=0.73) and construct validity (from 0.69 to 0.94) (Kortte et al., 2007). However, these scales have not been used to measure the engagement of stroke survivors with CI.

More studies are needed to evaluate these measurements' reliability and validity in assessing engagement by post-stroke cognitively impaired patients. Currently, the most widely utilised measures concentrate on the patient's behaviours and attitudes within rehabilitation sessions and do not take into consideration other factors which may influence engagement, such as clinician behaviour and communication skills (Bright et al., 2015). Therefore, more measures are required to assess patient engagement and contribute to all aspects that might hinder patient engagement.

1.4 Motivation

The term 'motivation' has several meanings across several different areas such as psychology, physiology and cognitive neuroscience, but in this thesis it is defined as the mental process that encourages a person to act purposefully in order to achieve goals by taking action (e.g., PT programme) toward some end-state purpose (e.g., functional recovery) (Deckers, 2018). Motivation has two kinds of sources: internal (intrinsic motivation) and external (extrinsic motivation). Intrinsic Motivation (IM) results from an inherent (psychological and biological) desire to think, plan, challenge, and learn to achieve goals, while Extrinsic Motivation (EM) is related to external (environmental) situations such as rewards offered in return for completing a task (Ryan and Deci, 2000). Motivation and cognition are linked together in what is considered to be the main mechanism of motivation, termed cognitive motivation; this involves the thinking, visualising, and planning needed to achieve a goal (Deckers, 2018). In addition, studies have found a neural brain mechanism which links motivation and cognition through specific brain regions such as the Anterior Cingulate Cortex (ACC); which might serve as a pathway between motivation and executive functions; the striatum which mediates between motivation, cognition, and action; and the lateral PFC which integrates motivation with cognitive functions especially via visuospatial

signals (Braver et al., 2014). Therefore, people with better cognitive functions are often more motivated and will tend to engage more in effortful cognitive endeavour (Cacioppo et al., 1996) due to the interaction between cognitive processes and motivation.

In the field of physical rehabilitation, high levels of motivation related to a rehabilitation programme are associated with enhancing patient engagement and leading to positive outcomes (Drieschner et al., 2004, Siegert and Taylor, 2004, Kusec et al., 2019). However, stroke survivors have described having low motivation and interest in rehabilitation programmes (Poltawski et al., 2015b, Rapolienė et al., 2018). The concept of motivation in physiotherapy was highlighted in a review undertaken by Maclean et al. (2000a) that found that motivation is affected by three factors: a) internal factors, which derive from patient personality traits; b) social factors, which derive from the environment of the rehabilitation setting and therapist's skills; and c) both social and internal factors.

Moreover, Maclean et al. (2002) conducted a qualitative study to investigate rehabilitation professionals' understanding of motivation in stroke rehabilitation clinical practice, identifying motivation as an essential determinant of the rehabilitation process. Participants suggested motivation was indicated by patient behaviour, such as asking questions, initiating therapeutic activities, and desiring more rehabilitation sessions and activities. Also, motivation is indicated by compliance with rehabilitation. The rehabilitation professionals claimed that personality factors are the main drive for motivation.

Clinical factors which impact stroke survivors, such as age, stroke severity, depression, and CI also influence motivation (Maclean et al., 2002, Rapolienė et al., 2018), as motivation can be related to all these intrinsic (personality traits), extrinsic (environmental and social factors), and clinical factors. However, the

studies have not focused on the meaning of motivation and how it could be utilised and understood in the stroke rehabilitation practice.

Improving all the related factors affecting motivation is crucial to enhancing stroke rehabilitation outcomes. It has been suggested that improving patients` intrinsic motivation improves the quality (e.g., exercise accuracy) of task performance, and improving extrinsic motivation increases the quantity (e.g., training repetition) of task performance (Cerasoli et al., 2014). Both sufficient quantities and quality of patient performance in rehabilitation programmes are essential to achieve the greatest benefits for stroke survivors.

There are various factors affecting stroke patient motivation. For instance, Yoshida et al. (2021) conducted a qualitative study with subacute stroke patients to identify the factors influencing rehabilitation motivation from the stroke patients' perspective. The identified factors were divided into personal factors and social factors. Personal factors refer to the physical condition and cognitive functions, resilience related to the patients' abilities to adapt to different situations and needs, the experience of success and failure, and patient goals such as the desire to return to home or work. The social factors were related to stroke patients' relationships with the rehabilitation professionals, the relationships with other patients, and family support all social aspects that affect stroke patients` motivation.

Moreover, a scoping review and meta-analysis by Cheong et al. (2021) exploring psychosocial factors affecting stroke patients' rehabilitation motivation in Korea identified several internal and external factors that influence motivation. The internal factors included depression, cognitive impairment, disability acceptance, self-efficacy, self-esteem, communication-related impairment, and empowerment. The external factors included the rehabilitation environment, social support, financial burden, quality of life, sleep pattern, and disease-related

characteristics. This study provided essential factors that might affect stroke patient motivation rehabilitation and pointed out that the internal factors were more significant than external factors in affecting motivation. However, the study did not distinguish between acute and chronic stroke-related factors influencing motivation. Therefore, more studies on identifying motivational factors in acute or chronic stroke-specific could be valuable to support patient motivation. Overall, rehabilitation motivation can be affected by internal factors such as depression and cognition, which results in affecting patients' intrinsic motivation, as well as external factors such as the rehabilitation environment and social support that affect extrinsic motivation. Therefore, considering the social support and enhancing the rehabilitation environment and the early diagnosis of internal factors such as depression, cognitive impairment, and fatigue can support patient motivation, thus, improving rehabilitation effectiveness.

1.4.1 Ways to improve patient motivation

Enhancing patient motivation could be a determinant in producing good motor learning and rehabilitation outcomes. A study has suggested several ways to optimise motor learning performance through motivation: including providing positive feedback as regards the performance, using self-modelling (videotape) which shows other learners` best performance in order to encourage better practice, providing rewards, giving autonomy to the learners to explore and think about how to enhance their performance, providing all essential information about the task, and encouraging learners to shift their attention toward the external environment rather than to self-focus (Wulf and Lewthwaite, 2016).

In stroke rehabilitation, motivational interventions such as motivational interviewing and goal setting could support stroke patient motivation. Motivational interviewing is defined as a directive client-centred method, targeting the intrinsic motivation to change by discovering and resolving ambivalence. Motivational

interviewing applies five main principles: expressing empathy, avoiding argumentation, rolling with resistance, developing discrepancy, and supporting self-efficacy (Miller and Rollnick, 2012). It improves stroke patient motivation in rehabilitation programmes as it enables patients with information to understand their cases, helping them to manage their goals, reflect on their experiences, manage their fears and difficulties, and improve their abilities and confidence (Prior and Suskin, 2018, Chen et al., 2020).

Goal setting in rehabilitation also enhances stroke patients' motivation for rehabilitation, as it can have a positive impact on stroke patients' motivation and enhance the rehabilitation outcomes (Sugavanam et al., 2013, Oyake et al., 2020b). Moreover, the levels of motivation may increase when patients know the role of rehabilitation in their recovery; this builds a rapport between the patient and the therapist by the latter understanding the former's needs, knowing their abilities, and providing all important information (Maclean et al., 2000b). All this provides evidence to support the importance of the external factors (clinical environment, rehabilitation professionals' attitudes and skills) and the therapeutic interactions through goal setting and motivational interviews in enhancing patient motivation. However, the available evidence did not evaluate the motivation levels of stroke patients with CI who might have more difficulties in understanding and following therapist instructions. Therefore, more studies are needed to evaluate strategies for enhancing the motivation levels of stroke survivors with CI to physical therapy programmes.

1.4.2 Motivation outcome measurements in stroke physical therapy programmes

In stroke rehabilitation, a few measurement tools have been specifically designed to assess motivation (Park et al., 2020). Example of some measures which have been used in stroke rehabilitation studies are the Intrinsic Motivation Inventory

(IMI) and Stroke Rehabilitation Motivation Scale (SRMS). IMI is a multidimensional measurement questionnaire used to assess participants' motivation when engaging in activities (Deci and Ryan, 1997). IMI determines intrinsic motivation level and covers various areas, including enjoyment/interest, perceived competence, effort/importance, pressure/tension, value/usefulness, perceived level of choice and relatedness. It consists of 45-items with 7-point Likert scale (1=not at all true; 7=very true). The number of items which can be selected changes according to the research area (e.g., education, medicine), the task, and the participants' characteristics (Popovic et al., 2014, Monteiro et al., 2015). IMI has been used recently in stroke rehabilitation studies to assess motivation (Colombo et al., 2007, King et al., 2012, Popovic et al., 2014). SRMS was developed by White et al. (2012) specifically for stroke-recovery populations to measure the internal and external factors that influence motivation levels as regards rehabilitation. It consists of 7-items, each item is rated employing a 5-point Likert scale (1=completely disagree; 5=completely agree). The highest score possible is 35 with higher scores (21≥) indicating normal to high motivation. SRMS has good internal consistency and inter-rater reliability (White et al., 2012). However, this scale only focused on feelings and desire with no questions of why the patient's feelings and desire cause motivation or no motivation. Also, the measurements excluded stroke patients with CI, thus, it cannot be generalised and requires investigation of its validity and reliability for measuring motivation for stroke individuals with CI. Overall, providing an assessment of stroke survivors' motivation is essential for clinicians to provide a better understanding of the factors that might influence motivation and effective engagement (Kusec et al., 2019), leading to more structured and effective rehabilitation programmes for stroke survivors with CI.

1.5 Theory for engagement and motivation

Self-Determination Theory (SDT) has been recognised as a key theory for rehabilitation engagement and motivation research (Kusec et al., 2019, Biel et al., 2022). SDT is a concept of human motivation and personality which emphasises the importance of humans' developed inner resources for self-regulation of behaviour and personality development (Ryan and Deci, 2017). SDT organises human motivation and development based on psychological needs. These needs are competence (need for affection, control over task or situation), relatedness (need for social support and connection with the environment), and autonomy (need for having a choice of action). SDT focuses on the quality rather than the quantity of motivation. Furthermore, SDT is a metatheory involving mini theories, such as social needs theory, cognitive evaluation theory and organismic integrated theory. This section will focus on the nature of human motivation according to SDT.

According to SDT (Ryan and Deci, 2017), motivation has two sources intrinsic and extrinsic. IM is related to individual motivation due to enjoyment and pleasure, not associated with rewards or goals. However, not all human behaviours and actions are performed for enjoyment, thus, the pleasure derived from an activity alone cannot reveal the underlying reasons for one's intrinsic motivation. Therefore, the mini theory of cognitive evaluation theory was formulated to describe and identify the effect of social context on people's IM. It suggests that the need for autonomy and competence are involved in the IM and contextual events such as positive feedback or praise.

However, EM contrasts with IM and is related to performing the action to obtain outcomes. Different types of EM are formulated in the mini theory of organismic integrated theory. According to organismic integrated theory, EM has four types, including external regulation which relates to the source of motivation through

obtaining rewards or avoiding punishments; integrated regulation which represents the motivation due to social pressure or personal value such as avoiding shame or self-esteem; regulation through identification which represent the motivation due to the identified goal such as PT treatment goals; and integrated which is the identified regulation adjusted to the value of the goal or task and considers the most autonomous type of external motivation. Overall, SDT is a human motivation theory that supports all human actions and behaviours related to basic psychological needs (autonomy, relatedness, competence) and primarily focuses on the social and environmental support to support or hinder an individual's motivation. SDT can be applicable to enhance PSCI survivors' engagement and motivation in physiotherapy rehabilitation programmes by setting treatment goals, praise, providing feedback, information provision, learning, and considering the therapeutic tasks' dose and frequency.

The SDT has some limitations. Firstly, the complexity of the theory as the theoretical framework continuously extended to encompass all the SDT sub-theory summarised in one framework, which might create complexity in explaining the theory (Ryan and Deci, 2017), thereby increasing the falsifiability when explaining or highlighting the theory due to the various constructs included in the framework. Secondly, the SDT theory is generalised and not specifically developed for rehabilitation or education (Biel et al., 2022). Identifying motivational factors such as beliefs, experiences, and support for PSCI survivors could enhance the use of the SDT to support engagement and motivation in rehabilitation programmes. Lastly, the SDT theory concept has a high explanatory power as it takes into account both internal (e.g., goals, desires) and external (e.g., connections to others, environment) factors when describing the individuals' motivation and actions. Thus, it has low predictive power as it

explores the assumption, like how environmental and social support leads to outcomes via needs, satisfaction and motivation (González-Cutre et al., 2016).

1.6 The link between engagement and motivation

Engagement and motivation have two links in association with this project. Firstly, motivation is not observed (Martin et al., 2017), therefore, it is complicated to identify whether stroke patients with CI were motivated to the rehabilitation. However, engagement in rehabilitation is an observed behaviour. Many studies identified engagement behaviours in rehabilitation, such as attendance at the rehabilitation session, active listening and asking questions, compliance, adherence, and exercise repetition (Lequerica and Kortte, 2010a). Therefore, engagement in rehabilitation programmes can reflect the level of motivation if the patient is actively engaged; the level of motivation is high and vice versa. Secondly, the concepts of engagement and motivation align with the critical role of social support and environment to facilitate or diminish patient engagement and motivation. Therefore, the researcher assumes that considering the social and environmental factors can enhance both engagement and motivation for stroke patients with CI in rehabilitation programmes.

1.7 Summary

Stroke is a widespread medical condition that is a primary contributor to mortality and disability across the globe, causing various levels of disabilities, including motor, sensor, visual, and CI. PSCI is common, and it has a significant impact on patient recovery. PT rehabilitation is important to improve stroke survivor's functional recovery, with PT practice relying on intensive interaction between stroke patients and physiotherapists (Talvitie and Reunanen, 2002). Hence, motivation and engagement are essential elements in the relationship between patient and clinician to enhance PT treatment outcomes. However, stroke survivors with CI tend to have low motivation to engage in PT rehabilitation

programmes, as motivation and engagement after a stroke are reduced for various reasons, including the CI. Therefore, enhancing motivation and engagement for stroke survivors with CI is an important goal for physiotherapists to ensure an effective PT rehabilitation programme.

The concepts of patient engagement and motivation highlighted therapeutic connection, social support, personal factors (e.g., stroke severity) and environment as important constructs in rehabilitation engagement and motivation. Lastly, the SDT was highlighted as a theory that supports both engagement and motivation as it concerns the types of motivation (intrinsic and extrinsic) to support engagement in the activities.

1.8 Healthcare in Saudi Arabia

The KSA covers an area of about 2,000,000 square kilometres and has an estimated population of around 32,175,224 as of mid-2024 (General Authority for Statistics, 2024). The Ministry of Health (MOH) is the main provider of health services in the KSA. According to Ministry of Health (2022), there are 287 MOH hospitals with 45,470 beds and these services are limited to Saudis only. The increasing number of inpatients, population growth, and financial burden on the MOH have led to a need for growth in the private sector. In 2022, the number of private sector hospitals reached 154, with the majority located in Riyadh and Jeddah. Additionally, there are 51 hospitals for other governmental sectors such as the National Guard provide healthcare services to their employees (Ministry of Health, 2022).

The Saudi healthcare system is transitioning towards privatising healthcare services, increasing public-private partnerships, launching new domestic healthcare programs, and boosting the Saudi professional workforce as part of the KSA economic and social vision (Saudi Vision 2030, 2023). The national primary healthcare and service delivery strategy in the KSA follows a person-

centred approach, emphasising health promotion, protection, and social factors, as identified by the MOH and the WHO (Word Health Organisation, 2013).

Medical rehabilitation centres in Saudi Arabia were not introduced until the early 21st century. Before that, some prosthesis centres were available in hospitals, and rehabilitation centres were launched in military and private hospitals. Currently, separate rehabilitation centres, mainly found in large cities, offer services to both adults and children (Al-Jadid and Robert, 2010). These include Sultan Bin Abdulaziz Humanitarian City and several other rehabilitation facilities. According to Ministry of Health (2022), there were 12 MOH rehabilitation centres, and 165 private-sector physiotherapy/rehabilitation centres in the KSA. However, due to the increasing population, road accidents, and lifestyle changes leading to health issues such as stroke, there is a constant need for more rehabilitation centres in the KSA (Aleisa et al., 2014, Alanazi et al., 2023).

Saudi Arabia acknowledges the importance of physiotherapy practice, demonstrated by the growing number of bachelor's and master's degrees in physiotherapy. In 1980, the country established its first physiotherapy program (Alghadir et al., 2015), and since then, significant progress has been made in Saudi universities. Currently, 16 universities offer undergraduate physiotherapy programs, and two universities offer postgraduate programmes (Alahmari et al., 2024). Physiotherapists in the KSA are authorised to assess, design care plans, and deliver the treatment (Alghadir et al., 2015). However, patients in the KSA cannot directly visit a physiotherapist without a physician's referral, unlike patients in the UK and the United States (Alshehri et al., 2017). In the absence of specific professional guidelines for standards of care, physiotherapists in the KSA adhere to the codes of conduct set by regulatory and licensing authorities, such as the Saudi Health Commission (Alshehri et al., 2017). For instance, if a stroke survivor is admitted to an inpatient care unit, the physician assesses the

need for physiotherapy and then writes a referral to the physiotherapy clinic. When visiting a physiotherapy outpatient clinic, the patient has to first visit the physician's outpatient clinic. The physician will then assess the patient and determine if physiotherapy is necessary. Only after receiving a referral can the patient be assessed, diagnosed, and treated using care plans created by physiotherapists.

1.9 Study rationale

KSA is the largest country in the middle east (Aleisa et al., 2014), with stroke being a rapidly-growing health problem causing death and disability (Asirvatham and Marwan, 2014). The available evidence suggests that stroke care in the KSA has fallen behind developed countries, with only two hospitals out of over 350 hospitals having a specialised stroke team (Al Khathaami et al., 2011). Stroke rehabilitation is important to improve patients' recovery. Indeed, several studies have reported the importance of providing more rehabilitation centres, increasing the number of rehabilitation therapists, improving education regarding stroke rehabilitation, as well as conducting more research into stroke rehabilitation field in the KSA (Al-Jadid, 2013, Bindawas and Vennu, 2016a, Asirvatham and Marwan, 2014).

Despite all the evidence regarding stroke care in the KSA, current evidence has identified stroke care as a key focus for improvement in the coming decade (Al-Senani et al., 2019b). PT rehabilitation is an important aspect of stroke care, particularly in the early stage of improvement in KSA (Algudairi et al., 2018). Therefore, conducting more research in stroke PT rehabilitation can help to develop and improve PT rehabilitation services in KSA. No available studies related to PSCI have been conducted in KSA, hence this study will help to:

- highlight the current facilitators and barriers to PT rehabilitation services for stroke survivors with CI

- raise awareness of this issue
- discuss possible ways to improve the service
- provide a recommendation for the stakeholders in the rehabilitation field to act toward service improvement

As mentioned in the previous section, PSCI can influence the efficacy of rehabilitation outcomes. Decreased motivation and engagement in the PT rehabilitation programme is one factor associated with stroke survivors with CI. To the best of my knowledge, there are no available reviews evaluating the strategies used in PT rehabilitation programmes to enhance stroke survivors with CI motivation and engagement in treatment sessions. Also, the amount of evidence regarding this issue is limited, therefore, the rationale of this research is to identify strategies used in PT rehabilitation to improve the motivation and engagement of stroke survivors with CI in treatment sessions, evaluate utilising these strategies in a clinical setting, and discuss the barriers and facilitators to utilise these strategies. Also, to design an intervention and evaluate its applicability in the local clinical settings. The term "intervention applicability" refers to the feasibility of implementing the intervention in the local PT rehabilitation settings. In this research, it refers to understanding whether the planned intervention can be conducted and delivered based on the existing systems, culture, individual and environmental capabilities, and policies, as perceived by the selected stakeholders.

1.10 Research questions

1. What are the strategies used in PT rehabilitation programmes to enhance the engagement and motivation of stroke survivors with CI?
2. What are the barriers and facilitators to applying engagement and motivation enhancement strategies in PT practice in the KSA?

3. To what extent is delivering an intervention applicable in the local rehabilitation context to improve the engagement and motivation of stroke survivors with CI in PT rehabilitation programmes?

2 Research Methodology

This chapter details the research methodology used in this research project, highlighting the framework adapted to the project and justifying its selection and stages for intervention development. The multi-phase Mixed Method Research (MMR) (using a mixture of methods) is described as a research approach for this research. In this chapter, general discussion of MMR will be provided by explaining its strengths, criticisms, types, and justification for its selection. This chapter also provides the research paradigm, objectives, and approaches.

2.1 Medical Research Council (MRC) framework

According to MRC, complex interventions are defined as interventions that have multiple interacting components, targeting a range of behaviours and outcomes and require evaluators to overcome practical and methodological difficulties (Craig et al., 2008, Skivington et al., 2021).

Complex interventions aim to improve health by targeting multiple levels of an organisation or groups with multiple interacting components to achieve various outcomes (Craig et al., 2008). Stroke rehabilitation interventions can be considered complex due to various problems and impairments associated with stroke, the variety of treatments given to patients, and the multidisciplinary team approach delivered via multiple teams collaborating to provide patient care in different time frames (Langhorne et al., 2011, Luker et al., 2016). Additionally, it is a complex intervention to deliver in the KSA due to the difference in policies, systems, culture, and the limited evidence of stroke rehabilitation for patients with CI. Therefore, using a framework to develop the intervention should reflect the complexity of the intervention to guide its development. The MRC framework was used for the development of a complex intervention to improve the engagement and motivation of stroke survivors with CI to a PT rehabilitation programme in the

KSA. When using the MRC framework, the researcher can go beyond whether the intervention works or not, considering a wider range of factors. This includes identifying the impact of the intervention, evaluating its value compared to the resources needed to achieve it, theorising about how it works, taking into account its interaction with the environment in which it is implemented, examining how it contributes to system change, and determining how the evidence can be utilised to support decision making in the real world (Skivington et al., 2021). Overall, using the MRC framework for the current project is appropriate due to the complexity of the research topic and the context of the intervention.

The MRC framework was published in 2000 to help researchers and funders understand the intervention processes and implement appropriate methods (Craig et al., 2008). Subsequently, the MRC framework has been updated to explain different aspects of the complex intervention's development and evaluation (Craig et al., 2008, Skivington et al., 2021). At the beginning of the research project, the researcher followed the MRC framework provided by (Craig et al., 2008). The framework has four stages to develop and evaluate complex interventions including development, feasibility and piloting, evaluation, and implementation stage. During the second year of the PhD, an updated MRC framework was published by (Skivington et al., 2021) which was similar to the previous framework but included comprehensive guidance on using the framework to develop complex interventions. Therefore, the researcher adopted the updated framework to guide intervention development. The switching to use the lastly updated has not incorporated in changing the research process and focus. It rather helped the researcher explicitly understand the core elements of developing the intervention and how to maximise the utility of each element during the development of the complex intervention.

In the MRC framework (see Figure2-1) adapted from (Skivington et al., 2021), the complex intervention research is divided into four phases: developing or identifying the intervention which relates to the process of planning and designing the intervention, a feasibility study to assess the intervention applicability and the criteria of evaluation design such as recruitment and retention, evaluation of whether the intervention works and identifying other impacts the intervention have, how they work and interact with the context, and how they contribute to the system change and implementation. Each phase has six core elements: context consideration such as settings and health system, developing and refining programme theory to describe how the intervention might work and why, engaging stakeholders whom the intervention targets such as healthcare professionals and policymakers, identifying key uncertainties, refining intervention, and economic considerations of the costs and consequences.

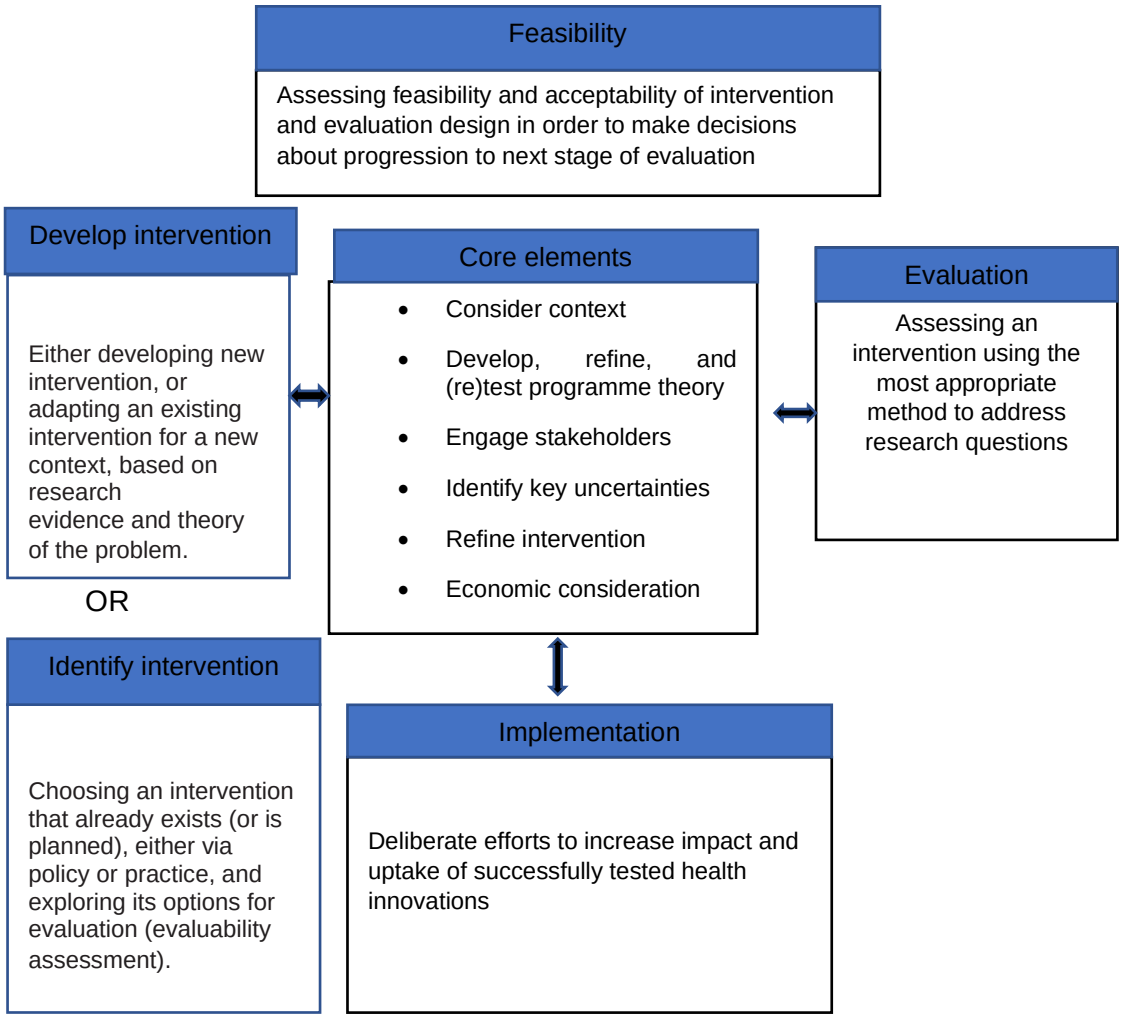

Figure 2-1: MRC framework for developing and evaluating complex intervention.

2.2 Research Approach

In the current project, developing the intervention requires a multiphase process including exploring the evidence-based strategies to support the engagement and motivation of stroke patients with CI, identifying the barriers and facilitators to apply identified strategies in the Saudi rehabilitation context, synthesising the findings to develop an intervention plan, and engaging stakeholders to discuss and refine the intervention plan. For this, a flexible research methodology

approach and different research methods are needed to guide the intervention development. Therefore, a mixture of methods approach was selected as suitable to guide the intervention development. The use of mixture of methods also fits with the MRC recommendation of its utilisation in multi-phase complex intervention development and evaluation process. The mixture of methods approach is derived from the MMR approach of the multiphase design. This section will provide an overall discussion of MMR to cover all its aspects and clarify all its designs.

According to Creswell (2021), MMR is a way of studying social, behavioural, and health sciences that involves collecting both qualitative and quantitative data, combining them, and drawing conclusions based on the combination. This approach provides more profound insight than qualitative or quantitative data alone and has been widely applied in health sciences research in the last decade (Regnault et al., 2018). The usage of MMR is crucial in research projects and empirical studies because of the complex nature of research processes (Sandelowski, 2014), which involves gathering, integrating, embedding, synthesising, and evaluating findings. MMR can also improve research quality and enhance researchers' creativity when designing and implementing interventions (Creswell and Clark, 2017).

Using MMR in the current research has several strengths. Firstly, it allows for a thorough exploration of the phenomenon being studied. Health research is typically conducted within specific healthcare settings that have unique organisational structures, systems, processes, financial systems, and individual behaviours that can affect how interventions are implemented (Wisdom et al., 2012). Therefore, it is crucial to investigate health research using methods that can handle this complex clinical reality (Richards and Hallberg, 2015). The

current research topic has different concepts (e.g., CI after stroke, patient engagement, patient motivation) and has been undertaken in a specific context. Therefore, MMR is a useful tool that can capture the complexity of the research process and increase our understanding of whether the intervention works or not, why or why not it works, and how is it delivered (Farquhar et al., 2011). Another advantage of the MMR, as outlined by Creswell and Creswell (2017), is its practical design. Practicality refers to the ability of researchers to use practical and methodological tools to effectively address complexity. In the development of interventions, MMR allows researchers to use the results from one method to inform the development of another (Greene, 2007). This use of MMR in this research can provide support for the research aims, help with the interpretation of findings, and ultimately contribute to the development of knowledge and interventions.

2.2.1 Criticisms of MMR

MMR has some criticisms that should be noted. Firstly, MMR has faced criticism for combining quantitative and qualitative methods in the same study due to their differing philosophical assumptions. These philosophical assumptions are related to the ontological (the nature of reality) and epistemological (how the reality is known) positions, that is, qualitative and quantitative research have different ontological and epistemological assumptions, so they should not be combined because combining cross-validation methods violates philosophical assumptions and misrepresents the captured data. This criticism, known as the incompatibility thesis, was popularised in the 1980s (Howe, 1988, Guba and Lincoln, 1989) and is supported by other researchers such as, (Sale et al., 2002). but researchers of the MMR design have challenged it (Johnson and Onwuegbuzie, 2004, Morgan, 2007, Greene, 2007, Mertens, 2012b). For example, Johnson and Onwuegbuzie (2004) argued no clear, proven relationship between epistemology and research

method, rather they believed that the research problem being investigated, not the researcher's philosophical beliefs, should guide the methods of investigation. Furthermore, Morgan (2007) proposed an argument against the incompatibility thesis in a review article that discussed the various interpretations of the term "paradigm" in social science research. According to Morgan (2007), the metaphysical paradigm, which connects ontological and epistemological concerns with research methodology and methods, is not practical in actual research. Therefore, they recommended researchers start by identifying a research question of interest and then selecting the best research methods to answer it. This argument and recommendation is known as the centrality of the research question, which is a key characteristic of the MMR (Tashakkori and Teddlie, 2021).

Critics have pointed out that the lack of a clear overall framework or paradigm is a major issue with MMR (Tashakkori and Teddlie, 2021). Some researchers take an a-paradigmatic approach, where paradigms are not considered important, and methods can be used without considering ontological and epistemological matters (Greene, 2007, Hall, 2013). Others follow a singular or alternative paradigm approach, where pragmatism is the most commonly associated paradigm with MMR (Yvonne Feilzer, 2010, Morgan, 2014). Some have suggested a multiple paradigm approach, where different paradigms such as positivism (quantitative-driven perspective), constructivism (qualitative-driven philosophy) or even combined approaches can be used in different phases of a research design to enhance the understanding of the investigated phenomenon (Cameron, 2011, Creswell and Clark, 2017). This flexible approach shows that mixed methods researchers have different views on the use of overarching paradigms to guide research, therefore (Tashakkori and Teddlie, 2021) narrative

of paradigm pluralism seems like an accurate description of MMR, where various paradigms can serve as the underlying philosophy.

2.2.2 MMR designs

MMR research has several designs which vary in terms of their data collection methods and aims. Cresswell and Plano Clark (2011) identified six main designs for conducting MMR: convergent, explanatory sequential, exploratory sequential, embedded, transformative, and multiphase design.

2.2.2.1 Convergent design

The convergent mixed method design is also known as concurrent or parallel design and involves collecting the qualitative and quantitative data concurrently, analysing them separately, merging both datasets to compare the convergent and divergent data and drawing an interpretation or conclusion from mixed data. This approach's strengths include using different types of information obtained from qualitative and quantitative data and allowing researchers to gather both data types while in the field. Using two methods provides a more comprehensive approach to answering the research question, allowing the researcher to compare the findings for an in-depth understanding of the findings (Halcomb and Hickman, 2015). However, this approach has some challenges, including the difficulty in merging two databases which not typically combined in research, particularly due to variations in data, samples, sample sizes, and potential conflicts in the findings (McBride et al., 2019). Also, the difficulty of designing a research question to be addressed similarly in qualitative and quantitative data collection to obtain efficient data comparisons. Additionally, this design could also increase researcher bias when collecting both data simultaneously. Researchers could overcome this by introducing an explicit procedure of qualitative data collection, such as participant journaling, which does not require researcher involvement during the quantitative data collection.

2.2.2.2 Explanatory sequential design

In this design, the researcher starts by collecting and analysing quantitative data and then follows up the findings by collecting qualitative data, providing a more understanding and in-depth description of the quantitative results. The strength of this approach lies in the two phases built upon each other, making it distinct and easily recognisable. However, this approach is challenging, requiring more time to conduct and decide which quantitative data needs further explanation.

2.2.2.3 Exploratory Sequential design

This design is opposite to the explanatory design and begins with collecting and analysing qualitative data and then following up with quantitative data. The exploratory design intends to provide measures and instruments suited to a particular culture or population group. This design has similar challenges to explanatory design in the timing requirement and connecting the qualitative results to design the quantitative phase.

2.2.2.4 Embedded design

In this design, researchers embed qualitative and qualitative data sequentially or concurrently. This design can be helpful when researchers need to incorporate qualitative or quantitative data to answer a research question within a study with a mainly quantitative or qualitative scope. This approach can help evaluate research projects to increase evidence-based intervention adoption in real clinical settings but can be challenging for researchers as it requires them to decide when to collect data (before, during, or after) and the main study also might require conducting more than one data collection, thus, requiring more time and resources to analyse and report the results.

2.2.2.5 Transformative design

The transformative design study is a two-phase process that can be conducted either sequentially or concurrently. The collection of data is theory-driven and the

integration of results occurs during the interpretation phase. This design uses theoretical frameworks such as feminist theory, racial theory, or sexual orientation theory to address the needs of marginalised or underrepresented populations (Mertens, 2012a). Transformative design has several strengths, including its action-oriented nature, its ability to empower communities to enact change, and its inclusion of research participants (McBride et al., 2019). However, there are associated weaknesses such as the need to establish trust with participants, the requirement for additional justification in using transformative methods, and the lack of structure and guidance on how to best utilise transformative approaches (Creswell and Clark, 2017, Camacho, 2020).

2.2.2.6 Multiphase design

The multilevel design involves a research team or individual researchers studying a topic or problem of interest through a series of connected qualitative and quantitative studies. These studies are sequentially aligned and build upon previous findings to inform the new approach, all to address the programme's objective. The multiphase design or a mixture of methods is particularly used in this research project due to the nature of this research of having different phases, developing, delivering, and evaluating the findings in a sequential manner where the findings in each stage help in designing and guiding the other study.

2.3 Research Paradigms

The term "paradigm" refers to a fundamental set of beliefs scientists share. It outlines how one approaches and understands problems, views the world, and conducts research (Denzin and Lincoln, 2018). A research paradigm has four key components: ontology, which explores the nature of reality or truth; epistemology, which looks at the nature of knowledge and what it means to know; axiology, which examines the nature of values and what is valuable to know; and methodology, which determines the strategy used to find answers to these

questions (Creswell, 2014). Several research paradigms have been reported in the literature but the most common paradigms used in research are positivist, postpositivist, interpretive or constructivist, critical, and pragmatic (Davies and Fisher, 2018). Table 2-1 adapted from (Denzin and Lincoln, 2018) provides brief information about research paradigm

Table 2-1 Research paradigms

Characteristic	Positivist	Post-positivist	Interpretive	Critical	Pragmatism
Aim	Production of predictive, generalised data	Uncover the meaning of reality as understood by individuals or groups	Description, exploration and understanding of experience	Raise awareness and elicit social change	Solving real-world problems
Ontology	Belief in a single reality; real-world driven by natural causes	Critical realist	Belief in subjectivity multiple realities, mentally constructed by individuals	Historical realism	Single and multiple realities
Epistemology	Researcher objectivity and detached impartiality; control	Modified objectivity	Researchers entwined in the production of knowledge; dialectical	Knowledge socially constructed	Non
Research methods	Quantitative	Qualitative and quantitative-Triangulation	Qualitative	Qualitative	Quantitative and qualitative
Methodologies	Cohort, descriptive, cross-sectional, experimental, case-study, RCT	Modified experimental, critical multiplism	Grounded theory, phenomenology, narrative, ethnography, biographical	Neo-Marxist, Feminist Research, Queer Theory, Participatory Action Research	MMR
Criticism	Does not consider an individual's experiences	Does not produce well-defined answers	Limited transferability and generalisability	Does not always guarantee its aim of emancipation	Can cause confusion due to the approach flexibility

2.3.1 Paradigms used in this research

Pragmatism is viewed as the ideal philosophical partner for mixed methods (Denscombe, 2008, Creswell and Clark, 2017), offering a practical approach to inquiry and a set of assumptions that support the mixed methods approach (Johnson and Onwuegbuzie, 2004). It emphasises outcomes and requires researchers to engage in an iterative process, constantly evaluating their beliefs and approaches to obtain the practical application's success and applicability (Liamputtong, 2019a). Pragmatism focuses on practical and achievable solutions rather than theoretical or ideal ones. The value of knowledge is judged based on its usefulness in addressing practical questions of daily life in a context-dependent and extrinsic manner. Pragmatism does not require perfect knowledge but rather deems knowledge meaningful only when coupled with action (Denzin and Lincoln, 2018).

When using pragmatism in practical research, every experience starts with a problem or question that needs solving. To address this, a set of procedures should be developed to tackle the issue; this combination of purpose and procedures leads to action and consequences (Tashakkori and Teddlie, 2021). Therefore, the pragmatic approach to inquiry allows the creation of a planning process that begins with the research question, followed by developing a research design and selecting available methods. The pragmatism paradigm also creates a cycle in which the findings of a research project improve our comprehension of future research questions and the effectiveness of methods used to address them (Morgan, 2013). This approach views research as a dynamic process that combines objectives and procedures, with neither being considered in isolation (Morgan, 2013). To effectively address the issue of engagement and motivation in stroke rehabilitation clinical practice, a pragmatic approach has been adopted in the planning stage of this project. This approach

allows reflecting on the nature of the problem and considering potential solutions, as well as determining how actions can contribute to improving patient outcomes in a specific context. Also, this approach aligns with the MRC framework concept of the complexity of designing health interventions.

Using a mixture of methods allows for flexibility, which means that various approaches can be utilised during the different project phases (Creswell and Clark, 2017). The constructivist paradigm is a form of qualitative research operating under the assumption that reality is shaped by social constructs, meaning there is no singular, objective reality. Instead, there are various interpretations of a single event. Researchers do not simply discover knowledge, they create it (Merriam and Tisdell, 2015). The main reason for selecting the constructivist approach is that the perspective of the development stage is purely qualitative, which is focused on exploring, understanding and developing an intervention. Overall, as a researcher with a clinical background, the pragmatic paradigm was adopted as the researcher views the development of and delivery of a clinical intervention from an experimental perspective. However, throughout the research processes, the researcher aimed to explore and understand the contextual realities that contribute to the research intervention development, thus, the constructivist paradigm was adopted as a compatible paradigm where the research is mainly qualitative driven during the intervention development phase. The use of multiple paradigms in MMR can provide a deeper understanding of the subject being studied.

In this research, both pragmatism and constructivism are needed. Pragmatism is required as it allows the researcher flexibility in selecting appropriate research methods to guide the intervention development for each stage of this research project. Constructivism is required to capture the reality of the context. It allows the researcher to understand the context and provide a suitable intervention

design based on these realities, which could result in an intervention that is applicable to the local setting's capabilities, culture, and systems.

2.4 Justification for using a mixture of methods research approach and research objectives

There is a paucity of research evidence regarding the engagement and motivation of stroke patients with CI in PT rehabilitation programmes. Also, there is limited evidence of stroke rehabilitation in the Saudi context. Therefore, this research project is a complex intervention that requires exploring various areas related to the research topic and context, including synthesising existing knowledge, exploring contexts, planning, testing, and evaluating during the research process. Although the current study focuses only on developing an intervention, future research, such as designing and evaluating results, will build upon the findings and information gained during the development phase, therefore, it is essential to apply multiple different methods to cover all aspects of the project.

This study uses sequential exploration phases (multiphase MMR) to develop an intervention that emphasises the qualitative perspective to guide its development. This project aims to develop an appropriate intervention for individuals, their cultural and environmental contexts, and systems. To achieve this, each stage built upon the findings from the previous stage (Figure 2-2).

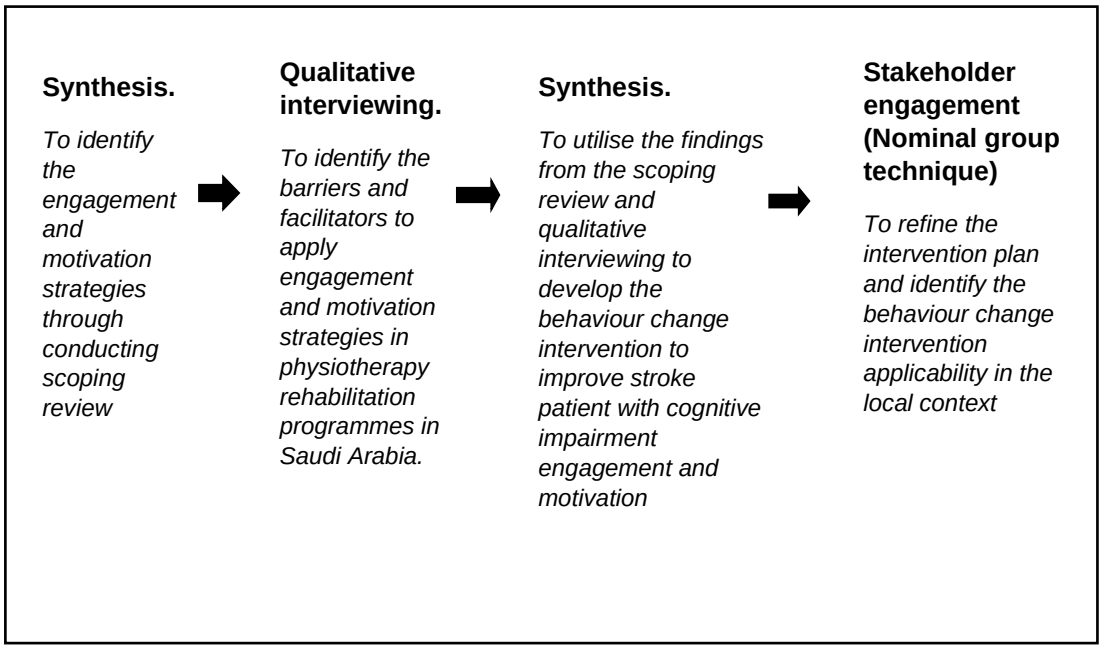

Figure 2-2: The phases in developing the intervention to enhance engagement and motivation in physiotherapy rehabilitation programmes

This project has several objectives to develop an intervention to enhance the engagement and motivation of stroke patients with CI in physiotherapy rehabilitation programmes.

2.4.1 Exploring the research topic

The first objective is to identify strategies used in physical rehabilitation interventions to increase stroke patients with CI engagement and motivation in the PT rehabilitation programmes. To address this objective, a scoping review was conducted. The scoping review is a knowledge synthesis methodology that allows key concepts and gaps in practice to be identified (Tricco et al., 2016). It was crucial to conduct a scoping review early on to identify strategies for improving engagement and motivation and to understand how these concepts are addressed in existing literature. Conducting the scoping review is linked with the researcher's philosophical stance and connects with the pragmatic paradigm in the sense that the result reflects the strategies used in clinical practices to

support engagement and motivation. This led the researcher to know the skills, instruments, measurements, and technologies required for engaging and motivating stroke patients with CI. It is also linked with the constructivist paradigm by allowing the researcher to understand the reality of how engagement and motivation are constructed in different contexts, thereby enabling the researcher to inform the theoretical framework selection to explore the reality in a specific context and allow comparing the realities in different contexts. Thus, this project's scoping review helped theoretical framework selection to guide intervention development and provide a practical understanding of the clinical practice related to patient engagement and motivation. Overall, the scoping review was conducted to synthesise the existing evidence related to the research topic, highlighting the nature of engagement and motivation concepts utilisation in the physical rehabilitation practice. These findings generated knowledge to inform decisions about the next stage.

2.4.2 Qualitative interviews

The second objective is to identify the facilitators and barriers to applying engagement and motivation strategies in physiotherapy rehabilitation practice in KSA. To address this objective, a qualitative study was conducted to explore the individual, cultural and environmental facilitators and barriers. The qualitative study in this thesis is considered the main study that the intervention development built upon the findings gathered from the qualitative interviewing. Healthcare research has increasingly adopted qualitative research methods (Chapman et al., 2015). This approach enables researchers to explore the meanings, experiences, and social and cultural norms that impact healthcare delivery, individual behaviours, and health outcomes (Hansen, 2020). Qualitative research is crucial for developing, testing, and implementing interventions (Sandelowski and Leeman, 2012). Unlike quantitative research, qualitative

research is inclusive and concerning building concepts, theories, and hypotheses and gathering rich descriptions of the phenomena of interest (Merriam and Tisdell, 2015). Qualitative research methods in complex interventions have a crucial role in developing and process evaluation of interventions as they allow identifying assumptions, components, and active ingredients and mechanisms (Craig et al., 2008, Clark, 2013). As a result, this qualitative study guided the development of an intervention after providing a better understanding of the facilitators and barriers of clinical practices that hinder or aid in enhancing clinical services and stroke rehabilitation outcomes.

2.4.3 Development of the programme theory

The third objective is to use the findings from the scoping review and qualitative interviews to inform an intervention design. To make the intervention plan clear, a programme theory through designing a logic model was created to explain how it works and why. Developing a programme theory is an essential element of the MRC framework because it improves the understanding of interventions among decision-makers and researchers and allows for its refinement to suit contextual settings, policies, and practices (Skivington et al., 2021). Therefore, designing a programme theory in this research provided a detailed explanation of the intervention development process by highlighting the research findings and the intervention components to promote engagement and motivation of PSCI patients in the PT rehabilitation programmes.

2.4.4 Stakeholder engagement

The final objective is to refine the intervention plan and identify its applicability in the local context through engaging stakeholders. Stakeholder Engagement (SE) is recognised as a crucial part of developing complex interventions (O'Cathain et al., 2019, Petkovic et al., 2020, Skivington et al., 2021). Engaging stakeholders is crucial for maximising intervention potential, as they play a key role in decision-

making and raising awareness of policies and obstacles during the intervention design process (Skivington et al., 2021). To achieve this objective, a Nominal Group Technique (NGT) was conducted with key stakeholders in the PT rehabilitation settings such as quality managers, heads of departments and physiotherapists. The NGT is a structured method to gather information on a particular topic during a cross-sectional activity for group consensus (Harvey and Holmes, 2012). NGT is a method that uses both qualitative and quantitative data collection in a group setting and it is designed to gather expert opinions and establish a consensus, or a ranking of priorities related to a specific topic (Jünger and Payne, 2020). Despite the nature of the NGT as mixed methods activities which serve as a pragmatic, consensus methods have a constructivist element because it is the main procedure of qualitative information from experts in a focus group (Harvey and Holmes, 2012). Therefore, it allows for understanding the realities, especially to this research to identify the policies and processes to deliver the intervention in the local contexts. The NGT was used to identify key stakeholders' perspective in the behaviour change intervention plan and seek a consensus on the intervention applicability, as well as refine the intervention plan. This stage is crucial before moving toward designing and testing the intervention.

2.5 Conclusion

This chapter highlighted the MRC framework as a guide to developing the intervention. This was necessary because the intervention is complex due to limited evidence on PSCI engagement and motivation, as well as the various concepts related to the research topic. The chapter also highlighted the MMR approach as suitable for intervention development. Using a mixture of methods (multiphase MMR) is compatible with the MRC framework for developing complex interventions as a flexible approach that allows researchers to select

appropriate research methods to explore the research topic and develop the intervention. Therefore, the multiple research methods were used to address the thesis objectives and achieve its aim. The subsequent chapters will discuss exploring the topic and developing the intervention.

3 Strategies to improve motivation of stroke survivors with cognitive impairment to engage with physical therapy programmes: A scoping review

3.1 Introduction

A scoping review is defined as an exploratory project which maps the literature available on a topic and is specifically adopted when a certain topic or area is complex or not extensively reviewed in previous studies (Mays et al., 2001, Levac et al., 2010). This approach has become popular for synthesising research evidence (Davis et al., 2009, Pham et al., 2014) and can be undertaken for a variety of reasons including examining the extent, nature, and range of research activities in a specific area, determining the value of conducting a full systematic review, identifying the research gap, and summarising and disseminating the research findings (Arksey and O'Malley, 2005). Moreover, it can be ideal in the rehabilitation field as it allows researchers to incorporate different research design findings, raise questions other than those related to treatment effectiveness, and identify findings which possibly complement the clinical trial findings (Levac et al., 2010). This chapter has conducted a scoping review instead of a systematic review for various reasons. Firstly, systematic reviews usually focus on a well-defined and narrow question, where a range of studies can be identified in advance (Arksey and O'Malley, 2005). In the current study, the research question involves multiple concepts, such as engagement, motivation, stroke, CI, and stroke, and there is a lack of study designs that can be identified in advance. Therefore, a scoping review is more suitable to explore the topic and the range of studies. Secondly, systematic reviews are typically undertaken to assess the quality of included studies (Grant and Booth, 2009, Levac et al., 2010). This chapter uses a scoping review because it does not aim to address the quality of evidence in the included

studies. Instead, it identifies the nature of the research on this topic and builds knowledge to guide the research process in the next stage of this project. The rationale for this review was to identify strategies used to support stroke survivors with CI to enhance their motivation and engagement in PT rehabilitation programmes and evaluate the efficacy of these strategies.

3.2 Background

Chapter One presented the background to this thesis. To recap in brief. CI after stroke is common and negatively impacts patient outcomes (Jokinen et al., 2015, Levine et al., 2015, Kapoor et al., 2019a). PT interventions such as therapeutic exercises improve stroke motor and cognitive outcomes (Pollock et al., 2014). However, a lack of motivation and engagement in stroke survivors who have CI is a barrier to achieving potential rehabilitation benefits (Harris et al., 2014, Gillespie et al., 2015). Studies identified that cognitive domains, such as memory and executive dysfunction, were strong predictors that influence whether patients fully engage in rehabilitation programmes (Williams et al., 2021, Lowder et al., 2022a). Improving engagement and motivation in rehabilitation is essential to improving functional performance for stroke patients with CI. Even if HCPs cannot reverse CI, they may be able to improve engagement and motivation in this hard-to-treat group of patients.

Applying engagement and motivation strategies in healthcare can enhance patients' experiences, adherence, safety, and outcomes (Popovic et al., 2014, Kim et al., 2018, Miller-Rosales et al., 2022). In this context, engagement and motivation strategies are defined as techniques or tools healthcare professionals use to orient patients to being involved in rehabilitation and decision-making activities (Grande et al., 2014, Oyake et al., 2020a). Some different methods or strategies have been described to support patient engagement and motivation in

physiotherapy rehabilitation programmes. For instance, Brett et al. (2017) conducted a systematic review to identify strategies to enhance rehabilitation engagement for adult clients with acquired brain injuries. The findings were divided into behavioural modification techniques and cognitive/metacognitive skills. Behavioural modification is referred to as environmental manipulation to improve the desired behaviour or decrease the problem behaviour. The behavioural modification techniques mentioned were sending reminders to patients, visual cues, written contracts of patient and therapist therapy expectations, and contingent rewards. Cognitive/metacognitive skills involved information provision, motivational interviews, meta-cognitive strategy training, self-regulation, and goal setting. However, some limitations in the strategies were reported, especially for behavioural modification, such as the inconsistency in outcomes measures (studies were measuring adherence and compliance, not engagement and motivation) and many were single case studies that had limitations in the external validity. Moreover, a cross-sectional study by (Oyake et al., 2020c) provided a list of motivational strategies drawn from the researcher's experience in stroke rehabilitation, existing literature, and a previous qualitative study with stroke rehabilitation practitioners that could be used in rehabilitation programmes. The participants (n=362) selected the strategies they mostly used in their practice including active listening, praise, enjoyable communication, providing a suitable environment, explaining the necessity of the practice, goal setting, and respecting self-determination. Furthermore, most participants selected other strategies, such as family member presence, providing medical information, task difficulty control, patient references to practice, goal-oriented practice, and practice related to patient experiences. The study highlighted the varieties of motivational strategies applied by rehabilitation professionals, most of which require patients to be cognitively intact to take part, use their memory, executive skills, listening and learning. The study did not provide information

regarding the motivational strategies used based on the level of disability, such as severe functional disability or the presence of cognitive or communication impairment.

Despite the evidence of using motivation and engagement strategies to enhance patient outcomes, it was evident that information about using such strategies with stroke patients with CI was lacking. To the researcher's knowledge, there were no published reviews to identify the engagement and motivation strategies for stroke patients with CI to date. Therefore, this scoping review aimed to identify which published strategies have been applied in the physical therapy practice to improve stroke patients with CI engagement and motivation in rehabilitation programmes.

3.3 Method

The research methods for this scoping review followed the framework suggested by Arksey and O'Malley (2005). The framework has five stages which are:

- Stage 1: Identifying the research question
- Stage 2: Identifying relevant studies
- Stage 3: Study selection
- Stage 4: Data charting
- Stage 5: Collating, summarising, and reporting the results

3.3.1 Stage 1 Research question

- What strategies are used in rehabilitation settings to enhance stroke survivors with CI engagement and motivation in rehabilitation programmes?
- How effective are these strategies to enhance the engagement and motivation of this population?

3.3.1.1 Objectives

- To identify strategies used to improve engagement and motivation in stroke patient who have CI and assess their effectiveness.
- To identify the outcome measurement used to assess engagement and motivation
- To understand how the concept of engagement and motivation is used in stroke rehabilitation for a stroke patient with CI
- To assess the quality of evidence for the identified studies

3.3.2 Stage 2 Identifying relevant study

A computerised search was conducted to find studies related to the research questions and objectives. MEDLINE, AMED, CINAHL, and EMBASE databases were systematically search for articles. The terms searched for this review were “stroke”, CI”, “rehabilitation”, “physiotherapy”, “occupational therapy”, “participation”, “engage*”, “motivate*”, “compliance “and “adherence”. Terms related to CI were “attention deficits, “memory deficits”, “spatial neglect”, “executive dysfunctions”, “motor apraxia”, “aphasia” and “perceptual disorder were searched to involve any studies that might target the patient’s specific domain cognition. Medical Subject Headings “MeSH” were used to include all related terms. In addition, the difference in the used terms between American and British English was taken into consideration. For instance, the terms “cerebrovascular incidence” or “CVA” were applied in addition to stroke, the term “physical therapy” and “PT” was applied in addition to physiotherapy and the term “OT” in addition to occupational therapy. These terms were applied only if they were not present in the MeSH headings. The references from the relevant papers were screened in order to find more studies to be included in the results.

Furthermore, if data from studies was not available, the author was contacted. It only searches the articles published in the time 2000-2023 (last search was performed on 23/03/2023). The search was limited to English language studies. Search strategy is provided in appendix 1.

3.3.3 Stage 3 Study selection

Study selection was based on the following criteria:

- Studies published in full-text articles
- Patients over 18 years old and diagnosed with stroke
- CI was identified by utilising a global cognitive assessment tool such as MoCA or MMSE tools, or any recognised objective assessment tools, to determine the participant to be cognitively impaired. Studies which did not provide measurements for cognitive functions but the author stated the participants or some participants had CI were included
- It should have patients' motivation or engagement in their outcome measurements, not necessarily as main outcome measurements
- Involve all types of quantitative studies that report findings regarding improvement or non-improvement in the engagement and motivation of the rehabilitation programme. Qualitative studies that discuss the concept of engagement and motivation in rehabilitation programmes were included to emphasise the current issues in rehabilitation settings and programmes to provide possible solutions and strategies to improve services.
- Only studies that were published in the English language were searched and conference abstracts and case studies were excluded.

3.3.4 Stage 4 Data charting

The main author independently screened the titles and abstracts of the search findings to identify studies that met the selection criteria. After identifying

potential studies for inclusion in the scoping review, two authors (FA & JY) individually evaluated the potential articles in a specific form (eligibility studies) to decide whether to include or exclude the article (Appendix 2). The second author reviewed 10% of the articles that the main researcher had identified as potential candidates. The main researcher randomly selected studies for evaluation and sent them to the second reviewer along with the eligibility form. The two authors then assessed the studies and came to a consensus on whether to include or exclude them. There were no disagreements between the authors throughout the process. The third author (PL) was consulted in the case of disagreement. Data extraction was conducted to gather details and information related to the research question and aim, including study title, author names, year of publication, type of study, geographical location, number of participants, outcome measurements, and study findings. The data extracted were recorded in an Excel file.

3.3.4.1 Quality assessment tool

The Critical Appraisal Skills Programme (CASP) checklists were used to assess the quality of the research included in the review, as this comprehensive tool provides checklists for different types of research, such as systematic review, Randomised Controlled Trials (RCTs), case-control studies, cohort studies and qualitative studies, as well as assessing various research domains, such as the identification of the research questions, evaluating the methodology and research design, descriptions of population and sample size, outcome measurements, analysis methods, relevance and interpretation of research findings. In this study, CASP checklists were utilised for both randomised controlled trials and qualitative studies (Appendix 3). Regarding RCTs, question number 7 (How large was the treatment effect?) and question number 8 (How precise was the estimate of the treatment?) were excluded as they provided

description information and it was not possible to score them, so the total score for RCTs was 9 instead of 11. Furthermore, question 2 (Was the assignment of patients to treatments randomised?) was excluded for the non-RCT studies for the same reason, hence, the score for non-RCT studies was 8 points. For the qualitative checklist, question 10 (How valuable is the research?) was excluded due to the inability to score it, hence, the total score for the qualitative studies was 9 points.

The studies were scored and the overall score converted into a percentage in order to identify the quality of studies (higher than 70% indicate high-quality studies; 40-70% indicate medium-quality studies; less than 40% indicate low-quality studies).

3.3.5 Stage 5 Collating, summarising, and reporting the results

In total, 16,084 articles were identified (CINAHL N=3186, MEDLINE N=4480, AMED N=298, EMBASE=8120) and after removing duplicates using ENDNOTE X9, 10,167 studies were screened. After title and abstract screening, 187 articles remained, of which, seventeen studies met the inclusion criteria and were included in the review. Studies (N=160) were excluded due to various reasons including: the treatment programme in the studies was not related to physical therapy (N=38); studies were not related to the aim of the review (N=29); study protocol articles (N=7); and patients in the study were not cognitively impaired (N=86). A summary of the search results is shown in the PRISMA flow chart (Figure 3-1) and the individual studies are presented in Table 3-1.

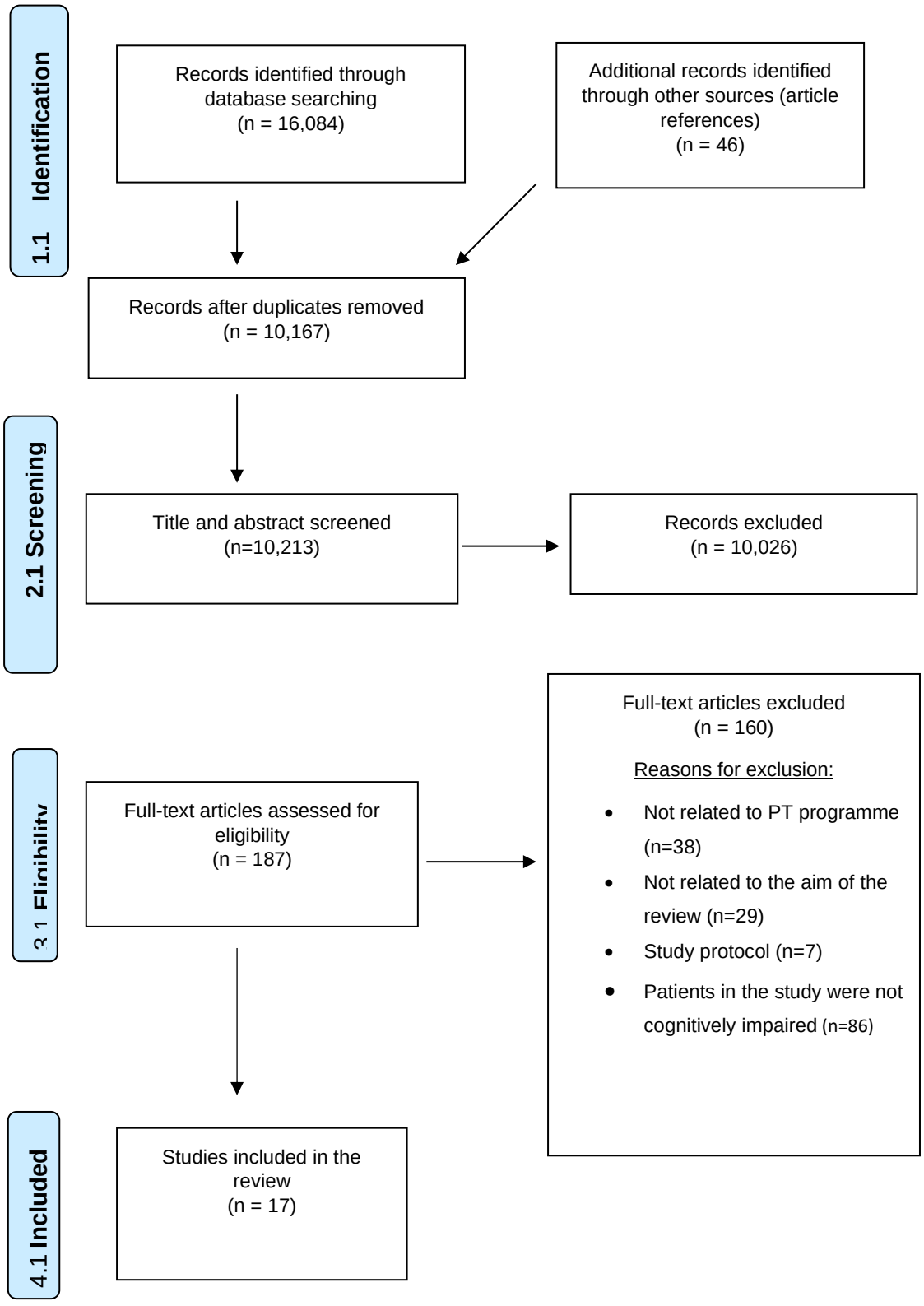

Figure 3-1: PRISMA flow chart for search strategy findings

Table 3-1 The characteristics of included studies and quality assessment scores

Author (Year) and countries	Setting	Design	Number of Participants	Engagement or motivation Strategy	Finding	CASP score
Bright et al., 2018 NewZeeland	Inpatient and commun	Qualitative study	28 Rehabilitation practitioner (n=25)	Longitudinal observation of the treatment programme and an interview to discuss the process of patient engagement in the rehabilitation programme	Improvement in engagement in the rehabilitation process was strongly connected with the communication skills of the rehabilitation practitioner	1 0 0 %
Bright et al., 2017 New Zealand	Inpatient	Qualitative Study	53 Rehabilitation practitioners (n=42)	To examine how the engagement and disengagement between the patient and rehabilitation practitioner occur in therapeutic sessions	The rehabilitation practitioner sought to be an important factor in facilitating patient engagement as the study supported that when the rehabilitation practitioner was engaged in the rehabilitation session, the patients were engaged and when they were not engaged, the patients were less engaged in the therapeutic sessions	100%
Cano-Manas et al., 2020 Spain	Inpatient	Randomised control trial	48	Video game rehabilitation: The control group received the usual rehabilitation session (45 min physiotherapy and 45 min occupational therapy) 5 days a week for 8 weeks. The experimental group received 35 min of physiotherapy, 35 min of occupational therapy, and a 20 min video game using the Xbox 360 console	A significant difference in experimental group motivation (P<0.01), self-esteem (P<0.01) and adherence (p<0.01) measured by motivation, self-esteem, and adherence scale	87%

				and the kinetic device 3 days a week for 8 weeks, and the remaining sessions receive the usual rehabilitation programme (45 min physiotherapy and 45 min occupational therapy).		
Celinder and Peoples, 2012 Denmark	Inpatient	Qualitative stu	9	Video game. Stroke patients performed the therapeutic sessions using Wii in a rehabilitation room with support from the occupational therapist by adjusting the and providing verbal and physical support. duration of each session was 30 min for 3 weeks with no more than 3 sessions each week.	Participants stated using Wii in rehabilitation provided a variety in daily routines by breaking up the daily rehabilitation routine by engaging in meaningful activities and increasing the communication and conversation within the rehabilitation unit. Also, participants suggested that Wii supported the engagement by providing excitement and motivation, and improved the functional outcomes	88.9%
Dofler and Kulnik, 2020 Austria	Hospital	Qualitative Study	11 rehabilitation professionals	Explored the strategies the rehabilitation practitioner utilised to involve stroke patients with communication and cognitive impairment in a person-centred goal setting.	Strategies used during the rehabilitation practice to increase stroke patients with CI engagement in rehabilitation goal setting were flexibility in changing and evaluating goals, trusting patient-therapist relationship establishment, enabling empowerment, communication skills and interaction, and involving relatives	88.9%

Erikson et al., Sweden	Inpatient + outpatient	Qualitative Study	7	To describe the meaning of action in different places one year after stroke.	The study found a strong connection between the desire to be reintegrated into a familiar place such as home or workplace and the motivation to engage in the rehabilitation programme	88.9%
Horton et al (2011) UK	Hospital	Qualitative observational Study	2	To investigate how active engagement was achieved in daily multidisciplinary rehabilitation practice	The engagement in rehabilitation sessions is facilitated by the interaction between the therapists and patients. An institutional ethos of right practice was observed as the working practice of therapists and aligned with or resisted by stroke patients. The therapeutic activity type impacted how the engagement developed and sustained.	88.9%
Janssen et al., 2014 Australia	Inpatient	Non-randomise controlled trial	29	The intervention group received the usual rehabilitation care + access to environment enrichment equipment activities such as computers, reading materials and games. The control group had the usual rehabilitation care.	The enriched environment group was significantl engaged in all types of functional, cognitive, and social activities (p=0.02) compared with the non-enriched environment group	75%
Kersey et al., 2021 Canada	Inpatient	Feasibility stud	16	Strategy training. The core elements for the intervention were participant-select activities, participants-directed self-evaluation of the selected activities' performance, improve activity performance through applying global strate (Goal-Plan-Do, Check), self-evaluation, and learned skills application in daily activities.	Participants had good engagement in the intervention (PRPS: Median=5, IQR=2.0)	N/A

Keyes et al., 2022 New Zealand	Inpatient and outpatient	Qualitative Study	19	Understanding the meaning of engagement in stroke rehabilitation from the stroke patient's perspective focusing on identifying the important processes to engagement in stroke rehabilitation	The engagement process was achieved through developing connections. The most fundamental connections identified were therapeutic connections with rehabilitation practitioners. This connection could be achieved via rehabilitation practitioners knowing the individual needs and personalities, mutual trust between patients and practitioners, adapting the treatment programme based on patients' capabilities and preferences, and practitioner commitment, dedication, and emotional support during the sessions and in the whole recovery process	100%
Khan et al., 2016	Inpatient	Randomised controlled trial	103 participant with neurological conditions and stroke participants	Providing an enriched environment. Patients have access to individual and communal enriched environment equipment and an activities programme in t "Activity Arcade". It's a separate location with its own lift access and offers a range of activities including computer workstations cognitive exercises, a library, music, and video mirrors. Participants can also engage additional 2-hour sessions on weekdays based on their clinical needs.	Significantly different scores between groups on the DASS P=0.06 and FMI p=0.04, suggesting that an enriched environment improved patients' engagement, coping and self-management in inpatient neurorehabilitation settings	100%

Kowk et al., 2022 Canada	Inpatient	Qualitative Study	17 Rehabilitation Therapists (n=7)	Using outcomes measurement to support engagement in the physiotherapy programme.	Using outcome measurements during the rehabilitation programmes improve the engagement through increasing stroke patient confidence and trust to engage in rehabilitation programme, enhance communication with therapists and discuss the progress, and offer encouragement and affirmation for stroke patients. The use of outcomes also motivates the patient by measuring the changes in functions and enhancing the treatment expectation.	100%
Oyake et al., 2022 Japan	Hospital Based	Qualitative study	15 PT	Identify strategies physiotherapists tailored to enhance the stroke patients' motivation during stroke rehabilitation	In stroke patients with cognitive impairment, physiotherapists reported motivating their patients by applying the individuals' preferences and lifestyle to practice tasks and respecting the individual's self-determination.	100%
Pereira et al., 2021 Portugal	Outpatient	Within-person Randomised controlled trial	21	Video game. A two-player game to catch balls that appear in random positions using different game modes: Competitive, Co-active, and Collaborative. In competitive mode, each participant had to catch a maximum number of balls, and the participant who caught more balls won. the other two modes participants worked as a pair to catch balls (Co-active mode) and catch balls of the same colour (Collaborative mode), the result scored as a team score.	Participants were highly engaged in all Game modes with a significant change in flow $p=0.002$ and challenge $p=0.004$. Participants also had significant differences in behavioural involvement $p<0.001$.	66%

Skidmore et al., 2015 USA	Acute inpatient rehabilitation	Randomised controlled trial	30	Strategy training. The Intervention group received usual rehabilitation care + Strategy training focused on coaching participants to address their self-selected activities, self-evaluation performance, and self-derived strategies to address performance. The Control group received the usual rehabilitation programme + reflective listening regards patients' rehabilitation experiences.	Both groups were highly engaged in the intervention (strategy training PRPS mean=4.69, control group PRSP mean=4.99). Strategy training group had decreased the apathy symptoms at 3 (p=0.013) and 6 (p=0.073) months compared with reflective listening group. The level of improvement was higher over time (Not in the early stage of the programme)	100%
Skidmore et al., 2014 USA	Inpatient	A pilot random controlled trial	10	Strategy training. The intervention group received the usual rehabilitation care+ strategy training addressed self-selected goals, self-evaluation of performance, strategy development	No significant difference between both groups of the intervention engagement PRPS P=0.07.	87.50%

				and implementation, and therapeutic guided discovery. The sessions were 30-40 min 5 days per week for the duration of length of stay. Control group participants completed a daily journal with details of their thoughts and feelings about the rehabilitation sessions in addition to the rehabilitation usual care.		
White et al., 2015 Australia	Outpatient + Home	Qualitative Study	12	Using technology. Evaluation 3 months iPad App use (semi-structured interview) after patients returned the iPad	The study suggests using iPad App promotes stroke survivors' confidence, participation, and motivation to practice the rehabilitation programme	100%

Abbreviations: DASS, Depression Anxiety Stress Scale; PRPS, Pittsburgh Rehabilitation and Participation Scale; FIM, Functional Independence Measure; PT, Physiotherapists

3.3.5.1 Participants, settings, and study designs

In total, 380 participants (277 stroke survivors and 103 rehabilitation practitioners) were included in the selected studies published between 2010 and 2022 and conducted in Australia (Janssen et al., 2014, White et al., 2015, Khan et al., 2016), Canada (Kersey et al., 2021, Kwok et al., 2022), Sweden (Erikson et al., 2010), the USA (Skidmore et al., 2015b, Skidmore et al., 2014), New Zealand (Bright et al., 2017a, Bright et al., 2018, Kayes et al., 2022b), Austria (Dörfler and Kulnik, 2020), Spain (Cano-Manas et al., 2020), Portugal (Pereira et al., 2021), Japan (Oyake et al., 2022), Denmark (Celinder and Peoples, 2012) and the UK (Horton et al., 2011a). The study settings were inpatient, outpatient and community-based settings. The included studies were of various research designs: three were RCTs, one within-person RCT, one feasibility design, nine qualitative studies, and two pilot non-RCTs (Table 3-1).

3.3.5.2 Engagement and motivation strategies

3.3.5.2.1 Providing enriched environment

Two included studies (Janssen et al., 2014, Khan et al., 2016) supported engagement and motivation by providing an enriched environment. The enriched environment in this context refers to interventions designed to enhance physical, cognitive, and social activities for stroke patients who experienced cognitive impairment through providing equipment and a stimulating environment (Khan et al., 2016). Both studies were conducted in inpatient stroke rehabilitation units and involved enriched activities such as providing computers with internet access, materials of the participants' choice including books, music, board games, and puzzles, and a workstation with game technology such as Nintendo Wii. The enriched environment interventions significantly increased stroke patients with CI engagement resulting in a significant improvement in functional, cognitive, and social outcomes compared to participants not receiving the enriched environment intervention.

Reintegration in the outside hospital environment (home or work environment) was important to support the stroke patients' engagement in the rehabilitation programme (Erikson et al., 2010). This desire to return to their familiar and preferable places positively impacted their rehabilitation programme engagement, therefore, they were encouraged to enhance their functional activities. It also impacted their desire to find activities in their homes and workplaces that improved their functional independence.

3.3.5.2.2 Therapeutic interaction and communication

Seven studies were related to achieving better engagement for stroke patients with CI through effective communication during rehabilitation sessions. Kayes et al. (2022b) explored how stroke survivors view rehabilitation engagement and its significance in terms of developing connections during the rehabilitation programme. These connections were laid on rehabilitation practitioner knowledge, entrusting, and their abilities to adapt to the rehabilitation programmes and being flexible to provide change. To achieve active engagement via connections, physiotherapists should be aware of their patient's needs and capabilities, show empathy, and contextualised tasks to highlight the progress. The physiotherapist should also trust the patient’s capabilities and desires for independence.

Two observational studies (Horton et al., 2011a, Bright et al., 2017a) identified how active engagement was achieved during rehabilitation sessions. Both studies identified the positive interaction between patients and therapists to facilitate and achieve active engagement. The studies focused on the rehabilitation practitioner interactions through their level of engagement, selection of activities and feedback provision to facilitate stroke patient engagement. Practitioners should actively participate by demonstrating a positive attitude and providing verbal and non-verbal support throughout the treatment session to improve patient engagement during rehabilitation sessions. Additionally, it is important to select activities that are

appropriate for each patient's abilities and interests and to provide positive feedback, particularly regarding performance characteristics that lead to successful outcomes.

Moreover, another study by Bright et al. (2018) observed the rehabilitation sessions and then discussed the principle of engagement in the rehabilitation programme. The key findings were the importance of communication as it encouraged and enhanced engagement in the rehabilitation programme. Positive communication was suggested, by the authors, through interaction with the patients, knowing their personality and needs, and working in a way that matters to them, with active listening and relational dialogue. Relational dialogue involves practitioners performing a range of communication behaviours, such as writing and gestures, using body language, and communicative acts, such as joking and questioning. Furthermore, engagement in the stroke rehabilitation programme can be improved by utilising the outcome measurements, which could enhance communication and trust between stroke patients and physiotherapists.

Rehabilitation communication was also essential to enhance the stroke patient's with CI motivation. Their motivation was enhanced through goal setting with flexibility in delivering and designing the rehabilitation goals, patient empowerment in selecting rehabilitation goals, involving relatives and using effective communication techniques to accommodate patients' cognitive needs (Dörfler and Kulnik, 2020). In addition, provide physiotherapy programmes based on the individual's preference and lifestyle and respecting their self-determination (Oyake et al., 2022).

3.3.5.2.3 Using strategy training

Three studies used strategy training when delivering rehabilitation programmes for stroke patients with CI (Skidmore et al., 2014, Skidmore et al., 2015b, Kersey et al., 2021). All studies were set in inpatient rehabilitation units and the strategy training was described as a task-specific intervention that teaches stroke patients to evaluate their daily activities performance and develop strategies to overcome performance

barriers to achieve improvement in the selected activities (Kersey et al., 2021). The studies applied the core elements of the strategy training: selecting activities, self-evaluation of selected activities, using global strategy (goal, plan, do, check) to address the performance, and applied the learned principles across self-selected goals. Two of the included studies were feasibility studies. One study did not have significant differences between groups in the patients` engagement (p=.77; (Skidmore et al., 2014), while participant engagement in the other (one group only) was not excellent (PRPS > 5) (Kersey et al., 2021).

The third study was a secondary analysis of an RCT which analysed apathy (lack of motivation) symptoms at admission, three months, and six months. The intervention group had significantly lowered their apathy level at three months (p=.01) using the strategy training compared to the control group (Skidmore et al., 2015b).

3.3.5.2.4 Using technology

Four studies evaluated and discussed the use of technology (video games and iPad) to support stroke patients with CI. Three studies were related to using video games (Celinder and Peoples, 2012, Cano-Manas et al., 2020, Pereira et al., 2021), on engagement in the game tasks and the rehabilitation programme. The authors concluded that video games can positively influence the patients' engagement via interaction with games and social involvement with rehabilitation practitioners and other stroke patients. It also enhances game engagement throughout various modes (standard–competitive) applications, enhancing functional and social outcomes. Moreover, it improved the motivation for the rehabilitation programme. For instance, Cano-Manas et al. (2020) combined video games with a conventional physiotherapy programme to enhance stroke patients’ satisfaction, adherence, and motivation ($p<0.01$), which resulted in significant improvement in functional outcomes such as ADL activities, balance and gait capacities, and health-related quality of life.

The included studies also reported some challenges of using technology with stroke patients with cognitive impairment. For example, Pereira et al. (2021) reported that more competitive game modes significantly caused more annoyance (p=.04) for participants with a lower cognitive score (measured using t MoCA) when compared with participants with a higher cognitive score due to the higher cognitive demand when playing the competitive mode games. Also, some challenges were raised in other studies, such as the difficulty of using and following instructions, disappointment, the suitability of the game activities for stroke patients, and cognitive exhaustion (Celinder and Peoples, 2012, White et al., 2015).

3.3.5.2.5 Quality assessment of included studies

The CASP tool (RCT and qualitative study checklists) was used to assess the included studies. One study (Kersey et al., 2021) was not critically appraised because it was a one-group feasibility study which was not applicable to apply the CASP tool to assess its quality. All studies achieved 66 to 100% (Table 1) which indicated good quality evidence. There were some methodological issues in study validity such as the groups were not similar at the start of the trial (Cano-Manas et al., 2020, Pereira et al., 2021) but the overall CASP score was > 66%.

3.3.5.2.6 Outcome measurements used in the included studies

Different outcome measurements were used to evaluate the engagement and motivation of stroke patients with CI. Five studies stated which measurement tools for engagement they had used: the Pittsburgh Rehabilitation and Participation Scale was used in two studies (Skidmore et al., 2014, Kersey et al., 2021), one study used the Game Experience Questionnaire (GEQ) core module (Pereira et al., 2021), one study measured the engagement via recording the level of activity reported as the percentage of observation (Janssen et al., 2014), and one study used DASS (Khan et al., 2016). Two studies measured motivation using the Satisfaction, Adherence,

and Motivation scale (Cano-Manas et al., 2020) and the apathy evaluation scale (Skidmore et al., 2015b).

3.4 Discussion

This review aimed to identify and evaluate the strategies for stroke survivors with CI to enhance motivation and engagement in PT programmes. The enriched environment of stroke rehabilitation units, therapeutic interactions, communication skills of rehabilitation practitioners, use of technologies, and application of cognitive strategy training were all identified to improve stroke patients' engagement and motivation. These results indicated that stroke patients with CI could enhance their rehabilitation experience, and by association, improve their functional outcomes. Rehabilitation potential is only achieved when patients are motivated and actively engaged in the therapeutic sessions.

The concept of engagement in this study was suggested to be facilitated by providing a suitable supported environment (e.g., home or hospital), positive interactions and effective communication of the rehabilitation practitioners in rehabilitation programmes. This is aligned with Higgs et al.'s (2017) definition of patient engagement as the individual's desire and capability to participate in a care plan suitable for their conditions in cooperation with the institution or healthcare provider to improve the treatment outcomes and experiences. Regarding the rehabilitation environment, different studies reported it as a barrier, which impacted stroke survivors' engagement in the rehabilitation programmes (Lipson-Smith et al., 2021, Last et al., 2022). Therefore, not surprisingly, providing an enriched environment could enhance rehabilitation engagement and outcomes. The expanded evidence supported the enriched environment to improve stroke patients' outcomes (Bernhardt et al., 2012, Rosbergen et al., 2017). However, the existing literature was in acute stroke units, therefore, the evidence is lacking regarding the transferability of enriched

environments into other settings such as outpatient, community, or home environments. Moreover, the rehabilitation environment could involve physical resources (e.g. public transportation, mobility devices, providing reminders), as well as social support, factors which moderate reengagement in rehabilitation programmes (Wang et al., 2006). Therefore, specific identification of the physical, social, and service requirements and the mechanism of how the rehabilitation environment could support stroke patients with CI could enhance rehabilitation services and patient outcomes.

In this review, effective communication and professional skills, including goal setting, feedback provision, active engagement, and building trusted relationships, were identified as essential factors in increasing stroke patients with CI engagement in the rehabilitation process. This finding agrees with other published studies (Luker et al., 2015, Sivertsen et al., 2022a, Solbakken et al., 2022). However, communication is a complex process, and multiple studies explain some barriers and factors that might impact effective communication. For instance, an observational study (O'Halloran et al., 2015) reported 126 factors affecting communication between healthcare providers and stroke survivors which were divided into subcategories and categories with seven overall themes. These were knowledge of healthcare providers about communication-related problems such as CI and language impairment, communication skills to facilitate more interaction with stroke patients, healthcare providers' attitude, healthcare providers' characteristics such as the accent, presence of family, physical environment such as noise, as well as hospital procedure and system. Furthermore, in another qualitative study (Clancy et al., 2020), HCPs described that the hospital setting structure, routine, environment, workloads, and roles affect staff-patient communication. Therefore, evidence indicates that it is

important to provide strategies to enhance communication skills, such as educational programmes for the staff, developing systems, services, and policies that support communication, offering enough time to communicate, providing access to written information in particular, patients' communication and care needs, and collaborating effectively with patients' carers (Hemsley and Balandin, 2014). Most studies in this review highlighted that communication strategies were implemented for stroke survivors with aphasia. Therefore, more studies are recommended to evaluate the communication difficulties linked with other cognitive domains, such as memory and attention deficits, to provide techniques or strategies to minimise such an impact on rehabilitation sessions and achieve more effective communication and therapeutic outcomes.

Using technology and applying cognitive training can enhance the engagement of stroke patients with CI in rehabilitation programmes. The potential benefits of using technology such as mobile apps and games to enhance stroke patient engagement in PT rehabilitation were highlighted in several studies. These benefits could include increasing physical activities, enhancing language and cognitive functions, providing educational material, increasing the variety and intensity of therapy, overcoming the loss of medical resources and service accessibility issues, and facilitating social activities and communication (Sureshkumar et al., 2015, Kondapalli et al., 2016, Zhou et al., 2018, Marwaa et al., 2022). Despite all the positive findings, most studies did not acknowledge the difficulties and challenges of using mobile phone apps, such as the cost, accessibility to internet services, and the criteria of the games or apps that suited stroke patients with cognitive decline. Concerning applying strategy training, the included studies in this review aimed to test the feasibility and did not identify a significant change in stroke patients' engagement in the intervention. The extended studies on applying the strategy training identified a significant impact

on stroke patients with CI cognitive measurement scores and functional outcomes (Skidmore et al., 2015a, Wolf et al., 2016, Skidmore et al., 2017). However, these studies did not measure patient engagement or motivation or explain the difficulties and challenges of the strategy training application. Therefore, more evidence should address the challenges of cognitive training strategy application with the rehabilitation programme and provide a measurement of engagement and motivation.

Overall, applying different strategies to rehabilitation enhanced stroke survivors with CI engagement and motivation to participate in the rehabilitation programme, and the findings supported the evidence that stroke survivors with CI benefit from rehabilitation (Rabadi et al., 2008, Saposnik et al., 2012, Mizrahi et al., 2016). Some gaps were identified in the current findings. Firstly, there was limited evidence in applying motivational strategies to stroke patients with CI in rehabilitation programmes. Also, limited available evidence provided a measurement for motivation in rehabilitation programmes. Secondly, many studies included stroke patients with and without CI in the intervention group, therefore, there was no specification and reporting of the findings based on the CI, which could add important findings and explanations on the engagement and motivation in their studies. Studies also lacked information regarding the cost of the intervention. Finally, there was a lack of information regarding the requirements and training provided for the rehabilitation practitioner to implement the interventions.

3.4.1 Implications

This review has implications for the current PhD project and physical therapy practice, and the findings will be instrumental in shaping the intervention's design, providing valuable insights for formulating relevant topic guide questions during interviews. These questions will be formulated based on the conclusions

drawn from the scoping review. This approach will enable researchers to explore the facilitators and barriers to applying engagement and motivation strategies in rehabilitation programmes.

The findings will be used to choose the theory to inform the intervention design. The identified engagement and motivation strategies and the gap in the evidence guided the researcher to select the appropriate theory that informed the intervention development. After evaluating the evidence on engagement and motivation strategies, the researcher identified the theoretical domain framework (TDF) to guide the intervention development. The decision was based on the scoping review findings where the majority of the motivation and engagement strategies (therapeutic connection and interaction, using strategy training, and involving technology (e.g., smartphones) rely on the physiotherapists' behaviours (knowledge, skills, beliefs, attitudes, and roles) and rehabilitation environment (providing enriched environment). Therefore, the theoretical framework was selected to investigate the barriers and facilitators related to physiotherapists and rehabilitation settings environment. If physiotherapists have limited knowledge, skills and attitude, applying engagement and motivation strategies, such as building therapeutic connections and interaction and using strategy training, can be challenging. Also, providing an enriched environment to facilitate engagement and motivation can be challenging if the rehabilitation department settings cannot provide suitable space and equipment.

Regarding PT practice, the findings could add to PT practice by highlighting strategies physiotherapists could consider engaging and motivating stroke patients with CI. Also, the findings can help physiotherapists by knowing the skills to engage stroke patients with CI in rehabilitation programmes.

3.4.2 Strengths and limitations

This review has some strengths. Firstly, this review was the first conducted on this topic and involved a systematic and well-defined approach following established procedures to conduct the scoping review. This increases the reliability of the search process and makes it repeat the search in the future and track the development of the topic, therefore, it gives more insight regards the opportunities and gaps to implement further research. Secondly, this review used a quality assessment tool to determine the quality of the included studies and assess methodological issues.

This review also has some limitations. Firstly, the engagement and motivation strategies were not the primary focus of the included studies and research interventions in general, therefore, information about them may be lacking in detail and measurement. There are likely more engagement and motivation strategies used in studies that were not included, but because that information is not published, it cannot be included. Secondly, the research evidence does not typically focus on stroke patients with CI. If studies that included both patients with and without cognitive impairment were considered, more studies could have been included. Unfortunately, it was not possible to identify these studies during the screening of titles and abstracts. Thirdly, only four databases were searched, so more articles could have been identified by searching more databases. Finally, the review included only studies published in the English language, and more studies that might be published in other languages were excluded.

3.5 Conclusion

To encourage the engagement and motivation of stroke patients with CI in rehabilitation, the published evidence suggests that physical therapists need to use a range of complex individual personal skills and provide a supported social and physical environment. However, more studies are still required, especially to

evaluate these strategies of engagement and motivation of stroke individuals with CI and also to develop an understanding of how physical therapists are trained to apply these strategies. Furthermore, future studies ought to report how the rehabilitation environment and individuals supported research interventions for stroke individuals with poorer cognitive function. The following part of the current project aims to identify the facilitators and barriers to applying engagement and motivation strategies in PT rehabilitation practice in the KSA.

4 Theoretically driven behaviour change frameworks

4.1 Introduction

In the previous chapter, the identified engagement and motivation strategies to enhance the engagement and motivation of stroke patients with CI in PT rehabilitation programmes were therapeutic interaction and communication, providing an enriched environment, applying strategy training, and using technology. However, the evidence provided did not clarify the mechanism of how these strategies might influence patient engagement and motivation, nor did they highlight the professional competencies required to effectively apply these strategies in the physiotherapy sessions. Successful application of the strategies is influenced mainly by physiotherapists' behaviour, such as knowledge, skills, and beliefs, and the rehabilitation setting environment, such as providing suitable equipment and space in stroke units.

HCPs, whether working individually or in teams, typically perform behaviours related to six distinct objectives including assessing and diagnosing illnesses, promoting health and preventing illness, managing general health conditions, providing treatments, carrying out actions related to healthcare system management, and building therapeutic relationships with patients and their caregivers (Graves et al., 2017, Patey et al., 2022). Building therapeutic relationships with patients and their caregivers is closely linked with the concept of engagement and motivation in the PT rehabilitation practice and the strategies for patient engagement motivation in rehabilitation programmes (Bright et al., 2017b, Miciak et al., 2018, Kayes et al., 2022a). Therefore, physiotherapists require a variety of collaborative, communicative, empathetic, and respectful behaviours to ensure optimal patient care (Babatunde et al., 2017). Physiotherapists should also understand stroke patients' needs and priorities, be up to date with evidence-based practice, have knowledge of stroke as a long-

term condition, and have skills in helping patients with self-management and coping with stroke by providing support throughout the care pathway (Baatiema et al., 2017, Jarva et al., 2021). Therefore, physiotherapists' behaviour can be an essential factor that affects whether patients achieve their best possible health outcomes (Francis and Presseau, 2019). The HCPs' behaviours can be influenced by many factors including individual (knowledge, attitude, personality traits) and social and physical environment (policies, systems, social environment) (Presseau et al., 2017, Patey et al., 2022). Therefore, it is essential to identify the physiotherapists' behavioural factors, such as knowledge and beliefs and the PT rehabilitation environmental factors that could impact applying engagement and motivation strategies, to design and deliver an effective intervention to improve stroke patients with CI engagement and motivation in the rehabilitation programmes.

4.2 Behavioural change interventions

Behaviour Change Interventions (BCIs) are defined as a set of activities created to change specific behaviour patterns (Michie et al., 2015). Most diagnoses, intervention plans, interactions and health-related behaviours occur within healthcare settings (Dobmeyer et al., 2014). Therefore, enhancing clinical setting systems and policies and HCPs' behaviour can successfully improve health services and enhance patient outcomes. Many reviews of BCIs conducted in health and medical research target HCPs such as to improve their eHealth competency (Virtanen et al., 2021), hand hygiene guideline compliance (von Lengerke et al., 2017, Srigley et al., 2015), and type 2 diabetes management in primary care settings (Presseau et al., 2018), promote weight reduction programmes delivery for obese and overweight children and adults (Flodgren et al., 2017), and enhance clinical guidelines practice adherence (Tudor Car et al., 2019). The reviews showed that using BCI can improve various

aspects of HCPs' behaviours, including motivation, habits, capabilities, and adherence to guidelines. BCI can also be applied to a diverse group of healthcare professionals, such as physicians, nurses, allied HCPs (e.g., physiotherapists), etc. across different healthcare settings, including primary, secondary, tertiary, and community services.

Several studies suggested that using BCIs effectively improves HCPs' skills and health services. For instance, Chauhan et al. (2017a) conducted an overview of reviews to evaluate the evidence on BCIs and policies aimed at HCPs working in primary healthcare settings. This comprehensive review included 138 reviews which represented 3502 individual studies. Most of the included reviews were related to chronic disease management, such as mental disorders, diabetes, cancer, cardiovascular diseases, hypertension and respiratory diseases. The results were classified into BCIs and policy categories. The BCIs category included education, enablement, environmental restructuring, persuasion, modelling, multiple interventions, training and incentivisation. The policy categories included service provision, guidelines and communication. The included studies ranged from poor- to high-quality reviews that demonstrated the effectiveness of the reported BCI to enhance professional practice, such as knowledge, skills, screening rate, prescription, and use of electronic health records. Furthermore, they demonstrated the effectiveness of BCI in changing the policies and enhancing clinical practice, such as guideline development, increasing collaboration among HCPs from different disciplines, and improving the rate of vaccination. The study concluded that most BCIs could effectively modify the HCPs' practice and patient outcomes. It also reported that limited evidence exists to support some BCI techniques such as environmental restructuring, modelling and financial incentives in changing the clinical practice. The evidence suggests that BCIs which target HCPs, clinical environment and

policies play an integral role in improving health services and patient outcomes. This review did not consider reviews from low- and middle-income counties. It is important to include evidence from these areas to gain insight into how BCI applications work in different cultural, environmental, policy, and professional roles. Additionally, the studies included in the review mainly focused on physicians, leaving limited evidence on BCI applications in rehabilitation professionals.

Overall, the evidence shows that using BCIs for HCPs can effectively improve their behaviour and enhance their practice. By targeting both individual and environmental barriers, the use of BCIs in this project can lead to delivering better practices to enhance the engagement and motivation of stroke survivors with CI.

Despite the positive impact of BCIs on changing HCPs` behaviours and health services, designing BCIs is complex and challenging (Michie et al., 2016). There are some gaps and methodological inadequacies reported in association with BCI development, including a lack of clarity in describing and not using a theory to design the intervention, as well as difficulty in selecting appropriate and the most important outcomes for the end users in clinical settings and intervention fidelity (putting the intervention into practice as intended) (Bacon et al., 2015, Byrne, 2020, Toomey et al., 2020). The previous evidence from the scoping review shows a lack of clarity in describing engagement and motivation strategies. Also, most included evidence from the scoping review did not use theory to explore or deliver engagement and motivation strategies. Therefore, it impacted the understanding of the theories used to improve patient engagement and identify key constructs for applying these strategies. Also, the previous studies have limited evidence in specifying measurements to apply such strategies in clinical trials.

Addressing these methodological issues during intervention planning is crucial to enhancing BCI design, implementation, and adoption in clinical settings. The current project uses a TDF (Michie et al., 2005) as a theoretically driven framework to determine the barriers and facilitators. Furthermore, stakeholders were engaged (chapter 7) to discuss the programme plan and provide feedback on its activities. The involvement of the stakeholders (physiotherapists department managers, and quality improvement managers) in the development and intervention delivery can improve the effectiveness of the BCI and increase its adoption and sustainability (Oakman et al., 2021). In the current research, involving stakeholders can enhance their understanding of the intervention development process and inform the researcher of the systems and policies to support the BCI application. A feasibility study will be also conducted in the next project of delivering the intervention to test the intervention feasibility, acceptability, outcome measurements and applicability within the local clinical context.

4.3 Behaviour change techniques

Behaviour change Techniques (BCTs) refer to a component of an intervention that can be replicated to modify or redirect the causal processes that control behaviour (Carey et al., 2019). The purpose of BCTs is to facilitate behaviour change by either enhancing factors that encourage it or reducing factors that hinder it (Michie et al., 2020). There are many strategies reported in behaviour change and implementation science which can be used to overcome the barriers to change the practice at the individual and organisational levels, and policies. For instance, Michie et al. (2013) developed a hierarchy of BCTs to apply in the BCIs using the Delphi method with input from 14 experts in BCIs. The outcome of this process identified 93 BCTs which were agreed upon by the experts to be used in the BCIs. These techniques were then grouped into 16 clusters and were

found to be reliable in linking with TDF domains. For instance, a study included four researchers who identified 35 BCTs to link with 11 domains of the original TDF (Michie et al., 2008). The BCTs in this study were derived from behavioural techniques identified in two published studies (Hardeman et al., 2000, Abraham and Michie, 2008). Furthermore, a more recent study was conducted to connect BCTs from the extensive BCTs to the improved TDF, with the input of a greater number of behaviour change experts (18 participants) (Michie et al., 2015). Out of the 14 domains, this allocation was reliable for 12 of them, within which, 68% of the BCTs (59 in total) were reliably allocated, while 14% of the BCTs (12 in total) had borderline statistical significance ($p > 0.05$ but $p < 0.1$), and six were allocated to multiple domains. Two domains, 'social/professional role and identity' and 'memory, attention and decision processes', did not have any BCTs significantly assigned to them, despite having BCTs allocated to them during the sorting process (15 and 49, respectively). This suggests that experts did not consistently allocate or rate any BCTs highly to these two domains. Moreover, Powell et al. (2015) identified 73 implementation strategies achieved and refined in consensus methods (Delphi process) with implementation research experts. These strategies are divided into six categories, financing (e.g., access new funds, alter consumers/patient fees), planning (e.g., conducting local consensus discussion, conducting local need assessment), education (conducting educational meetings, develop educational materials), policy context (e.g., develop and implement tools for quality monitoring), restructuring (e.g., revise professional role, change physical structure and equipment), and managing quality (audit and provide feedback, provide clinical supervision). Implementation strategies application within BCIs can support HCPs to change their behaviour and practices (Campbell and Douglas, 2017). Overall, a range of BCTs is available to address various barriers including individual, organisational, and

policy-related barriers. Mapping the target findings (behaviours to change) to TDF can be helpful to select appropriate BCTs (Porcheret et al., 2014).

4.4 Frameworks to identify behavioural facilitators and barriers

There are various theories for behaviour change (Michie and Johnston, 2012). However, it is difficult to choose a particular behaviour change theory to understand, explain and guide the intervention design due to the varieties of factors affecting behaviours, such as individual, environmental, social and organisational-related factors (Atkins et al., 2017). Therefore, a framework was utilised in this project to guide the intervention development instead of a specific behaviour change theory. Frameworks can be useful to guide intervention design and identify determinants (facilitators and barriers) (Birken et al., 2017). Determinant frameworks were typically useful in this specific PhD project to explore determinants of applying engagement and motivation strategies with stroke patients with CI. Determinant frameworks identify various categories or domains of determinants that may impact the intervention outcomes, such as HCPs` behaviours. These categories consist of individual barriers and facilitators that consider independent variables and can affect the intervention outcome (Nilsen, 2020). There are many frameworks used to identify determinants such as the Consolidated Framework of Implementation Research (CFIR) (Damschroder et al., 2009), and the TDF (Michie et al., 2005).

The CFIR is a framework that contains standardised implementation-related concepts and it can be used in implementation research across different areas. The CFIR is made up of 39 constructs that are organised into five major domains (intervention characteristics, inner setting, outer setting, individual characteristics, and process) (Damschroder et al., 2009). These domains work together to impact the implementation process and its effectiveness. The CFIR model uses behaviour change theories, improvement science, and diffusion theory (King et

al., 2020a). It also includes a taxonomy with definitions, a codebook, and interview questions to facilitate its usefulness. The CFIR is a versatile tool that can be used during any phase of implementation, before, during, or after implementation (Means et al., 2020). Researchers can also use the CFIR constructs to create testable models focusing on specific constructs and their interrelationships. At a broader level, the CFIR provides a standardised structure for building upon findings across studies (Kirk et al., 2015). It has been used in a wide range of studies with various objectives, units of analysis, designs, and methods, demonstrating its applicability to a broad range of interventions, settings, and research designs. CFIR is considered an explanatory framework that can help determine the success of implementing an intervention and identify potential obstacles and facilitators before or during the process (Breimaier et al., 2015). This valuable information can guide the selection of strategies to overcome or affect these influential factors. The CFIR can be applied in developing BCIs. For instance, Connell and colleagues employed CFIR to investigate the implementation of an upper limb rehabilitation intervention for stroke rehabilitation. This study involved a combination of a qualitative study (Connell et al., 2014a) and a survey (Connell et al., 2014b) that utilised the CFIR framework to describe rehabilitation contexts. Based on this contextual information, specific behaviour change strategies were developed to support the implementation of increased upper limb rehabilitation. Overall, the CFIR can be used to guide the development of BCIs because it is a comprehensive framework that can assess or explore all individual and environmental factors that influence the implementation of evidence-based interventions. The CFIR was not utilised in this study as the objective was to develop an intervention to improve stroke patients' engagement and motivation with CI during their PT rehabilitation programme. The CFIR is more explanatory in nature, focusing on how and why

the intervention works or does not work, while our research project is exploratory, therefore, using the CFIR may not align with our research aim.

The TDF, developed by Michie et al. (2005), helps identify factors influencing health professionals' behaviour when implementing evidence-based practices. A consensus study was conducted to develop the TDF, which included experts (n=64) from diverse backgrounds and research interests who participated in a project that identified psychological theories and constructs for evidence-based practices. The project consisted of five meetings and six stages including identifying, simplifying and evaluating theories, conducting interdisciplinary evaluations, validating a domain list, and developing pilot interview questions. Relevant theories and constructs were categorised into motivation, action, and organisational behaviour change. The participants prioritised three theories and constructs, which were grouped into 5-9 core domains and evaluated for importance and coherence. The domain list was validated, and interview questions were created to evaluate behaviour change for healthcare practice improvements. The results identified 12 domains and 128 constructs drawn from 33 behavioural change theories. The TDF domains were knowledge, skills, social/professional role and identity, beliefs about capabilities, beliefs about consequences, intention, memory, environmental context and resources, social influence, emotion, behavioural regulation, and nature of behaviour (Michie et al., 2005). A group of independent behavioural experts validated the TDF to determine the best structure and content of the framework. The validated version of TDF had a similar structure and content to the original but with slight differences that resulted in 14 domains and 84 constructs covering the implementation of evidence-based practice. Table 4-1, adapted from (Cane et al., 2012), displays all 14 domains of TDF including their definitions and constructs. The TDF added three domains to the framework: reinforcement, optimism, and

goals. The validation study removed the nature of the behaviour domain because it was not represented in any single cluster solution in the open sort, and only one construct was assigned to it in the closed sort task (Cane et al., 2012).

Table 4-1 TDF domains, definitions, and domains construct

Domain	Definition	Construct
Knowledge	An awareness of the existence of something	- Knowledge (including knowledge of condition/scientific rationale) - Procedural knowledge - Knowledge of task environment
Skills	An ability or proficiency acquired through practice	- Skills - Skill assessment - Skills development - Practice - Competence - Interpersonal skills - Ability
Social/Professional role and identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting	- Professional identity - Professional boundaries. - Professional role - Organisational commitment. - Social identity - Leadership. - Identity - Group identity.
Believe about capabilities	Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use	- Self-confidence - Self-esteem - Perceived competence - Beliefs - Self-efficacy - Perceived behavioural control
Optimism	The confidence that things will happen for the best and the goal will be obtained	- Optimism - Unrealistic optimism - Pessimism - Identity
Believes about consequences	Acceptance of the truth, reality, or validity about outcomes of behaviour in a given situation	- Beliefs -Anticipated regret - Outcome expectancies - Consequents - Characteristics of outcome expectancies

Reinforcement	Increasing the probability of a response by arranging a dependant relationship, or contingency, between the response and the stimulus	- Rewards Proximal/distal, valued/not valued, Probable/improbable - Incentives - Consequents - Contingencies - Punishment - Reinforcement - Sanctions
Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way	- Stability of intentions - Transtheoretical model and stage of change - Stages of change model
Goals	Mental representation of outcomes or end states which the person wants to achieve	- Goals (distal/proximal) - Action planning - Goal priority - Implementation - intention - Goal/target setting - Goal (autonomous/controlled)
Memory, Attention and Decision Processes	The capability to retain information, concentrate on the environmental aspects and be able to select between two or more alternatives	- Memory. - Cognitive overload/tiredness. - Decision making. - Attention - Attention control
Environmental Context and Resources	Any personal or environmental circumstances that encourage or discourage the development of skills and abilities, social competence, independence, and adaptive behaviour	- Environmental stressors - Barriers and facilitators - Resources/ material resources - Person x environmental interaction - Organisational culture/climate - Salient events/critical incidents
Social Influences	The interpersonal processes that can affect people to change their thoughts, feelings, or behaviours	- Social pressure - Group norms - Power

		- Social support - Group conformity - Modelling - Social norms - Group identity - Alienation - Social comparisons - Intergroup conflict
Emotion	A complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the person tries to deal with a personally significant matter or event	- Fear - Positive/Negative affect - Anxiety - Stress - Affect - Burn-out
Behavioural Regulation	Anything aimed at managing or measured actions or changing objectively observed	- Self-monitoring - Breaking habit - Action planning

The TDF can be used for different purposes, including identifying factors (e.g., facilitators and barriers) that affect behaviour, systematically designing interventions, helping process evaluations of interventions, and can be used as guidance to identify BCTs and designing intervention strategies (Atkins et al., 2017). The TDF can be applied to collecting qualitative data (e.g., interviews) or quantitative data (e.g., surveys) (Cane et al., 2012), and has been used in stroke rehabilitation to create, develop, and design BCIs. One example is the design of multifaceted BCIs to improve physical activities and reduce sedentary behaviour after a stroke by targeting healthcare professionals and stroke patients (Moore et al., 2022). In a series of focus group studies with HCPs and stroke patients, TDF was employed to identify facilitators and barriers to long-term physical activities and reducing sedentary behaviour. In this study, TDF was applied in data analysis to map out barriers and facilitators to TDF domains, as well as in selecting intervention components to target the identified behaviour. Another study used TDF to identify barriers and design BCIs to increase guideline implementation in a multidisciplinary stroke unit (Vratsistas-Curto et al., 2017). Overall, TDF is an effective framework for exploring barriers and facilitators and developing BCI to enhance the behaviour and practice of stroke rehabilitation professionals.

The TDF was selected to identify facilitators and barriers to applying engagement and motivation strategies with stroke patients with CI for various reasons. Firstly, TDF is a comprehensive framework derived from 33 theories, including action, motivation and organisational theories (Michie et al., 2005). Therefore, domains of the TDF cover relevant individual and organisational factors that are likely to impact evidence-based implementation. Consequently, they can be used to explore factors such as physiotherapists' skills, knowledge and environmental factors that relate to

the application of engagement and motivation strategies, as identified in the scoping review chapter. Secondly, TDF is mainly used with HCPs to support implementing evidence-based practice (Atkins et al., 2017, McGowan et al., 2020). Therefore, the framework is suitable for use with physiotherapists to identify determinants to apply engagement and motivation strategies in stroke rehabilitation. Finally, TDF can be useful in tailoring, selecting BCTs and designing interventions. Thus, it can be used to inform developing BCIs to enhance stroke patients with CI engagement and motivation in PT rehabilitation sessions.

4.5 Behaviour change intervention in stroke rehabilitation

In stroke PT rehabilitation, BCIs have been created to help improve the behaviour of physiotherapists in applying evidence-based practices and enhancing rehabilitation services (Perry et al., 2014, Connell et al., 2016, McCluskey et al., 2016, Vratsistas-Curto et al., 2017, Stewart et al., 2019). Two key criteria were followed in most of the studies to develop BCIs for stroke rehabilitation professionals: first, identifying the determinants of practice, which usually involves identifying facilitators and barriers; second, developing the BCIs by mapping the barriers and facilitators to appropriate BCTs. This process is usually guided by a theory or theoretical framework, which is considered critical in understanding the process of behaviour change in clinical practice.

For example, a study was developed in the UK (Connell et al., 2015) to increase upper limb exercise in stroke rehabilitation, with the BCI intervention developed to target the rehabilitation professionals' behaviours (e.g., identifying suitable patients for exercises, communicating exercising to family and visitors, and monitoring and reviewing exercises) to increase the intensity of upper limb task-oriented training performed by stroke survivors. The intervention consisted of two parts: a team

meeting and a toolkit. The team meeting involved face-to-face meetings between the research team and the clinical team for the intervention development process. The toolkit was developed to help rehabilitation therapists prescribe and monitor the upper limb exercises for stroke patients, enabling therapists to identify patients' ability to perform exercises and enhance prescribing and exercise monitoring, improving self-mentoring. The intervention application was reported by (Connell et al., 2016) using a participatory action research approach. The intervention was performed in three stroke rehabilitation units and its effectiveness was assessed by measuring changes in the behaviour of therapists and the perceptions of rehabilitation therapists and stroke patients regarding the intervention application. The data were collected using an audit tool, interviews with rehabilitation staff and patients, and field notes from site visits. The findings suggested there was a high adherence from therapists to use the toolkit and a positive perception regards the toolkit application. The result of the intervention application indicated that using BCIs to change rehabilitation therapists was useful in changing their behaviour and skills in managing upper limb functions for stroke as it enables physiotherapists to identify suitable patients for exercises and provide supplementary self-direct exercises for stroke patients. This example indicated that BCIs for physiotherapists could enhance patient engagement in upper limb exercises by changing their skills in screening the patient and a provision of exercises to suite the patients' abilities. However, the study did not provide any data on how the therapists' behaviour had changed throughout the intervention application (six months period) or any data relevant to the study's aim which was to increase upper limb exercises such as repetition and dose. Therefore, the intervention results needed to specify and evaluate stroke patients' outcomes to determine whether patients benefited from the intervention or not.

Another intervention which was developed in Australia (Stewart et al., 2020a) targeted the stroke unit rehabilitation team and aimed to increase active practice (activities outside the rehabilitation hours) during inpatient stroke rehabilitation. The intervention was developed using a mixed-method approach to identify the facilitators and barriers to active practice, which included direct observation and focus groups. After mapping the facilitators and barriers to the BCTs, the research team developed a ward-based practice book to increase stroke patient's active practice. Interventions included a training package for rehabilitation therapists to address their skills and knowledge and build motivation and coaching skills. The intervention efficacy was reported in a different context (Stewart et al., 2020b) by developing an observational study to compare the practice ward book usage and pre- and post-BCI application. Twenty-four stroke participants were recruited for the study (12 participants for the pre-intervention group and 12 for the post-intervention group). The primary outcome measurement was a change in the number of stroke participants with the practice book six months post-intervention; the secondary outcome was the amount of active participation completed by stroke survivors. Active participation was measured by the repetitions of practice recorded in the practice book or by observing the number of participants using the practice book. The number of stroke patients with the practice book increased from one to six (not statistically significant p=.069), with no significant difference in the total number of repetitions recorded on the days of observation between pre- and post-intervention. The intervention minimally changed active practice during acute stroke. Unfortunately, the study did not offer any information or data regarding any changes in the rehabilitation team's behaviours such as motivational and coaching skills, so it is difficult to determine the effectiveness of implementing BCIs in improving

rehabilitation team skills or stroke unit environment to support inpatient stroke patients' active practice during rehabilitation programmes.

The provided examples highlight the possible benefits of BCIs in improving stroke rehabilitation practice. However, some challenges are still thought to be linked with the BCI studies (e.g., specifying the outcomes), which reflect on the complexity of designing and evaluating BCIs, especially when addressing multiple barriers.

4.6 Conclusion

TDF is a comprehensive framework that can be used to understand HCPs' behaviours and can be applied across multidisciplinary research. This study used the TDF as a determinant framework to develop an interview topic guide to identify facilitators and barriers to applying engagement and motivation strategies for stroke patients with CI. The key findings were mapped into TDF frameworks (chapter 5) and the TDF was also used to guide selecting BCTs to the targeted individual and environmental barriers (chapter 6).

5 Physiotherapists’ perspectives of the facilitators and barriers of applying engagement and motivation strategies with stroke patients with cognitive impairment in the Saudi rehabilitation context: A qualitative descriptive study

5.1 Introduction

The background to the thesis and scoping review was described in chapter 1. Briefly, PSCI is common and has a negative impact on functional rehabilitation outcomes (Zietemann et al., 2018), as well as on the rehabilitation process by decreasing stroke patients' motivation and engagement in therapeutic sessions (Stolwyk et al., 2021, Lowder et al., 2022b). In chapter 3, the scoping review identified strategies that could enhance stroke patients with CI motivation and engagement in rehabilitation programmes, including therapeutic interactions and communications, enriched environment, using technologies, and applying strategy training (adding cognitive strategy providing task-specific teaching to evaluate and enhance patients performance in rehabilitation goals and practices). These findings reflect on enhancing patients' engagement and motivation from two crucial perspectives: rehabilitation professionals' knowledge and skills and the rehabilitation environment. Therefore, this chapter explores the individual and environmental barriers to enhance engagement and motivation in the Saudi rehabilitation context.

There are many studies suggesting the impact of the individual and environmental barriers to engagement and motivation in stroke rehabilitation. For instance, a qualitative study by Chen et al. (2016) investigated first-time stroke patients and their caregivers’ perceptions of being engaged in stroke rehabilitation, suggesting that several factors affect engagement throughout the rehabilitation process. These included the lack of information provision on stroke recovery and the rehabilitation

process which is usually ignored due to the workload in the health settings and time constraints on the rehabilitation professional which results in them not providing detailed explanations for patients. Another factor was the difficulty coping with the transition from hospital facilities to home which may influence the rehabilitation services continuity. Moreover, the participants stated that the rehabilitation programmes were fragmented and disorganised due to the limited information support they received from the rehabilitation professionals. Also, the study participants stated that continuous changes in rehabilitation goals and plans at different stages of rehabilitation affect engagement in the rehabilitation. This study provided essential evidence of how the transition from hospital to home could affect engagement in the rehabilitation process. However, this study was conducted with patients and their caregivers, therefore, more environmental-related barriers, such as policies and systems that could affect stroke patients' engagement in rehabilitation plans and processes, were not highlighted.

In another study, O'Halloran et al. (2012) conducted a meta-synthesis of three qualitative studies (with stroke patients with communicating disabilities, healthcare providers, and an observational study of the patients and healthcare providers interactions) of the environmental factors that affect the communication between health providers and patients with communication difficulties in the stroke unit. The authors presented environmental factors in two main themes which were the healthcare provider-related factors and stroke unit structure and processes. The healthcare providers' related factors were knowledge, communication skills, experience, attitude, and healthcare providers’ characteristics such as accents. All these factors are facilitators and barriers to support effective communication between patients and healthcare providers. In terms of the stroke unit structure and

processes, the factors may include the healthcare provider's presence and timing, family member's support, equipment, physical environments such as noise and visual distraction, lack of training and information support for healthcare providers, and hospital systems, policies, and procedures.

These examples clarified the high impact of the healthcare setting environment and healthcare professionals' factors such as knowledge, skills and attitude on communication with stroke patients and their engagement in the rehabilitation process. Overall, various environmental and personal factors can affect stroke patients' motivation and engagement. To ensure effective rehabilitation, it is essential to identify these factors that can influence patients' motivation and engagement during physiotherapy programmes in Saudi Arabia so that suitable interventions can be designed for a specific rehabilitation environment.

There is limited qualitative evidence on the practice and interaction between HCPs and patients in Saudi rehabilitation context. This is important because most research comes from studies conducted in the West, and the delivery of healthcare services in KSA is different due to socio-cultural norms. Attitudes, beliefs, lifestyles, and expectations about certain topics or interventions are likely to be different. One key difference is gender segregation, which is particularly relevant to physiotherapy rehabilitation practice in KSA. This is related to receiving rehabilitation treatments where a female physiotherapist cannot treat a male patient, or vice versa, and most physiotherapy departments have male and female physiotherapists working separately. Therefore, it is essential to involve both genders in the current research interviews to provide robust results from the perspectives of male and female physiotherapists.

This study aimed to determine the facilitators and barriers that affect stroke patients with CI's motivation and engagement during physiotherapy rehabilitation programmes. The study focused on identifying environmental and personal barriers and facilitators from physiotherapists' viewpoints, including their knowledge, attitudes, and skills, as well as sociocultural and environmental barriers and facilitators in Saudi rehabilitation settings.

5.2 Methods and methodology

5.2.1 Qualitative study approach

This study used a descriptive qualitative approach. Qualitative studies gather data using various techniques, including interviews, observations, and documentation (Merriam and Tisdell, 2015). The qualitative descriptive approach refers to an explicit description of a desirable phenomenon or event of interest (Sandelowski, 2000, Bradshaw et al., 2017). It is considered significant and suitable for research questions related to identifying the who, what, and where of events or experiences, as well as helping to obtain insights from participants about a poorly understood phenomenon (Kim et al., 2017). It is also an appropriate design for studies aimed at gathering information to help in the future design of a research intervention (Neergaard et al., 2009). Furthermore, qualitative description is highly suitable for researching health environments, as it offers a real insight into how people perceive a particular space, their reasons for using its features, who utilises specific services or functions, and what factors contribute to or hinder the use of the health services (Colorafi and Evans, 2016).

Qualitative research in healthcare aims to explore complex phenomena experienced by patients, clinicians, healthcare providers, and policymakers (Tong et al., 2007, Colorafi and Evans, 2016). Qualitative studies are appropriate in the health

environment because of their benefits in providing factual answers to questions related to individual experiences, identifying the reasons for a particular topic or issue, providing information about the services, and understanding the facilitators and barriers related to a particular service or topic (Sandelowski, 2000, Holloway and Galvin, 2016). They contribute to PT research in many areas, including answering questions not possibly addressed by quantitative research (e.g., stroke patients' experience of a particular treatment programme). They are also used before implementing a clinical trial (e.g., factors affecting physical activities). Furthermore, they might be used as a part of mixed-method research to develop outcome measurements by understanding and evaluating them to enhance or change them (McPherson and Kayes, 2012). Overall, using qualitative research in PT-related studies can improve evidence-based research practices by understanding the factors involved, such as the environment, individuals, social and cultural aspects, and healthcare systems, thereby providing better solutions for designing and implementing clinical interventions within specific healthcare settings.

There are several justifications for using the qualitative descriptive approach. Firstly, this approach is less theory-based than other qualitative approaches, such as grounded theory research, which is building a theory or focusing on culture as in ethnography research (Bradshaw et al., 2017, Kim et al., 2017). Instead, it focuses on exploring the perspective, knowledge, and process of a particular topic, thus, it can encourage the actions because of its ability to provide a description attached to everyday practices and interactions (Bradshaw et al., 2017, Chafe, 2017). Therefore, using the descriptive qualitative approach is suitable as it allows exploring the rehabilitation setting environmental and individual facilitators and barriers to applying engagement and motivation strategies with stroke patients with CI from

physiotherapists' perspectives based on their everyday practices with patients and services.

Secondly, the qualitative descriptive approach is compatible with different philosophical perspectives. This approach is most closely associated with constructionism and critical theories which employ interpretive and naturalistic methods (Doyle et al., 2020). These philosophical perspectives support that reality is perceived differently depending on the individual and is dynamic within various contexts, thus, reality is subjective and can be experienced in multiple ways (Denzin and Lincoln, 2018). In this qualitative descriptive study, the constructionism philosophy is used to understand the experiences of physiotherapists in specific rehabilitation contexts. This approach allows flexible research methods that are inductive and dynamic but the data should remain close to the topic being investigated (Sandelowski, 2010, Doyle et al., 2020). Moreover, the use of qualitative descriptive research has been linked with pragmatism (Neergaard et al., 2009).

Pragmatism involves using the studied topic or issue to make decisions during the research process. This helps researchers choose the most suitable methods for their study (Yardley and Bishop, 2015). The descriptive qualitative approach is described as practical and pragmatic because it looks for specific events or experiences (Turale, 2020). Therefore, it is usually used in mixed method studies or projects because it can be used as an exploratory (to explore the context of the study) or explanatory study (why the intervention achieves or does not achieve the expected outcomes) (Doyle et al., 2020). The findings can be particularly useful for healthcare professionals and stakeholders who make decisions and policies (Colorafi and Evans, 2016). Overall, using this approach provides more flexibility because it is the

least theoretical approach of the qualitative approaches and is more practical and focused on the topic of interest. This can help guide the intervention development. Furthermore, it allows researchers flexibility to select from any theoretical frameworks that fit the research purpose, sampling strategies, and data collection strategies (Sandelowski, 2000, Sandelowski, 2010).

Descriptive qualitative studies have some limitations. Firstly, it has been argued that descriptive qualitative studies do not have a theoretically driven approach (Doyle et al., 2020) but this limitation only arises when the study is used for a purpose other than describing a phenomenon (Neergaard et al., 2009). Secondly, descriptive qualitative studies have limited methodological texts of papers to guide researchers in conducting them (Kim et al., 2017). Thus, researchers usually integrate methods for other qualitative approaches such as phenomenology to guide designing the descriptive qualitative study (Doyle et al., 2020). However, when researchers use methods from other qualitative designs, they must ensure not to falsely claim that they are using designs that they are not using (Neergaard et al., 2009). Lastly, a descriptive qualitative study describes a specific topic of context which reduces its generalisability (Turale, 2020). Thus, it is preferable to use a qualitative descriptive study as a preliminary step before conducting additional research, such as an intervention study or questionnaire development (Colorafi and Evans, 2016).

5.2.2 Theoretical frameworks

A theoretical framework refers to applying theory as guidance to explain an event or provide insight into a phenomenon or research problem (Imenda, 2014). It is described as “the underlying structure, the scaffolding or frame” of the qualitative study (Merriam and Tisdell, 2015). When conducting qualitative research, it is recommended to use a theoretical framework to ensure project coherence and help

researchers maintain focus on research goals (Green, 2014). However, identifying a theoretical framework can be challenging due to the nature of qualitative research which is inductively built rather than testing concepts, hypotheses, and theories as in quantitative research (Merriam and Tisdell, 2015). Therefore, researchers should identify the theoretical framework from the existing literature, findings from previous project findings, and the disciplinary orientation of the researcher (Merriam and Tisdell, 2015, Garvey and Jones, 2021). The selection of the theoretical framework was based on the literature on rehabilitation engagement, motivation, PSCI concepts and definitions, as well as the findings from the scoping review on strategies to improve stroke patients with CI engagement and motivation in physical therapy programmes. Synthesising previous work provides some topics to explore, such as rehabilitation practitioner knowledge, attitude and skills, and rehabilitation environment factors, therefore, the framework selection should guide the investigation of these topics.

The TDF was applied as a theoretical framework for this study. TDF is an integrative framework developed to help researchers design behavioural change interventions (Cane et al., 2012, Phillips et al., 2015). It was created by combining 33 behaviour and behaviour change theories, including 128 key theoretical constructs related to changing health behaviours. The original framework had 12 domains, which has since been updated to include 14 domains (Cane et al., 2012). These domains are knowledge, skills, social/professional role and identity, belief about capabilities, belief about consequences, optimism, reinforcement, intentions, goals, memory, attention and decision processes, environmental context and reasons, social influence, emotion, and behavioural regulation (see Chapter 4). The TDF is considered a theoretical framework rather than a theory, as it does not offer testable

connections between components. However, it provides a theoretical perspective to examine the influences of cognition, emotions, social factors, and the environment on behaviour (Atkins et al., 2017). The TDF's main strengths are its coverage of multiple theories (33) theories and its ability to provide comprehensive views that might act as a mediator for changing behaviours (Francis et al., 2012). Furthermore, it is applicable in multiple research designs such as interviews, focused groups, questionnaires, and observational studies, thus, it can inform intervention design or process evaluation (Francis et al., 2012). The challenges of using the TDF include that the framework being too focused on specific domains, which might lead to missing some important findings, for example, when interview questions are applied rigidly to the domains. Also, the overlap between some domains could lead to a repetition in some questions (Phillips et al., 2015, McGowan et al., 2020). Therefore, researchers are advised to be flexible when applying the TDF, especially in interview questions by broadening the question guide and using prompts to avoid repetition and achieve more descriptive information (McGowan et al., 2020).

TDF can be a useful approach in the qualitative exploratory stage of health research (Francis et al., 2012, Atkins et al., 2017, McGowan et al., 2020). It has been also specifically described as a useful framework for identifying barriers to change in clinical practice (Phillips et al., 2015). Furthermore, the framework is primarily designed for use in research targeting healthcare professionals (McGowan et al., 2020) but can be also used with other participants such as stroke patients (Nicholson et al., 2014). Therefore, the TDF was used in this study because it is adaptable to various fields such as health, social, and behavioural research. Also, it can provide coverage to all previous findings linked to the research topic, such as therapeutic interactions, goal setting and applying cognitive strategy, and

environmental enhancement. These findings require identifying barriers to change, such as knowledge, skills, goals, and environmental context, to develop a practical intervention that suits a specific rehabilitation setting. Therefore, interviewing physiotherapists can help identify barriers to enhancing stroke patients with CI's engagement and motivation in the Saudi rehabilitation context.

5.2.3 Study design

5.2.3.1 Qualitative interview

The qualitative interview technique was chosen for this study to collect the data. Interviews are the commonly used technique in qualitative studies and can be individual (person-to-person) or with a group (focus group) where the researcher conducts the conversation with a group of participants at the same time (Merriam and Tisdell, 2015). Individual interviews were chosen to avoid issues that may arise when working with focus groups, such as difficulty in guiding the interview towards the research purpose, ensuring equal responses from all participants, and analysing the data (Bryman, 2016). Therefore, individual interviews were applied as they are suggested to generate more detailed information and require less effort and time compared to a focus group (Guest et al., 2017).

This study used interviews due various reasons. Firstly, all previous studies were designed to explore how engagement and motivation were achieved, suggesting that engagement and motivation were facilitated or hindered through positive interaction and communication between rehabilitation professionals and stroke patients and a supportive environment. However, these studies did not aim to explore factors affecting engagement and motivation, rather, it aims to identify the facilitators and barriers to using engagement and motivation strategies, such as building effective communication skills and interactions and enhancing the

rehabilitation environment to empower active engagement and motivation in rehabilitation programmes. Therefore, interviews can integrate with more information to help guide intervention design and be suitable for the research aim. Secondly, some have criticised observations as being too subjective and potentially biased towards the researcher's perception and cannot capture data on topics such as participants' knowledge, experience, intentions, and organisational structure (Merriam and Tisdell, 2015). As a result, relying on interviews may provide more reliable data that accurately reflects participants' responses.

Qualitative interviews are categorised as structured, semi-structured or unstructured (Merriam and Tisdell, 2015). Table 5-1, adapted from Merriam and Tisdell (2015), provides information about each category's question style and applications.

Table 5-1: Interview structure continuum

Structured interview	Semi-structured interview	Unstructured interview
• The questions are pre-written and cannot be changed • The sequence of questions has already been established in advance • It is considered an oral form of a written survey • It is commonly used to gather demographic information such as age, gender, ethnicity, and education level	• The interview guide consists of a combination of structured and unstructured questions • All questions can be used flexibly • Typically, certain information required from each participant • During an interview, the main focus is to address a list of predetermined questions or topics to explore	• Open-ended questions • Flexible, exploratory • It feels more like a conversation • It is used when a researcher lacks sufficient knowledge about a phenomenon to ask relevant questions • This interview aims to gather information that will help in developing questions for future interviews • Mainly utilised in ethnography, participant

• Examples: marketing surveys	• No predetermined wording or order	observation, and case study research

Semi-structured interviews were selected for this study due to various reasons. Firstly, they fit with the aim of the study, which focuses on exploring facilitators and barriers to applying engagement and motivation strategies in physiotherapy rehabilitation practice. The semi-structured interview can achieve the study's aim because it relies on questions and issues the researcher defined before the interview. Thus, a semi-structured interview can encourage information that adds to the previous research findings and literature. In other forms of qualitative research, a highly structured interview usually does not aim to provide information on why participants select a specific answer, therefore, it does not support knowledge production from human interaction, such as opinions, feelings, and attitudes (Leavy, 2014). Unstructured interview is usually applied in a storytelling type of conversation and aims to explore topics or issues on which the researcher does not have previous knowledge (Zhang and Wildemuth, 2009). Therefore, the interview is usually guided by participant responses and discussion while the interviewer acts as a listener and contributes with a general question to obtain more details. This type of interview cannot be applied because this study is built on previous findings and should be guided in directions linked to the study's aim. Therefore, the use of the semi-structure interview fits the research aims to lead to findings that are useful to support intervention development for the next stage of the research project.

The other reason for the semi-structured interview selection was the degree of flexibility. Semi-structured flexibility allows for questions to be ordered differently, leads to being followed up on, and inconsistencies in answers to be clarified (Bryman, 2016). This flexibility facilitates mutual communication between the

interviewer and participant by allowing the interviewer to ask relevant follow-up questions based on the participant's responses and providing a chance for participants to express themselves in their own words (Kallio et al., 2016). In other forms of interviews, highly structured interviews are more rigid and talk from the interviewer's perspective, thus, researchers should stick to the original questions and structure and avoid asking follow-up questions (Bryman, 2016). Unstructured interviews are similar to semi-structured interviews in their flexibility. However, the form of flexibility in unstructured interviews represented in the ability to understand the interviewee's responses and the meaning they attach to the conversation's purpose, being an active listener, and acting as an aide memoir to remind participants the conversation aims and asking general questions to encourage participants to provide details and meanings to the topic discussed (Edwards and Holland, 2013). Therefore, the interviewer usually has minimal control over the conversation and relies on encouraging the narration. Overall, semi-structured interviews were chosen as it strikes a balance between rigidity and flexibility. It follows a set topic guide for primary questions but allows for flexibility in the order of questions and follow-up questions based on the interviewee's answers. Thus, this interview form can effectively encourage information relevant to the research objectives.

The other common technique of qualitative data collection is observation which is related to observing a group of people's behaviour for some time (Bryman, 2016). Observations are frequently used in various forms of qualitative research, including ethnographies, case studies and action research studies (Merriam and Tisdell, 2015). Observation studies are mainly used in the literature related to the research topic, especially to explore the concept of engagement in rehabilitation and how

engagement/disengagement is achieved in the rehabilitation practice (Horton et al., 2011b, Bright et al., 2017b, King et al., 2021).

5.2.4 Interview topic guide

The topic guide refers to a set of questions designed to guide the conversation toward the research topic during the interview (Kallio et al., 2016). Designing an appropriate topic guide for the qualitative interview is essential to ensure the quality of the data collection (interviews) and analysis (Rabionet, 2011). Designing an effective topic guide can be done by creating open-ended and adaptable questions that encourage dialogue, allowing for flexibility in the question order and easy transitions between them (Turner 2010). Furthermore, Patton (2014) suggested different types of questions to include in qualitative interviews such as questions about knowledge, experience and behaviour, opinions and values, feelings, sensory (elicit more information from the participant's experiences and feelings), and background questions. Therefore, designing an effective topic guide can be complicated as it requires designing questions that are easy to understand, engaging, and appropriate to the participants' educational, professional, and cultural values.

The current study used the TDF to guide the interview questions. The question guide contains one main question related to each TDF domain and prompts (follow-up) for each question. All questions were pre-defined from the literature and scoping review findings. The main questions were rigid and applied to all participants. However, the sub-questions were predefined, but flexible to change based on the participant's

response to allow more information and maintain the conversation within the research purpose (Kallio et al., 2016).

The interview topic guide was piloted to the academic supervisor and two local clinical physiotherapists to evaluate the questions' clarity and relevance and to test the interview structure, such as the site and audio recording of the interviews (Busetto et al., 2020). The first piloting was to the academic supervisor. The type of piloting is referred to as internal piloting and was conducted to evaluate the questions' clarity, order, relevance to the existing knowledge and previous findings (Kallio et al., 2016). This stage was crucial to getting responses for all questions related to the research aim and linked with a research topic. The next piloting was for local clinical physiotherapists and is referred to as field-testing piloting. The field-testing piloting is related to testing the interview guide with potential participants (Kallio et al., 2016). In addition to evaluating the questions' clarity and relevance, this step is important to evaluate if each question provides sufficient answers, check the recording device and time to decide if the timing is reasonable and get feedback on ambiguous, difficult questions to reformulate before the actual interviews (Chenail, 2011). During this stage, essential revisions were made to the topic guide, including adding the Arabic translation of each question below the original English question, in response to feedback from clinical physiotherapists who reported difficulty understanding certain questions and misinterpreting others. Therefore, the Arabic translation was added to ensure participants responded and provided valuable answers. Furthermore, the clinical physiotherapists' responses revealed language differences in describing certain terms leading to confusion about their meanings. For instance, "engagement" was interpreted as patient participation, while "cognition" was understood as consciousness. To address this, the researcher incorporated

follow-up questions to clarify these terms at the beginning of the interviews to help participants to understand the main terms related to the study and provide relevant answers to the conversation topic. The final copy of the study topic guide is provided in Table 5-2.

Table 5-2: Interview question guide

#	Theoretical Domain	Question
D1	Knowledge	What do you know about cognitive impairment (CI) after stroke and its effect on the rehabilitation process?
D2	Skills	Which skills and strategies do you use to encourage stroke patients with CI during rehabilitation sessions? - How often do you use this strategy? - How effective is/are these strategies with your patients?
D3	Social/professional role and identity	Do you see improved engagement and motivation for a stroke patient with CI as a part of your roles? - Why?
D4	Belief about capability	How difficult or easy is it to engage and motivate stroke patients with CI?
D5	Optimism	Based on your experience, how confident are you that different engagement and motivation strategies will be used in rehabilitation services optimally? - What has made you confident/not confident?
D6	Beliefs about consequences	What are the benefits yielded from implementing different engagement and motivation strategies with your patients?
D7	Reinforcement	To what extent are the benefits of implementing engagement and motivation strategies enough to use in rehabilitation settings?
D8	Intentions	How much priority do you give to stroke patients with CI engagement and motivation in the rehabilitation programme?

D9	Goals	In your opinion, how would you feel the goal of using different strategies to enhance patient engagement and motivation in physiotherapy clinics?
D10	Memory, Attention and Decision processes	How could we pay more attention to this issue, and can you imagine applying different strategies with your patients in the future?
D11	Environmental context and reasons	What are the factors that impede or facilitate using different engagement and motivation strategies in your working setting? - How might this/these factors affect the implementation of engagement and motivation strategies?
D12	Social Influence	From your experience, did your patients or physiotherapist colleagues encourage you to try different strategies to enhance the treatment practice? - How often are you encouraged to try different strategies? - What kind of colleagues or patients give you the advice to try different strategies?
D13	Emotion	How would you feel when different engagement and motivation strategies are applied in the physiotherapy rehabilitation practice?
D14	Behavioural Regulation	What are the ways and steps that should be considered to encourage applying different strategies to enhance stroke patients with CI engagement and motivation?

5.2.5 Reporting guidelines

Using reporting guidelines in qualitative research can enhance research reports' clarity, accuracy, and transparency (Liamputtong, 2019b). To report qualitative health research, it is suggested to follow three specific guidelines: the Consolidated criteria for Reporting Qualitative Research (COREQ) checklist (Tong et al., 2007, Liamputtong, 2019b), the Standard to Reporting Qualitative Research (SRQR)

checklist (O'Brien et al., 2014), and the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) checklist (Tong et al., 2012). These guidelines were developed to assist researchers in reporting and are highly recommended (Liamputtong, 2019b). This study used the COREQ checklist which helps report interviews and focus group studies (Tong et al., 2007). It includes 32 criteria grouped into three domains: research team and reflexivity, study design, and data analysis and reporting (Appendix 4). Seventy-six items from 22 checklists were reviewed to create the checklist, including those from author and reviewer guidelines and existing checklists used to appraise qualitative studies. Duplicative, ambiguous, and impractical items were removed, and two new items were added to address previously unaddressed aspects of qualitative research. These new items ask for identification of the authors involved in the data collection and reporting the presence of nonparticipants during data collection.

5.2.6 Ethical considerations

Ethical approval was obtained to conduct the interviews from the Faculty of Medicine and Health Research Ethics Committee at the University of Nottingham (approval no: FMHS 53-0720) (Appendix 5). The researcher also obtained ethical permission from the Research and Studies department at the Directorate of Health Affairs, Taif, Saudi Arabia (approval no: 411) to collect the data from local hospitals (Appendix 6). Participants signed a consent form to participate in the study. They were anonymised in the quotation and participant (Therapist) numbers (e.g., T1, T2) were used instead. The participants' information was kept strictly confidential by storing it securely in a locked office in the Queens Medical Centre Medical School on a password-protected database.

5.2.7 Study sample

5.2.7.1 Sampling technique

A purposive sample was used to recruit the study participants. A purposive sample is a thoughtful selection of settings, events, and individuals because of the crucial information they can provide, which cannot be obtained from other channels (Liamputtong, 2019a). To address the study aim, this strategy was used to provide rich information regarding stroke rehabilitation and to better understand the factors that impede the implementation of different engagement and motivation strategies for stroke survivors with cognitive impairment. Two strategies were used to achieve a purposive sample and identify an adequate sample. Firstly, the criterion strategy uses specific criteria to identify the participants who can inform and understand the research problem and phenomenon including:

- Qualified physiotherapists
- Have a minimum of three years of experience working with stroke cases as they tend to generate more data due to the experience gained in dealing with multiple stroke cases during physiotherapy rehabilitation programmes

Then, snowballing was performed by contacting physiotherapists from both hospitals to nominate or inform the researcher about individuals who can provide more rich information and have more experience with the research topic. Moreover, other criteria considered include selecting participants related to individuals' capacity to inform and articulate and individuals who have the time and are willing to participate in the interview (Flick, 2018).

The researcher (FA) sent a message with information about the study to the physiotherapy department of the King Faisal Hospital and King Abdul-Aziz specialised hospital to circulate to the physiotherapists. The researcher also visited

the hospitals and was permitted to talk to physiotherapists in the staff room during break time about the study. They were advised to read the participant information sheet for more information and contact the researcher if they required more information or were interested in participating in the study. A purposive sample was achieved differently in the selected hospitals due to the variation in the organisation and management of the research data collection. In the King Faisal Hospital, the primary researcher spoke directly to the male and female physiotherapists about the research and encouraged the physiotherapists to participate in the research interview. The researcher also asked those who participated in the interviews to nominate and encourage other physiotherapists who met the inclusion criteria to participate in the study. Regarding King Abdulaziz Hospital, the researcher directly contacted the clinical supervisors from the male and female departments to provide participants for the study. They directly contacted the eligible physiotherapists and scheduled the interview time and location.

5.2.7.2 Sample size

There is no set of formulas adopted to determine the sample size in qualitative research (Malterud et al., 2016), therefore, the sample size is based on whether the number of participants used in the research can provide data that will answer or address the research aim and questions (Green and Thorogood, 2014, Mason, 2017). From this perspective, the sample size was 12 physiotherapists based on information power. The concept of information power is represented by (Malterud et al., 2016) to guide an adequate sample size for qualitative studies and comprises five items to identify the information power:

a) Study aim: a broader aim requires a larger number of participants, with a smaller number required for studies with a narrower aim. The current

study's aim was considered narrow and requires exploring environmental and professional facilitators and barriers to applying engagement and motivation strategies in a certain context.

b) Sample specificity: a smaller sample number requires participants who have precise criteria for the study aim.

c) Use of established theory: studies that use specific theory for planning and analysis require a smaller sample. Although this is an exploratory study, it still relies on the theoretical framework for guiding the interviews and analysing the data, thus, a small sample number is appropriate.

d) The quality of the dialogue: fewer participants are required in a study with clear and strong communication with the participants. This study is conducted in local settings where the researcher has previous experience and relations with the clinical physiotherapy team, thus, fewer participants might be adequate to generate the quality of the dialogue.

e) Analysis strategy: fewer participants are required in studies using an in-depth longitudinal exploration of narrative or discourse analysis and more participants are required for cross-case analysis. This study used fewer participants because the study explored specific information related to the research aim.

After the application of these items, a study sample of 12 participants was adequate to achieve the information power.

5.2.8 Data collection

The interviews lasted for 30-45 minutes and began with the researcher giving the potential participant the Participant Information Sheet (Appendix 7) and an

opportunity to ask questions. If they were happy to proceed, they completed the consent form (Appendix 8) and were given a copy of the topic guide to ensure they understood the questions and to clarify difficult questions. Next, the interviews were conducted in a quiet room in each hospital according to COVID-19 precautions, that is, in a ventilated room with the participants socially distanced and wearing face masks. The interviews were conducted in Arabic as it is the researcher's and participants' primary language. The researcher also selected to complete the interview in Arabic to achieve in-depth information from the therapists to understand their responses and more in-depth discussion. All interviews were audio recorded using a Sony IC recorder (model number: ICD-BX140).

5.2.9 Data analysis

Thematic Analysis (TA) was chosen as an applicable data analysis approach to identify the facilitators and barriers. TA is used in qualitative research for identifying and reporting patterns within data (Braun and Clarke, 2006). It is a flexible method that is used to describe and simplify data and can be integrated with other data analysis methods (Braun, 2019). TA is considered a compatible way to analyse descriptive qualitative research because it allows the investigator to describe and summarise the participants' experiences (Vaismoradi et al., 2016). It is commonly used to analyse interview and focus group data to gain insights into people's experiences, ideas, and perceptions, or examine factors affecting, supporting, or contextualising related to a particular topic (Braun, 2019). The TA approach is commonly used in health research (Braun and Clarke, 2014) and was utilised in this study due to theoretical flexibility and research questions. TA is suggested as an appropriate data analysis method that can be conducted with multiple ontological and epistemological views (Terry et al., 2017). It can be approached from either a

realist/essentialist or a constructionist perspective, yielding different outcomes and focuses (Terry et al., 2017), therefore is suitable for a broad range of study questions (Castleberry and Nolen, 2018). In this study, the constructionism philosophy is used to understand the experiences of physiotherapists in specific rehabilitation contexts, therefore, TA can provide findings to achieve the study's aim. Furthermore, TA has the flexibility to analyse data from 6 interviews up to 30 interviews (Clarke and Braun, 2013) and applies an inductive and deductive approach for the data analysis. The inductive TA approach is used when there is a lack of studies on the research topic, thus, the categories are based on the information found in the text (Vaismoradi et al., 2013). The deductive approach in TA is used when the research is based on theory or a theoretical framework (Azungah, 2018). In such cases, an organising framework consisting of themes is employed during the coding process. This approach is particularly useful when the TA aims to test a previous theory in a different setting or compare categories at various periods (Vaismoradi et al., 2013). Finally, TA allows interpretation of analysed data and analyses different aspects of the research topic (Braun and Clarke, 2012). Therefore, it allows to identify factors (e.g., facilitators or barriers) and explain reasons for participants' experiences, thoughts or behaviours (Alhojailan and Ibrahim, 2012). Overall, TA is a flexible data analysis approach compatible with different philosophical assumptions, applied with different type of data (e.g., face-to-face interview), and can apply an inductive and deductive approach to interpret the interview data.

There are several issues researchers should avoid applying effective analysis for research data. Firstly, developing an overall analysis of the data set is crucial instead of just presenting extracts. Secondly, some researchers rely solely on the

interview questions to organise the data; therefore, no analysis has been conducted. Thirdly, an analysis that misinterprets or lacks grounding in the data may fail to persuade the reader. Lastly, TA might become weak when it fails to use a theoretical framework that directs the research (Riger and Sigurvinsdottir, 2016). These issues often result from inappropriate research questions or poor data analysis rather than issues with the TA itself (Javadi and Zarea, 2016).TA is both flexible and robust, and it can provide valuable insights into complex phenomena when appropriately applied (Kiger and Varpio, 2020). The TA was applied following Braun and Clarke (2006) step-by-step guide to conducting TA involving:

1) Familiarising with data
2) Generating initial codes
3) Searching for themes
4) Reviewing the themes
5) Naming the themes
6) Reporting the analysis

5.2.9.1 Transcription, translation, and familiarisation

All audio-recorded interviews were transcribed verbatim and then translated into English by the principal researcher who is bilingual and shares the same language, culture, religion, beliefs, and social norms as the participants. It is suggested that a translator with similar sociocultural background and medical terminology knowledge is recommended to ensure the meaning is accurately conveyed in both languages and reduce translation errors (Al-Amer et al., 2015, Mohamad Nasri et al., 2021). In

this study, translation by the principal researcher (FA) was beneficial from two perspectives. Firstly, to maintain the meaning equivalence. It was noted during the interview that the meaning equivalence of the key terms associated with the research topic, such as "cognitive impairment", is understood as "conciseness" due to language differences in expressing the CI, therefore, the researcher clarified what they meant by CI, helping to maintain the correct meaning and avoid repetition and meaning equivalence throughout the interview. Secondly, it helps the researcher to translate the jargon and slang language into simple and formal meanings. Professional translators in this phase might not be able to identify the slang language which could result in a wrong translation. Overall, the researcher used direct line-by-line free translation (word-by-word) to ensure the precise meaning that reflects the participants' experiences and perceptions. Moreover, two techniques were applied to ensure translation accuracy. Firstly, the researcher applied backward translation, a common and effective method involving translating from the target language (e.g., English) back to the source language (e.g., Arabic) and then evaluating the equivalence between the two versions (Chen and Boore, 2010). Secondly, a bilingual checker was involved in checking a sample to provide feedback and confirm the translation accuracy.

After all translation processes were completed, the researcher read through transcripts to familiarise themself with the data.

5.2.9.2 Generating initial codes

Open coding was used to code the transcripts using NVivo12. Open coding simply refers to coding all the interview data in all possible ways (Glaser, 2016) and was utilised to identify more information and codes from the data, which is the method used in most qualitative research approaches (Saldaña, 2021). Line-by-line open

coding was used to identify the codes by starting to read each transcript in detail and focusing on all information and terms used by participants that could be coded. Line-by-line coding promotes the analysis's trustworthiness and minimises the likelihood of imputing the researcher's motives, fears, or unresolved personal issues to the collected data (Charmaz, 2015). The coding process was applied in two cycles as follows:

5.2.9.2.1 First coding cycle

Verbatim coding was used in the first coding cycle. Verbatim coding also referred to as " literal coding" or "in vivo coding" is defined as a method of analysing qualitative data that focuses on the exact words spoken by the participants (Manning, 2017). The researcher used verbatim coding because it is a coding method based on the participants' direct language to avoid the researcher's phrases and understanding (Saldaña, 2021). Moreover, it is used to find more codes from each transcript that help identify coding for patterns in the next coding cycle. The second researcher (KR) independently coded all interviews to ensure similarity between coders and achieve intercoder agreement on the coding process. Having two or multiple coders is suggested to enhance the reliability and validity of qualitative research data analysis (Morse, 2015). Multiple coders can enable inter-coding reliability assessment and measure the agreement between coders (Campbell et al., 2013, Belotto, 2018) .A high level of agreement between coders demonstrates that the coding process is reliable and can be replicated, thereby strengthening the validity of the qualitative study results (MacPhail et al., 2016). Additionally, having a second coder can provide valuable insights into the data by offering different perspectives. Moreover, the second coder can help minimise any bias from the main researcher (Burla et al., 2008), who was responsible for designing, conducting, transcribing,

translating, and coding all the interviews. The process of involving a second coder is performed as follows:

the principal researcher (FA) sent all the transcripts to the second researcher (KR) to code the transcripts. After coding completion, the second researcher sent the codes to the principal researcher for comparison. The researchers met to discuss the codes and agreed on the final set of codes to use throughout the data analysis. A range of 30-35 codes was identified in the first cycle of coding for each interview. An example of the first coding cycle is provided in Appendix 9.

5.2.9.2.2 Second coding cycle:

The second coding cycle allows the researcher to move from general (descriptive) coding into a more abstractive stage where the answers to some questions start to appear. Therefore, the second coding cycle involves " classifying, prioritising, integrating, synthesising, abstracting and conceptualising, and theory building" (Saldaña, 2021). The second coding cycle is researcher-centric, which requires the researcher to view the data more analytically and link these codes to the research topic or phenomenon (Gioia et al., 2013, Linneberg and Korsgaard, 2019). The main researchers began the process by clustering codes based on their similarities and regularities. They also eliminated irrelevant and duplicate codes. As a result, patterns in the data began to emerge.

5.2.9.3 Searching for themes

This method is called focus coding or coding for categorisation. After identifying the patterns in the data, these codes led to the identification of categories and subcategories relevant to the research aim and questions. The researcher then examined all the categories and the codes involved in each category to find overarching themes. The researcher named the themes based on the category and

the essence of the meaning and information provided in each category. Therefore, this stage leads to identifying themes/subthemes and representing the research data findings. An example for this step is provided in Appendix 10.

5.2.9.4 Reviewing the themes

The codes were categorised into themes and sub/themes were identified, which were then mapped into the TDF domains and their constructs to determine if all themes/subthemes adhere to the framework and identify any additional themes not in the framework that might add to the research findings.

5.2.9.5 Naming the themes

All identified themes/subthemes were named based on their meaning and the study aim to name facilitators or barriers to implementing different strategies to enhance stroke survivors with CI engagement and motivation.

5.2.9.6 Reporting the findings

All themes were described and discussed, and quotations supporting the description of each theme were added.

5.2.10 Study quality and rigour

Study rigour refers to the quality of the qualitative study (Liamputtong, 2019a).Qualitative research uses different criteria from quantitative studies to assess the rigour or trustworthiness of the studies including credibility, transferability, dependability, and confirmability (Cypress, 2017). These criteria are in parallel with the quantitative research studies' validity and reliability. Credibility means whether the researcher made a trusted judgement of the results and provided a comprehensive and sensible interpretation of the data findings (Liamputtong, 2019b). Transferability refers to the extent of the research to be transferred and

applied to another setting. Dependability refers to the consistency of the study. Furthermore, confirmability shows that the results are driven by the data and not from the researcher's imagination (Korstjens and Moser, 2018). Several reported methods were used to enhance the qualitative rigour and trustworthiness such as triangulation, maximum variation, thick description, and peer examination (Lincoln and Guba, 1985, Merriam and Tisdell, 2015, Creswell and Poth, 2016, Liamputtong, 2019a). It has been advised that researchers should use at least two methods to enhance the study rigour (Creswell and Poth, 2016). Triangulation is the gold standard method (Merriam and Tisdell, 2015) and uses multiple or different methods, sources, investigators, and theories to present corroboration evidence (Patton, 2014, Creswell and Poth, 2016). However, this study did not apply triangulation due to various reasons including time and budget limitations, and the absence of other researchers to collect and analyse the data. Instead, other methods were employed in this study to ensure the study rigour:

a) Thick description: the researcher provided a detailed description of the research process and justified all the steps performed in this study. A thick description suggests research transferability because it allows readers to decide whether to transfer the research to their setting based on the study details (Merriam and Tisdell, 2015).

c) Peer review: the researcher utilised this strategy to ensure the study quality. This involved piloting the research topic guide to physiotherapists, academic supervisors and colleagues. In addition, the interview translations were examined by bilingual academic colleagues. Finally, a second coder were involved during the coding and data analysis process, as peer review is suggested and recommended to improve

the credibility or internal validity of the qualitative studies (Merriam and Tisdell, 2015).

d) Audit trial: an audit trial refers to recording and documenting how the research was conducted and how the conclusion was reached (Carcary, 2020). An audit trial is considered to enhance the credibility of qualitative studies (Merriam and Tisdell, 2015). The researcher kept a record of the interviews, translation, and coding process, including initial codes, codes after agreeing with the second coder, codes after removing the duplications, categorisation, and thematic framework. Also, the study documented a thick description of methodological choice, sampling, data collection, data analysis, and finding interpretation and presentation.

5.3 Results

5.3.1 Participant characteristics

In total, 15 participants expressed an interest in participating in the study, of which, three were excluded because they did not meet the participants' criteria, two had less than three years of working experience with stroke patients and the third participant had no previous experience in working with stroke cases. Twelve participants from two hospitals consented to take part in this study and their details are provided in Table 5-3. These participants had experience working with stroke patients with CI in both acute and chronic stages. They shared their insights and expertise on the subject, discussing the primary factors influencing the implementation of engagement and motivation strategies in physiotherapy rehabilitation sessions.

Table 5-3: Participant characteristics

Physiotherapist's characteristics of interview data	
Sample number	12
Age (Years)	27-37
Female gender: n (%)	5 (40%)
Male gender: n (%)	7 (60%)
Education	University degree (n=12)
Experience (Years)	3-14

5.3.2 Findings

The data analysis revealed four barriers and five facilitators to implementing different methods to enhance patient engagement and motivation in the physiotherapy rehabilitation programme. All the barriers and facilitators were mapped into the TDF to match the theme with the specific domain they presented.

The barrier themes were: information and case identification, social and organisational environment, patient belief and health condition, and physiotherapist awareness and self-development (Table 5-4).

The facilitators were themed as: belief about consequences, professional responsibility and treatment priority, positive relationship with patients and their families, training and educational support, and physiotherapists' self-attitude (Table 5-5).

During the interviews, the participants mentioned that PSCI had a significant impact on the rehabilitation programme and outcomes because patients lose their ability to follow the treatment goals and plans and interact appropriately with their treatment providers.

Table 5-4: Barriers to applying engagement and motivation strategies

THEME	MEANING	QUOTATION	TDF DOMAIN
Information and case identification	Limited amount of information regards post-stroke cognitive impairment that leads to an inability to identify the cognitive decline and differentiate it from the normal stroke patient without CI	*"The most common thing we see and notice in the cases that we see in the hospital regarding cognitive impairment means that the patient is how he was and how he becomes to mean that his condition is healthy, and he walks and goes and goes and then suddenly deteriorates and is affected psychologically, so you do not know to treat him psychologically or physically" T8*	Knowledge
Organisational culture	Lack of communication with other professionals and limited amount of space and facilities in the department	*"The work environment does not provide physiotherapists with the needs they want or does not provide the right place for stroke patients to receive the rehabilitation sessions" T11*	- Social/ Environmental context and resources. - Social influences
Patient beliefs and circumstances	Patient's poor health status and lack of belief in physiotherapy treatment	*"The second thing that can prevent the application of motivation and engagement strategies is the patient's environment at home. Sometimes patient environment discouraging and sometimes encouraging. When it is discouraging, you have to face the patient and his family, you face a problem that is the belief that physiotherapy does not give a result and they move to traditional medicine and others" T11*	Belief about consequences
Physiotherapists` awareness and self-confidence	Physiotherapists are not aware of the impact of patient engagement and motivation and are not willing to improve their skills	*"Some specialists deal with the patient based on the thing they learned and what they should deal with is the reality of the case and develop themselves, so it is possible for physiotherapists to use the same treatment plan for two or three years without changing in the treatment and not having the ability to differentiate between one case to another"*	Belief of capabilities

Table 5-5: Facilitators of applying engagement and motivation strategies

THEME NAME	MEANING	QUOTATION	TDF DOMAIN
Promising impacts	The belief that using different engagement and motivation strategies will achieve benefits for patients, physiotherapists, and rehabilitation services	*"For me, it will manage my time by controlling my time by spending less time with the patient, also improving patient outcomes in a faster time. Also, improving the quality of service and patient outcomes, so the patient returns to the community and his family" T9*	- Goals - Belief about consequences - Intention - Optimism
Professional responsibilities and treatment priority	The belief that the primary responsibility of physiotherapists should be to engage and motivate their patients and that treatment programs should be designed with this in mind	*"I see it from the basic roles. Based on the literature, stroke patient needs early mobilisation. Therefore, you need to motivate the patient from the beginning and set the short and long treatment goals" T6*	Professional role and identity
Positive connections with patients and their families	Increase patient engagement and motivation through positive interaction and involvement in the treatment programme	*"I am of my nature before starting the session while preparing for the place and wearing gloves, I try to talk to him and motivate him that your condition is perfect. I try to turn around the least improvement that exists and highlight this thing and that the improvement is great. This is my idea*	Skills

		because some patients do not have much that you can give, so motivation is the most important thing in his condition" T10	
Training and educational support	Facilitate engagement and motivation strategies implementation via providing courses and training.	*"Giving educational courses to the physiotherapists and educating the patient's family on the importance of motivation and engagement to improve results. In general, focusing on physiotherapists, patients and patient's family's education" T9*	Behavioural Regulation
Physiotherapists self-attitude	Physiotherapy practitioners' positive attitude toward implementing engagement and motivation strategies	*"Because I believe in this thing, according to my experience that motivating the patient is the most important thing, so, physiotherapists must motivate the patient and encourage him to achieve goals because the patient is in poor health and cognitive status" T1*	• Optimism • Belief about capabilities

5.3.3 Barriers

5.3.3.1 Theme1: Information and case identification

Most participants had limited information regards PSCI, therefore, they mostly spoke about stroke impact in general and how it affects patients' functional outcomes and the physiotherapy rehabilitation process, including inpatient and outpatient rehabilitation and the referral to PT services.

"*Stroke patients, in general, need a rehabilitation treatment programme, the first thing is to assess muscle strength and other functions skills, then the most important thing is focusing on the cognitive state of the patient (conscious or semi-conscious and unconscious) and build the treatment plan based on that*." T3

Many participants lacked understanding and recognition of the meaning of cognition and the specific cognitive functions that are affected. Some described CI as affecting stroke patients' response and understanding of physiotherapists, possibly due to a lack of understanding of different cognitive domains and their role or impact during rehabilitation programmes. This may be particularly relevant for those who mainly work with stroke patients in the acute stage, where patient response and interaction reflect their cognitive status from their perspective.

"The patient not responding to me means, for example, responding to commands such as facial expressions, speech, or movement. Likewise, I see that he has a cognitive impairment, if he does not respond to me or to the companion who is with him, I make sure that he has a cognitive problem". T10

Participants suggested that some physiotherapists lack awareness of CI after stroke and the importance of patient engagement and motivation. Interviewees pointed out that physiotherapists might be unable to differentiate between stroke patients with normal cognitive functions and those with CI. Consequently, they do not provide stroke patients with cognitive decline more attention and time during the therapeutic

sessions. Moreover, some participants suggested that physiotherapists not being aware of the value of improving patient engagement and motivation does not assist them in achieving better outcomes from the rehabilitation programme.

"The thing that possibly prevents the implementation is the awareness of the specialist by not differentiating between the patient who has cognitive impairment and the one who does not have cognitive impairment and not giving the patient more attention and more time possible due to the lack of information. This is what I see from physiotherapists". T12

5.3.3.2 *Theme 2: Organisational culture*

During the stroke rehabilitation process, some participants reported experiencing poor communication with other professionals in their work environment including psychotherapists and social workers. They mentioned that all disciplines work independently and rehabilitation teams have limited direct contact. The only time they might interact is during a multidisciplinary team meeting, which is usually attended by the inpatient PT supervisor, not individual physiotherapists. Additionally, the PT department is typically an outpatient clinic, which means that physiotherapists are not stationed in the inpatient department, only visiting to deliver physiotherapy sessions.

> *“We have limited contact or no contact with other professionals. Therefore, the communication will be based on the patient's status. For example, we communicate with the social worker by writing notes about patients' needs for social support and contacting the neuro physician, usually when the case is severe; the psychology clinic just recently added. It's hard to communicate with them.” T5*

The participants mentioned a lack of understanding of the role of the PT department in the hospitals. Some interviewees complained that the physician ignored the PT services and hospital admission less aware of their role and services. Participants

reported that physicians usually do not discuss patient's progress and rehabilitation needs, and they do not involve physiotherapists in the patient's care plans especially during discharge. Therefore, some patients miss the PT sessions after discharge because physicians do not directly transfer patients to PT sessions.

"Because sometimes you are shocked by the doctors and the hospital administration about not knowing your role and services in physical therapy." T8

According to the participants, the PT department clinics present a challenge when it comes to implementing motivation and engagement strategies. Most of those interviewed suggested that the limited size of the rooms makes it challenging to try different methods and create a better environment that motivates patients. The physical structure of the department is also a problem, as there is no separate building or section where open space is available for equipment or to deliver therapeutic sessions, thus PT sessions for stroke patients in the acute and subacute stages are usually provided in limited space within patients' rooms without any equipment available for use. In addition, if the patient is transferred to the PT clinic, there is insufficient equipment to rehabilitate stroke patients in the outpatient clinic. Therefore, some participants also reported the shortages in the facilities available in the clinic, such as therapeutic devices, which limits their options to create and deliver better rehabilitation programmes. Overall, the challenges related to the physical structure of the PT department and providing essential equipment limit the role of the rehabilitation environment to support stroke patients with CI's motivation and engagement in PT rehabilitation programmes.

"Facilitate and provide appropriate places to motivate the patient, because it is impossible, for example, to enter a patient in a small room and in an inappropriate place that the patient will help us engaging". T6

"I see in it some factors that do not help to implement these methods. For example, providing therapeutic devices to us, we have a shortage of devices in the gym." T12

5.3.3.3 *Theme 3: Patient beliefs and circumstances*

Most participants suggested that the patient's condition is a crucial factor that affects engagement and motivation strategies implementation. They described the patient's condition as the patient's health condition, such as having other chronic diseases such as heart conditions and if they have pre-existing dementia or patients over 80 years old. Furthermore, they also described the patient's condition as having the support of relatives after a stroke. Finally, they also referred to the patient's psychological condition including depression and the state of shock when they lose their functional abilities as influencing patient engagement and motivation.

"It depends on the patient's condition and varies according to the age and health problems of the patient before the stroke. Also, the patient's family and children are some patients who do not have someone and feel lonely. These factors determine the ease or difficulty of motivating the patient." T4

During interviews, it was mentioned that stroke patients may not fully understand the importance of PT rehabilitation in recovery. According to some participants, patients sometimes view PT as an optional service rather than a crucial aspect of their functional recovery. Additionally, some patients attend their sessions but do not believe in the benefits of PT rehabilitation or its role in their recovery. As a result, motivating stroke patients to engage in physiotherapy can be difficult, not just because of CI but also due to a lack of belief in its ability to improve outcomes.

"except for the situation of the patient and his rejection of physical therapy, some patients see that the physiotherapy department is complementary and not curative, as they come to physical therapy because the doctor is referring him and they do not have faith in the ability of physical therapy, this is very difficult to deal with." T7

According to some participants, the success of a stroke patient's rehabilitation programme can be affected by the cooperation and beliefs of their family. They noted that some families do not follow the physiotherapist's instructions for home treatment or provide enough motivation and encouragement for the patient. This could be due to a lack of understanding about the importance of their role in the rehabilitation process and unrealistic expectations about the effectiveness of PT. As a result, some participants find it necessary to work with the patient and their family to educate them about the benefits of physiotherapy and the impact of CI on stroke patients' rehabilitation programmes to improve their beliefs about its ability to help the patient recover. Also, giving a realistic plan and home programme for stroke patients, especially with CI, as some participants suggested the patients lose motivation when they are in the home environment because they are not encouraged and supported adequately by their families.

"Almost the patient's external environment. If the patient engaged positively and motivated with me. Patients' environment cannot understand this progress and improvement like I do. You reach the level of progress and improvement when the patient is motivated in the hospital and back after Two days to the next physiotherapy session with disappointment, psychologically affected and having a lack of desire to do the exercises. The patient becomes doing the exercises less and not having the desire to continue due to their home environment." T5

5.3.3.4 *Theme 4: Physiotherapist professional confidence*

Participants also reported that physiotherapists have a lack of desire to try other treatment plans and develop themselves. Some interviewees suggested that some physiotherapists are erring on the side of caution by only applying therapeutic exercises and utilising the same treatment plan with all patients without changes. They also do not consider the differences between cases and have no desire to change the treatment programme. Some participants also noted that a few

physiotherapists are not cooperative and hard to convince about further developing their skills and treatment services.

"Physiotherapist desire, the thing that some physiotherapists do not have a desire and work on the safe side by doing stretching and strengthening exercises and using only the treatment protocols and they do not want to develop themselves and to try new things." T4

The lack of self-development and a personal desire for improvement led most interviewees to claim that they received no encouragement from their colleagues to try different ways to motivate and engage patients. However, some participants stated they have encouraged other physiotherapists to try further engagement and motivation methods with patients but that this is a rare situation and is only provided by experienced physiotherapists with research knowledge who have the trait of supporting and helping their colleagues.

“Often, there is reservation from the physiotherapists, so encouragement is very rare.” T1

“The hardworking who have the trait of sharing and discussion, and people who have more experience.” T11

Some interviewees felt that applying different strategies for engagement and motivation should come from physiotherapists who desire to achieve that and develop themselves by reading, understanding conditions, and finding ways to improve patient outcomes.

“I have a feeling that this thing must be from the physiotherapist, with his desire to learn this thing.” T2

5.3.4 Facilitators

5.3.4.1 Theme 1: Promising impacts

All those interviewed supported that applying different engagement and motivation strategies will benefit patients, physiotherapy specialists and the department. They suggested that this will improve patient outcomes and achieve better results. They also suggested applying these strategies will help to increase patients' acceptance of the PT treatment programme, enhancing community (e.g., relatives) awareness and beliefs about the role of PT in improving the patient's condition.

"Giving a chance to stroke patients who have cognitive impairment that they achieve better improvement and for their families to trust and believe in the physiotherapy department". T12

Participants also acknowledge that physiotherapists will improve their productivity and skills. They suggested that applying different motivation strategies will save physiotherapists time by achieving the goals in a shorter period. They also believed that will increase physiotherapists' productivity, confidence, and desire to give the patient the most appropriate treatment programme. Moreover, this can help ease the communication between patients and physiotherapists.

"For me, it will manage my time by controlling my time by spending less time with the patient, also improving patient outcomes faster." T9

"It is considered an addition to the physiotherapy services and helps the specialist know the patient's improvement. It helps to ease the communication with the patient and achieve results." T5

5.3.4.2 *Theme 2: Professional role and treatment priority*

As physiotherapists, participants believed that patient engagement and motivation are crucial aspects of their role. During stroke rehabilitation, most participants pointed out that it is important to motivate and engage stroke patients with CI over

an extended period. If patients are not actively engaged in the treatment programme, achieving the desired treatment goals may be difficult. Physiotherapists emphasise that by making patients more comfortable during treatment sessions and building their confidence in the rehabilitation programme, they are more likely to succeed in achieving their goals. Therefore, most participants prioritise patient engagement and motivation in their treatment programmes to ensure patients are actively engaged and satisfied with the treatment provider and rehabilitation services.

“Certainly, it is part of my job as a physiotherapist, so how can I achieve results without considering patient engagement and motivation.” T1

“It is my priority for the patient to be more active and improve with me”. T2

A minority of participants did not support patient engagement and motivation as their primary role. However, they suggested that they consider it as a secondary (part) role. Nevertheless, they still believe that it is their job duty and the profession's ethics to give the patient the best care and improve their condition. Moreover, they suggested that the role of improving patient engagement and motivation is integrative and requires multidisciplinary teamwork including physicians, nurses, social workers, and rehabilitation specialists. Despite that, some interviewees claim that even with multidisciplinary involvement, the outcome of patient engagement and motivation will not be significantly effective, so physiotherapists need to work on that to achieve better rehabilitation results.

"I may have a role, but I do not feel that I am the only person who cares about this thing. It is my job role as teamwork. I mean, I can't provide the sufficient result alone." T2

“If I involve the social workers with me to achieve that, they might help, but not the

same result when you work with the patients face to face and explain what they should do in the rehabilitation session." T5

5.3.4.3 *Theme 3: Positive connection with patients and their families*

Most participants agreed that establishing a positive relationship is the key skill they use to motivate stroke survivors with cognitive impairment. They employ various methods to achieve this, such as encouraging stroke patients by evaluating their progress during the rehabilitation programme. They mention even the smallest improvements in their condition and use it to motivate patients to work harder towards achieving better results. Consequently, participants believe this approach increases patient motivation and engagement in the treatment programme.

"Encouragement mmmmm maybe evaluating how the patient's condition was and how we improved. I encourage patients from that and state for them, for example, we improve, and patients feel that improvement." T2

Other interviewees suggested that they build positive relationships through verbal interaction. Some participants described they need to be cheerful with patients, remind them about the past, and make better connections with patients. Those participants believed that verbal interaction helps give patients a good impression of the physiotherapists and the treatment services. Meanwhile, a few participants described that they built a positive relationship with the patient by providing examples of other similar cases. They explain the improvement they achieved, their condition at the start of the rehabilitation programme, and how they became and improved after the PT programme.

"I try to give him an example because the patients usually ask if I had patients similar to their cases, so, I tell him that I had a patient with the same condition and improved with me, and the patient becomes motivated and actively engage in the treatment program." T8

The interviewees also insisted that a good relationship should be built with patients' families. They suggested that the patient's family involvement is an essential external motivational factor that helps the patient motivate and engage in the rehabilitation programme. They mainly build this relationship by educating them about patient conditions and PT programmes and what they expect to achieve. Also, they advise the family to keep the patient motivated and apply for the home programme.

"We, as a physiotherapy department, most of the patients in the inpatient are elderly, so most of our words and educating are for the person staying with the patient to implement the treatment program, so we focus on this person more." T8

A few participants also suggested building a positive relationship via setting treatment goals. They believed it is essential to set a short treatment goal and motivate the patient through that. They stated that goal setting should build on honesty and consider the safety requirements to achieve that (e.g., using an assisted device). Also, describe the stages of the treatment programme that will progress based on the patient's abilities and improvement.

"Yes, it is necessary to discuss with the patient the goals from the beginning; for example, we will start with you with this and that, and after that, we move to a more difficult stage." T7

Using various methods of building a positive relationship with patients is suggested as an effective way to enhance stroke patients with CI's engagement and motivation in the treatment programme. However, participants stated various degrees of these methods' effectiveness (effective, sometimes effective, not practical, depending on the patient and their family). Nevertheless, it seems that these methods of communication are effective with particular patients and their families such as elderly patients, patients who have doubts about their conditions, and patients and families

who are aware of the case and PT treatment programme.

“I see it is effective, especially with the elderly.” T8

“Very effective, frankly, and I saw how the patient trusts me in everything, even if the environment around the patient says no.” T11

5.3.4.4 *Theme 4: Training and educational support*

Most participants agreed that the importance of the education role is to facilitate implementing the engagement and motivation strategies. Therefore, they suggested physiotherapists need training and educational courses in this topic and highlighting the role of patient engagement and motivation to achieve positive outcomes. Unfortunately, these topics are not adequately covered in the educational curriculum, which usually focuses on improving the physical functions of stroke patients. Furthermore, they highlighted the need to provide courses and training regarding stroke patients' different impairments, such as CI and communication impairment and how they could deal with them; thus, they can have the skills to engage and motivate patients. In their place of work, they discussed that there are not enough courses and training provided primarily related to stroke patients because the PT department is not specialised for stroke cases but also receives all other cases, such as orthopaedic cases. Therefore, the training and courses regarding stroke rehabilitation are limited. Providing more comprehensive training could enhance physiotherapists' understanding and desire to improve patient engagement and motivation.

"Conduct educational lectures for physiotherapists about aaaa the issue of motivation and engagement and its importance to the patient. Some physiotherapists do not realise this thing." T7

During interviews, some participants suggested that the PT department could

improve patient engagement and motivation by leveraging the experiences of physiotherapists and feedback from patients. They recommended that the department provide information and techniques for engaging and motivating patients within their existing protocols to achieve this. By doing so, physiotherapists can gain more knowledge and skills to use with their patients. Additionally, participants recommended that the effectiveness and safety of engagement and motivation strategies be evaluated with patients, allowing physiotherapists and the department to apply these methods confidently. Overall, the PT department can effectively support patients' engagement and motivation concepts by providing essential information and support, enhancing protocols, and constantly evaluating the effectiveness of engagement and motivation strategies to improve the rehabilitation of stroke patients with CI.

"We see the pros and cons of implementing these methods, such as the patient's reaction and acceptance. We should analyse these methods from all sides and see their safety, advantages and disadvantages for these methods." T4

5.3.4.5 *Theme 5: Physiotherapists' self-attitude*

Most interviewees believed that they have the abilities and the confidence that the engagement and motivation strategies can be used optimally in the PT rehabilitation services in the KAS. In addition, some physiotherapists thought that they already use some engagement and motivation strategies in daily practice and notice how patients get motivated when smiling and encouraging them to achieve results. Also, participants highlighted that they used motivation and engagement strategies to keep the patient interacting in the session and consequently, this led to improved patient rehabilitation outcomes. Therefore, those participants' attitudes derived from their personal experience of motivating stroke patients with CI during rehabilitation sessions.

“I mean, I motivate them verbally, I give them positive pushes. For example, today the patient is tired or cannot understand me or apply the rehabilitation task, I give him this comment you are doing great. In the next session, he follows the tasks that I offer. Therefore, in all sessions that the patient comes to me, I work on his motivational status.” T5

Participants have expressed their belief that the current and future development of health services in KSA is promising. They attribute this to the ongoing plans and developments that Saudi Arabia is implementing, encompassing all healthcare aspects, including PT. The participants are optimistic that the current advancements in technology, science, and accessibility to resources will help to improve the health sector and achieve better services. Overall, their positive attitude towards enhancing health services is linked to their feelings and expectations of the current and future development in the field.

“The development and renaissance we are currently experiencing will certainly include the health aspect.” T12

Other participants linked their attitudes toward the engagement and motivation concepts. For example, they believed that patient engagement and motivation are essential to achieving rehabilitation goals and better interaction with the patient. Moreover, some interviewees asserted that patient motivation and engagement strategies are easy to apply, as they don’t require any additional facilities and equipment. Therefore, physiotherapists derive their attitude regarding engagement and motivation concepts based on their feelings and experiences.

“Among the things that can help us is that this thing is easy to apply and does not require any materials and equipment.” T10

“I must see an improvement in the patient's functions, and I must motivate him to accept treatment and be easier to deal with” T4

5.4 Discussion

This study aimed to identify the facilitators and barriers to applying engagement and motivation strategies for stroke patients with CI. The facilitators mainly related to individual beliefs and attitudes such as professional role and treatment priority, promising impacts, and providing education and training support that support applying engagement and motivation strategies. The findings also highlighted barriers related to the physiotherapists' knowledge and rehabilitation environment to hinder engagement and motivation strategies application in the Saudi rehabilitation context.

5.4.1 Increasing educational support

The lack of knowledge regarding PSCI impacted physiotherapists’ ability to recognise the CI and provide suitable treatment plans. These findings align with other qualitative studies about PSCI rehabilitation that identified rehabilitation professionals' lack of knowledge in detecting and treating CI after stroke in general (Longley et al., 2018) or specifically to specific cognitive deficits such as spatial neglect or executive dysfunction (Hayes et al., 2015, Chen et al., 2021). The specific reasons for the lack of knowledge in these studies were related to participants not receiving an education about PSCI or due to the limited training and documented information related to the CI after stroke. This study is similar in the lack of knowledge about CI, namely, not including CI in the PT educational programmes. It is also related to the lack of professional expertise to provide suitable training about CI after stroke. Indeed, a lack of professional expertise in stroke rehabilitation and neuropsychologists in clinical settings usually affects designing and delivering training and enhancing stroke rehabilitation services is highlighted in many studies (van der Veen et al., 2019, Jeffares et al., 2021) .

The lack of knowledge also can create difficulty in communicating with other physiotherapists and rehabilitation professionals because, from interviews and analysing the data, physiotherapists were not able to use an accurate term to describe patients' cognitive issues. For instance, participants used "difficulty of speaking" to describe "aphasia", " respond," to describe " attention", and "orientation" to describe "CI". Another study similarly found that the participants were inconsistent in describing spatial neglect, which they thought was due to the everyday language practised in the rehabilitation setting (Chen et al., 2021). Therefore, developing a common vocabulary that accurately describes neurologic and neuropsychological concepts across rehabilitation therapy, psychology, medicine, and nursing is essential. This will enable an immediate understanding of the terminology distinguishing between cognitive deficits, physical limitations, and behavioural impairments and ultimately improve collaboration and treatment for people with CI.

The lack of knowledge and information has many impacts on applying engagement and motivation strategies for stroke patients with CI. The main impact affects the physiotherapists' confidence in delivering effective rehabilitation programmes. The impact of knowledge on participants' confidence was found in different ways, including difficulty in recognising CI and the skills required to adapt the rehabilitation programme to the patient's needs. Therefore, building a knowledge base regarding the impact of PSCI on the rehabilitation process is essential to support their confidence. It has been suggested that it is essential for physiotherapists to have confidence in their knowledge and recovery potential of patients as it is associated with patient confidence in the rehabilitation process, motivation, and positive treatment outcomes (Kidd et al., 2011, Kleiner et al., 2023). As a result, the main

facilitator identified to knowledge limitation and self-confidence is to provide education and training to physiotherapists, other rehabilitation professionals, and patients to apply engagement and motivation strategies for stroke patients with CI through training courses, workshops and physiotherapists' self-education. However, continuous education was represented as a sociocultural barrier by some participants that impedes physiotherapists' professional development. This is challenging as it can affect the physiotherapists' practice in two ways: inhibiting taking education and inhibiting practice change (French et al., 2008). This study pinpointed that physiotherapists usually use the same treatment plans and rehabilitation process and do not try to change their practice. There are evidence suggested barriers to continuing education such as cost, time constraints, encouragement from managers, and the relevance of the programme or training (Ahuja, 2011). This study did not investigate the barriers to continuous education and professional development. However, highlighting this issue is essential to design more flexible, relevant, and accessible education training for physiotherapists to enhance the uptake and attendance at educational programmes or workshops. Overall, the lack of knowledge in PSCI among physiotherapists is a barrier not only associated with applying engagement and motivation strategies with stroke patients with CI, but it also influences other aspects of the rehabilitation process, such as communication with patients and other health care professionals, skills in delivering and planning rehabilitation programmes and physiotherapists' self-confidence and stroke patients' confidence in physiotherapists. Therefore, improving physiotherapists' knowledge is an essential step to ensure physiotherapists' uptake and enhance stroke patients with CI engagement and motivation in rehabilitation programmes.

5.4.2 Patients not valuing physiotherapy

Stroke patients' belief about PT rehabilitation is considered a barrier to engagement and motivation in rehabilitation programmes. The participants described that stroke patients do not value the importance of PT rehabilitation, thus, they do not have the motivation and actively engage in therapeutic sessions. Qualitative studies in the Saudi context highlighted stroke patients' experience of stroke rehabilitation and services. For instance, Alqahtani (2015) conducted a qualitative interview study with 34 Saudi stroke patients to understand the sociocultural factors influencing their health behaviour. The findings highlighted those interventions received during stroke care were classified into three themes: medical, lifestyle and behavioural, and cultural intervention. Initially, patients focused on medical interventions but later emphasised the importance of lifestyle and cultural interventions. Most patients reported using religious practices such as reading the Quran (Islamic Bible) and praying as coping strategies for their strokes. Praying was highlighted as the primary way to control the physical and psychological features that appear post-stroke, as patients agreed that stroke could be treated through praying and reciting the Quran. Additionally, some stroke survivors believed that the best cultural intervention for stroke was skin cauterisation, citing a famous traditional healer who performed this procedure, and many stroke patients knew him. A few patients also reported using cupping therapy, known as Hijama. This evidence stressed that religious and cultural beliefs influence patient recovery more than medical interventions. It also highlighted that stroke patients believe in traditional alternative treatments for stroke recovery. However, this study did not explain stroke patients' beliefs about PT rehabilitation. In this study, similar suggestions from physiotherapists' perspective, especially about stroke patients, rely on traditional treatments to recover from stroke and regain physical functions. Additionally, the condition of stroke patients, including stroke

severity, age, and depression, have been reported to pose challenges when linked with CI. This can have an impact on the engagement and motivation of stroke patients in physiotherapy programmes, therefore, the stroke patient's condition such as having CI or depression after stroke is defined as a major patient-related predictor that affects the engagement and motivation level in the rehabilitation programmes and functional outcomes (Robinson and Jorge, 2016, Lingo VanGilder et al., 2020, Gangwani et al., 2022).

The study participants also highlighted stroke patients' families' lack of belief that PT rehabilitation affects stroke patients with CI's engagement and motivation. They indicated that stroke patients' families do not follow physiotherapists' suggestions and adhere to the designed rehabilitation programme, presumably due to a lack of belief in PT rehabilitation. However, that cannot be generalised as this study did not involve stroke patients' family perspectives about stroke rehabilitation. A study by Alselami and Butcher (2022) identified stroke patients' families' perspectives and stroke services during the inpatient stage, finding that they pointed out the lack of interaction with healthcare providers and information received about the patient's condition and recovery process. Therefore, they expressed a need for genuine care from healthcare providers, including psychological support, honest answers to their questions, and assurance.

Additionally, family caregivers suggested that the information resources provided in the hospital are not always understandable, hindering their ability to ask more questions. They describe their need for access to comprehensive information and resources related to the patient's care, disease signs and symptoms, and post-stroke resources. This study highlights the environmental factors influencing stroke patients' families' involvement in stroke care.

The barriers to stroke patients' family involvement in stroke care an include the lack of resources and support from hospitals, lack of knowledge about stroke impact and care, and the culture (Magwood et al., 2019). Therefore, enhancing family involvement in supporting stroke patients with CI engagement and motivation in PT sessions requires providing families with essential information about the stroke rehabilitation process and their role in supporting the patient and providing a supportive environment.

Engaging the patient and their family in the stroke rehabilitation process is crucial, so further studies are needed to investigate the experiences of stroke patients and their families in engaging in PT rehabilitation programmes in the Saudi context. These studies should explore how cultural, environmental, and individual factors can impact engagement and motivation in rehabilitation programmes.

5.4.3 Organisational culture impact on physiotherapists' practice during stroke rehabilitation

The current study suggested that organisational culture is a barrier for physiotherapists. However, there are limited qualitative studies to investigate organisational culture in the physiotherapy department in the KSA but quantitative descriptive studies were discussed to identify the organisational culture in the Saudi governmental hospitals' context indicated as barriers in several studies. For instance, Alsoulami et al. (2018) conducted a study to assess the organisational culture in government hospitals in Jeddah City. The study used the organisational culture assessment instrument (Quinn, 2011) and included 239 participants from various professions: physicians, administrators, radiologists, nurses, pharmacists, and physiotherapists. The findings suggested that hierarchical culture is the dominant type of organisational culture in the governmental hospital in Jeddah city.

The study described hierarchical culture as bureaucratic, inward-focused, and adhering strictly to rules. This type of organisational culture can hinder flexibility and result in excessive control from management but can provide stability, consistency, and efficiency while keeping the employees and work under control. These findings might be applicable across the governmental hospitals in Saudi Arabia because they are managed by the Ministry of Health and hold similar policies, roles, and structures. The physiotherapy department comes after the administrators and physicians in the Saudi hospitals' hierarchy. Therefore, patients are required to have a physician referral to receive PT sessions in the KSA, as direct access to physiotherapists is not allowed (Al-Eisa et al., 2016). This requires high recognition and awareness from physicians toward the PT department practice. Several studies indicated that the patients' referral to PT services is poor, potentially due to the physicians' lack of knowledge about PT services and the lack of cooperation between the physicians and physiotherapists (Al-Eisa et al., 2016, Alshehri et al., 2018, Alyahya and Kashoo, 2022). In this study, physiotherapists similarly discussed the lack of awareness of physicians and hospital administrators about the role of the PT in stroke recovery affecting the utilisation of stroke rehabilitation and the communication with physicians and other professionals such as social workers and psychologists. Poor communication and coordination suggested causing important post-stroke topics and clinical concerns to be neglected. These concerns, such as PSCI or communication impairments, may not receive proper recognition from treatment teams (Kushner and Strasser, 2020). Therefore, the organisational culture can impact stroke with CI patients’ engagement and motivation in PT rehabilitation due to a lack of communication and cooperation between physiotherapists, physicians and other rehabilitation teams.

The current study also suggested the PT department's lack of space and equipment as an organisational factor influencing application engagement and motivation strategies for stroke patients with CI. The organisational barriers, such as space, equipment, resources, and work pressure, were highlighted in many studies as barriers to evidence-based practice in stroke and CI rehabilitation (Petzold et al., 2014, Munce et al., 2017, Cormican et al., 2023). The rehabilitation-built environment, such as the enriched environment, rehabilitation space, equipment, and bedroom design, was suggested to have positive consequences on stroke patients' clinical outcomes, safety and improvement of the clinical practice (Lipson-Smith et al., 2021). Providing supportive and simulating stroke units facilitates rehabilitation team communication and collaboration (Nordin et al., 2021). Therefore, enhancing the rehabilitation environment can improve stroke patients with CI's engagement in the rehabilitation programmes (Janssen et al., 2019). In the KSA, evidence acknowledged the significance of enhancing organisational culture, including the rehabilitation clinic space, equipment, multidisciplinary work, and adequate staff to facilitate stroke PT rehabilitation evidence-based practice (Alatawi, 2019). The current study identified similar findings regarding the organisational culture that can be a barrier to implementing engagement and motivation strategies. Providing a suitable environment for stroke rehabilitation is required as there is a lack of stroke units in the KSA (Bindawas and Vennu, 2016b) that provide appropriate space for enhancing stroke PT practice. Also, the outpatient PT clinic in the settings where the interviews are conducted has limited space for stroke patients, and the clinic space is also shared by patients with other conditions, which might affect stroke patients with CI's engagement and motivation in the therapeutic sessions. There is limited evidence to evaluate the impact of the organisational factors on physiotherapy practice patients' outcomes, therefore, designing studies to

focus on identifying organisational factors is required to enhance stroke services in the KSA.

5.4.4 Physiotherapists' beliefs and attitudes can facilitate applying engagement and motivation strategies

The current study identified positive outcome expectations and attitudes toward engagement and motivation in therapeutic sessions. The themes of "promising impacts", "professional responsibilities and treatment priority", and "positive connections with patients and their families were identified as facilitators to apply engagement and motivation strategies with stroke patients with CI. These themes linked to TDF of belief about consequences, beliefs about capabilities, and professional role and identity. These beliefs are essential to support applying evidence-based findings into practice. However, these domains are closely linked with knowledge (Huijg et al., 2014, Cox et al., 2017). Knowledge was highlighted as a main barrier in this study, therefore, it is crucial to provide physiotherapists with the proper information and training regarding CI after a stroke, as well as emphasise the significance of measuring and understanding the concepts of engagement and motivation in rehabilitation programmes. This will enable physiotherapists to adopt effective engagement and motivation strategies in PT rehabilitation programmes.

5.4.5 Study strengths and limitations

Despite being the first qualitative study regarding PSCI in the context of physiotherapy rehabilitation in Saudi Arabia, this study has some limitations. Firstly, the data were collected in one geographical area, which may impact the findings' transferability. However, the selected settings were governmental hospitals with similar individual physiotherapists' criteria, roles, structures, and policies. Secondly, the main researcher collected, transcribed, and analysed the data, thus there is a

risk of researcher bias. However, the researcher tried to minimise subjectivity by involving a bilingual person (clinical physiotherapist working in the UK) to check and confirm transcription and translation and involving the academic supervisors in checking the coding processes. Secondly, the study only included physiotherapists and involving other stakeholders in stroke rehabilitation, such as physicians, clinical supervisors, and managers, might help provide more information on applying engagement and motivation strategies with stroke patients with CI. Finally, the study did not include stroke patients with CI. Involving stroke patients could have provided valuable insights into the cultural perspective of rehabilitation engagement and motivation, as well as the environmental and systems barriers and facilitators. However, it was challenging to include stroke patients due to the difficulty of obtaining data to fit the research purpose. Therefore, physiotherapists' participants were chosen as the suitable group to provide very purposeful and relevant data that are focused on the project aim and stage.

5.5 Conclusion

The lack of knowledge and skills in PT and patients regards PSCI can affect supporting patients' engagement and motivation in physiotherapy rehabilitation programmes. In addition, the organisational culture emerged as a critical factor in hindering physiotherapists' effective communication, planning and delivery of rehabilitation programmes. Therefore, designing interventions targeting enhancing physiotherapists' knowledge and skills and the organisational culture might support stroke patients with CI's engagement and motivation in physiotherapy rehabilitation programmes.

6 A logic model design for planning the intervention

6.1 Introduction

A logic model was employed in this chapter to help synthesise the research project findings drawn from previous work in the PhD process: literature review (Chapter 1), scoping review (Chapter 3), and interviews (Chapter 4). It was used to design a plan for a behaviour change intervention to enhance the engagement and motivation in PT treatment programmes for stroke patients with CI. In this chapter, the logic model helps present the intervention plan in graphical form and explain the context of delivering the intervention.

6.2 Background

6.2.1 Programme theories

The recent MRC framework uses programme theory as a core element for developing complex interventions (Skivington et al., 2021). Programme theory is defined as an explicit model of how an intervention works and leads to or achieves the intended outcomes. It involves a causal pathway of the related context or evidence-based findings and explains the mechanisms of how actions could lead to specific outcomes (Funnell and Rogers, 2011). Developing the programme theory during the early stage of the intervention design can enhance shared decisions with various stakeholders and help to identify key uncertainties (Skivington et al., 2021). Moreover, programme theories can improve intervention plans by highlighting opportunities and gaps, enabling discussion with partners (e.g., decision-makers and stakeholders), and helping to configure realistic objectives (Funnell and Rogers, 2011). Therefore, developing a coherent programme theory to clarify the intervention design and plans can help guide successful design and outcomes.

6.2.2 Logic models

Programme theory is usually presented in a diagram called a logic model, which is also recommended as part of the MRC framework as a tool to describe the theory of the intervention (Funnell and Rogers, 2011, Greenwood-Lee et al., 2016, O'Cathain et al., 2019). The logic model is a graphic method of presenting ideas and organising information that describes the connection and relationships between the essential elements to operate the intervention and bring about the intended change (Knowlton and Phillips, 2012). Developing the logic model supports the design, planning, evaluation, learning, and communication, which can serve as a road map for the intended intervention application (Knowlton and Phillips, 2012, Naimoli et al., 2014, Hebard et al., 2021). The logic model usually represents the intervention in a simple, diagrammatical form (Mills et al., 2019) and can also work as a research hypothesis because it can state the assumptions and expected intervention outcomes (Booker, 2016).

In health research, logic models are used for several purposes, in this case, to assess the programme's feasibility in the initial development stage. Developing a logic model at this stage is crucial to decide whether the programme has a good chance of being implemented with the planned resources, achieving the intended outcomes and whether the programme has sufficient details that allow for planning its evaluation (Savaya and Waysman, 2005, Ebenso et al., 2019).

Moreover, it can be utilised for clarifying goals and conceptual gaps. A coherent logic model enables researchers and stakeholders (e.g., research project funders) to achieve consensus regarding their goals and uncover gaps in their programme logic (Mills et al., 2019). Hence, stakeholders could specify, modify, and clarify all

resources and activities required before implementing a full-scale programme (Ebenso et al., 2019). The logic model can also be used for knowledge building and translation, allowing researchers to examine the applicability and generalisability of the programme to other settings or populations when explaining the process that causes, prevents, or helps to achieve the intended intervention (Skivington et al., 2021). In addition, logic models can be used to synthesise the research evidence from qualitative, quantitative, systematic, and scoping reviews, which is considered a valuable tool in integrating and gathering studies of a complex intervention and better informing the interpretation of multiple sources of information (Anderson et al., 2011, Baxter et al., 2014). Therefore, logic models can enhance the health research intervention planning and implementation and better communicate with healthcare community stakeholders. Despite the advantages of utilising logic models in health research, evidence suggests there are limitations regarding using them in programme planning and evaluation (Lee, 2011, Knowlton and Phillips, 2012)**.** These limitations could be that logic models may not effectively capture the nuances of real-world scenarios. Additionally, the complexity of logic models can pose challenges to inclusivity in the planning process, limiting their accessibility to a wider range of stakeholders. Moreover, their practicality is often questionable, as they may not be referred to after initial creation and discussion, nor do they ensure the quality or fidelity of plan implementation. Finally, they might not address the organisational structure and culture, which can significantly impact programme effectiveness.

These limitations suggest that in developing a logic model, researchers need to plan the appropriate models or methods to fit their aims and purposes rather than applying logic models in all situations and environments. In this study, designing a logic model was considered appropriate because it can synthesise the findings and

knowledge from previous work (literature review, scoping review, qualitative interviews). Furthermore, it was used as a communication tool with stakeholders to assess the programme's feasibility and applicability in the selected environment.

Logic models vary in their complexity and how they are presented and can be categorised into four broad types: pipeline, outcomes chain, narrative, and realistic metrics (Funnell and Rogers, 2011). A brief explanation of different types of logic models is provided in Table 6-1.

Table 6-1: Types of logic model

Type	Definition	Representation	Advantages + Disadvantages
Pipeline	Represents the intervention as a linear process, where the input goes to one end and the outcomes to another end, with activities and output in between	Linear and nonlinear using boxes and arrows to show the programme components	Advantages: Fixed format, easy to understand and easy to produce Disadvantages: Not valuable to provide feedback on the programme; developers might require adaptation throughout the process evaluation to highlight the progress in their projects, and clarify and reflect on why and how the intervention works or does not work in the intervention settings
Outcome chain	Represents the intervention in a sequence of results leading to the expected outcomes or impacts of interest	Linear figures	Advantages: Able to represent more complex interventions where the activities happen during the causal change and are not presented at the beginning Disadvantages: Outcome chains might not highlight the intervention

			process and activities, usually focusing on one outcome and require the design of more outcome chains in multi-outcome interventions
Realist matrix	Represents the programme theory by showing the contexts in which causal mechanisms operate to produce the outcomes	Tables	Advantages: Explore how the intervention works in one or more contexts Disadvantages: Can't be used as an alternative to pipeline and outcome chain logic model because it is only interested in what condition the mechanism works within the group or organisation
Narrative	Represents the intervention in the form of a series of proposals that discusses the intervention rationale, why it is needed and how it can work	Written document	Advantage: It can provide details information on the intervention planning and evaluation; appropriate for groups who are not familiar with diagrams and find them hard to understand Disadvantage: It can be challenging to understand, especially when having a high level of details

Pipelines (linear) are the most commonly used design for logic models and are presented in a linear framework built in blocks that are read from left to right to

hypothesise the causal linkage of the programme. It starts with what is needed to put into the programme and then outlines the activities, outputs, outcomes, and the programme's impact (Wholey et al., 2010, Funnell and Rogers, 2011). Logic models may also explicitly include the programme’s assumptions and contextual factors which explain why and how the project might work (Reinholz and Andrews, 2020). These assumptions are usually related to the belief, built from the knowledge acquired from research, practice and theories (Knowlton and Phillips, 2012). Programme contextual factors related to external factors (e.g., cultural, institutional, socioeconomic) run outside the programme's control but might influence the project implementation (Cullen et al., 2016, Ebenso et al., 2019). Some logic models can be nonlinear, describing the programme in a circular pattern with no specific start point required to present the model (Knowlton and Phillips, 2012).

Due to the variety of contextual factors and mechanisms in the complex intervention, the elements of the logic model can be adaptive to suit the intervention stage and requirement (Funnell and Rogers, 2011). An Implementation Research Logic Model (IRLM) is an example of a logic model that uses different domains and presentations. The IRLM was developed by Smith (2018), which shares the aims and structure of the linear logic model. However, the IRLM is different from simple logic models in the causal links pathway as it combines the critical and more specific elements of research implementation. The IRLM structure for this research adapted from (Smith et al., 2020b) is provided in Figure 6-1. The overall aim of the IRLM is to improve the implementation research rigour and reproducibility (Smith et al., 2020b).

6.3 Methods

The IRLM was used because it has multiple purposes including planning, executing, reporting, and synthesising the information from different contexts (Smith et al., 2020b). The traditional logic model (if-then consequence) structure, which includes resources, activities, outputs, outcomes, and impact (Foundation, 2004), cannot be applied in this stage where the intervention plan is not based on empirically tested intervention. Instead, this logic model is chosen as it is more suitable for clarifying where different findings came from and how they are used to plan the intervention. The IRLM model can explicitly consider evidence-based findings (scoping review) and determinants (qualitative study findings) to align the intervention plan, mechanisms, and outcomes. Therefore, it can effectively highlight the evidence-gathering process and plans with key stakeholders. The IRLM design in this chapter will incorporate the clinical evidence (engagement and motivation strategies), determinants (facilitator and barriers), the intervention planning (techniques of behaviour change, outcomes) and the mechanism of action.

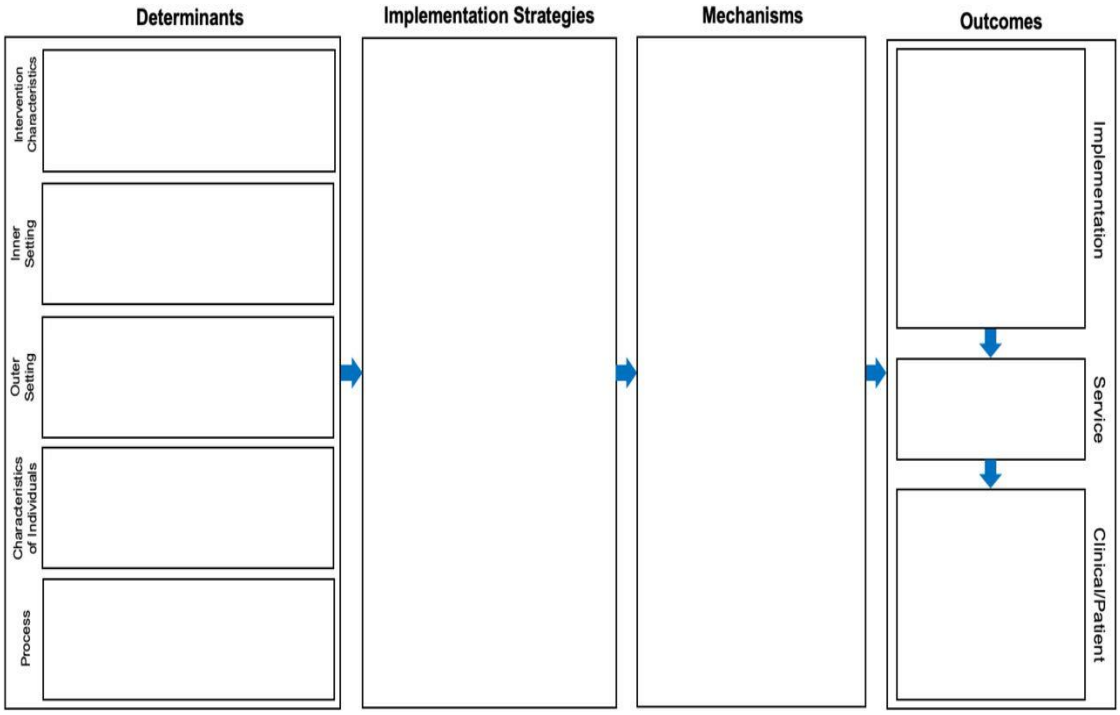

Figure 6-1: The implementation research logic model used in this study

6.3.1 The logic model development

All the previous findings were used to guide the logic model development. The IRLM was articulated in the traditional linear representation by aligning the determinants → implementation strategies → mechanism of action → outcomes. This logic model design used the same structure as the IRLM shown in Figure 6-1, but the IRLM was altered to fit with the framework (TDF) used in this study. Firstly, the determinants section was divided into five domains (intervention characteristics, inner settings, outer settings, characteristics of individuals, and processes) derived from the CFIR (Damschroder et al., 2009). Therefore, the determinants section was adapted to fit the use of TDF and the synthesis of the key findings from the qualitative chapter. The domains related to the determinants were structured into individual-level determinants, organisational-level determinants, and processes. In addition, the implementation strategies section was replaced with the behaviour change

techniques to fit the logic model with the research project aim and intervention plan (BCIs), thus providing concise links between the logic model components and the intervention plan.

6.4 Results

The final form of the IRLM used in this research aligned the engagement and motivation strategies → determinants → behaviour change techniques → mechanisms → outcomes as shown in Figure 6-2.

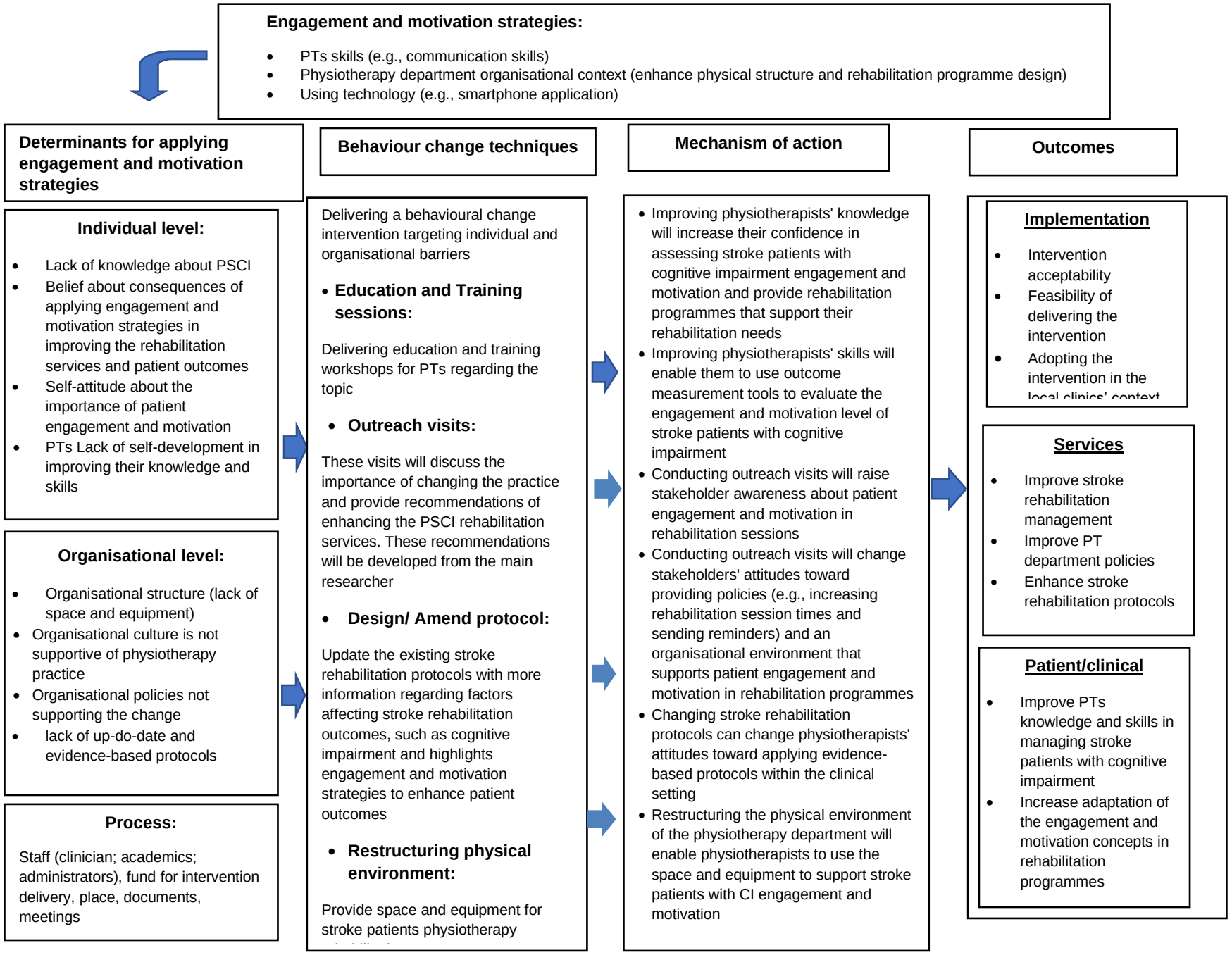

Figure 6-2: The logic model research study

6.4.1 Implementation Research Logic Model Elements

6.4.1.1 Engagement and motivation strategies

The engagement and motivation strategies identified in the scoping review (Chapter 3) and the interviews can be consolidated into therapeutic interaction and communication, providing an enriched environment, applying strategy training, and using technology. Effective ways of applying these strategies were not clarified in the identified studies which led to exploring the determinants for applying these strategies in the interviews with stroke patients with CI in the Saudi rehabilitation context. Taking this a step further, the IRLM process indicated what was needed to allow appropriate changes and implementation of effective interventions in the future related to physiotherapists' skills, the physiotherapy department's organisational context, and the use of technology (Figure 6-2).

6.4.1.2 Determinants development

The first element of the IRLM is determinants, which in this context are related to the factors that prevent or enable the delivery of BCIs to improve the engagement and motivation of stroke patients with CI. The determinants in the logic model were derived from the qualitative study findings and divided into three domains: the individual-related domain, the environmental-related domain, and processes. In the individual determinants, lack of knowledge about PSCI and the concept of engagement and motivation were the most notable factors affecting the individual abilities to apply engagement and motivation strategies to stroke survivors with CI. The knowledge of physiotherapists is crucial and can pose a significant barrier to implementing engagement and motivation strategies in the Saudi rehabilitation context. One of the consequences of a lack of knowledge is the difficulty in putting engagement and motivation strategies into practice. Many studies identified from the scoping review (Chapter 3)

emphasised the importance of therapeutic interaction and communication to encourage the engagement and motivation of stroke patients who have CI in therapeutic sessions. During interviews (Chapter 5), participants from two hospitals revealed limited knowledge regarding identifying CI after a stroke, its impact on the rehabilitation process, and how to support patient engagement and motivation during therapeutic sessions. This knowledge gap may hinder physiotherapists' ability to use appropriate communication skills and interactions with stroke patients with CI undergoing physiotherapy rehabilitation programmes. The other potential consequence of a lack of knowledge is that it can negatively impact the facilitators. In the interviews, physiotherapists believed in the positive impact of supporting patient engagement and motivation on stroke patients with CI outcomes and the use of health services. They also had a positive attitude towards using engagement and motivation strategies in therapeutic sessions. However, they may struggle to support patient engagement and motivation without essential knowledge. The reason for this is that people's beliefs and attitudes towards an intervention are influenced by their intentions regarding its usefulness and acceptance. However, without adequate knowledge, positive attitudes and beliefs may not translate into the application of engagement and motivation strategies during the rehabilitation process. As a result, supporting the physiotherapists' knowledge can improve using the individual-related facilitators (beliefs and attitudes) toward improving stroke patients with CI's engagement and motivation in PT rehabilitation programmes.

The organisational-related determinants highlighted barriers associated with the current physiotherapy department's capabilities. The PT department structure was the most reported barrier from the PTs' perspective, which refers to a lack of space and equipment. This barrier was believed to affect physiotherapists' behaviour to support patient engagement and motivation. The space limitations

in PT rehabilitation clinics make it difficult for physiotherapists to deliver rehabilitation sessions that meet the needs of stroke patients. They also pointed out that the department space is usually shared with other patients, which can limit stroke patients' engagement and motivation during treatment sessions. Additionally, physiotherapists have stated that insufficient equipment is available to support stroke PT rehabilitation. This is likely due to the PT rehabilitation department structure and the scope of the service which is receiving patients with different conditions. Therefore, concentrating on patients' needs and rehabilitation progress requires preparing the clinic with the essential space and equipment that empower physiotherapists to deliver the rehabilitation programmes, and engage and motivate patients to achieve positive outcomes.

The organisational social structure was another determinant linked to the organisational-related determinants. This determinant is related to the difficulty of interprofessional interaction between physiotherapists and other professionals and the recognition of PT services among hospital admissions. Participants from qualitative interviews insisted that affects delivering effective PT rehabilitation for stroke patients with CI. In light of the qualitative interviews, it appears that stroke patients with CI may not receive effective physiotherapy rehabilitation and sufficient engagement and motivation due to these barriers. In addition, physiotherapy department policies were added to the organisational-related determinants. Whilst the qualitative findings revealed fewer insights regarding this determinant, drawing upon knowledge from the TDF, it is likely that PT department policies such as work pressure and stroke rehabilitation protocol updating and utilisation are a relevant factor and as such, need further exploration. Therefore, a SE meeting discussed (see Chapter 7) the department policies to support the intervention applicability and refine the logic model. Lastly, the process-related determinants represented the requirement to design and

deliver the intervention, such as organisational funds and support could either encourage or impede the intervention delivery. This determinant is important to ensure the intervention's future sustainability.

6.4.1.3 Behaviour change techniques development

The next part of the logic model is BCTs which are related to the BCIs components. BCTs were selected to design interventions targeted at the main behaviours (barriers) to address, therefore, these BCTs aimed to address the barriers to applying engagement and motivation strategies with stroke patients with CI in physiotherapy rehabilitation sessions. To select appropriate BCTs, the key target barriers (lack of knowledge, organisational structure) were mapped to the 93 BCTs taxonomy (Michie et al., 2013) (Appendix 11), and Expert Recommendation for Implementation Change (ERIC) taxonomy (Powell et al., 2015) (Appendix 12). Implementation strategies share a similar meaning to the BCTs, a systematic process or methods, activities, techniques, and resources that support the integration, adoption, and sustainability of clinical practice or a change in healthcare settings (Brownson et al., 2017). Therefore, implementation strategies can be adaptable to BCI development because the intervention development is based on the barriers (individual and organisational) that might also be common in implementation research projects. Thus, implementation strategies can be used to change behaviour that could affect evidence-based intervention implementation (Fernandez et al., 2019). The application of the BCIs can be a single-component intervention or a multifaceted intervention. A single component refers to the intervention which addresses one of many barriers to changing the behaviour (Squires et al., 2014), whereas multifaceted interventions usually refer to the Cochrane Effective Practice and Organisation of Care Group definition which is interventions including two or more components and targeting more than one barrier to change the behaviour (Collaboration, 2009). The current

project uses a multifaceted intervention due to the different contextual barriers, which include individual and organisational barriers. The individual and organisational barriers identified were mapped to possible BCTs and ERIC taxonomies as shown in Figures 6-3 and 6-4 with the determinant (behavioural barrier) in the middle and the potential strategies are mapped to it.

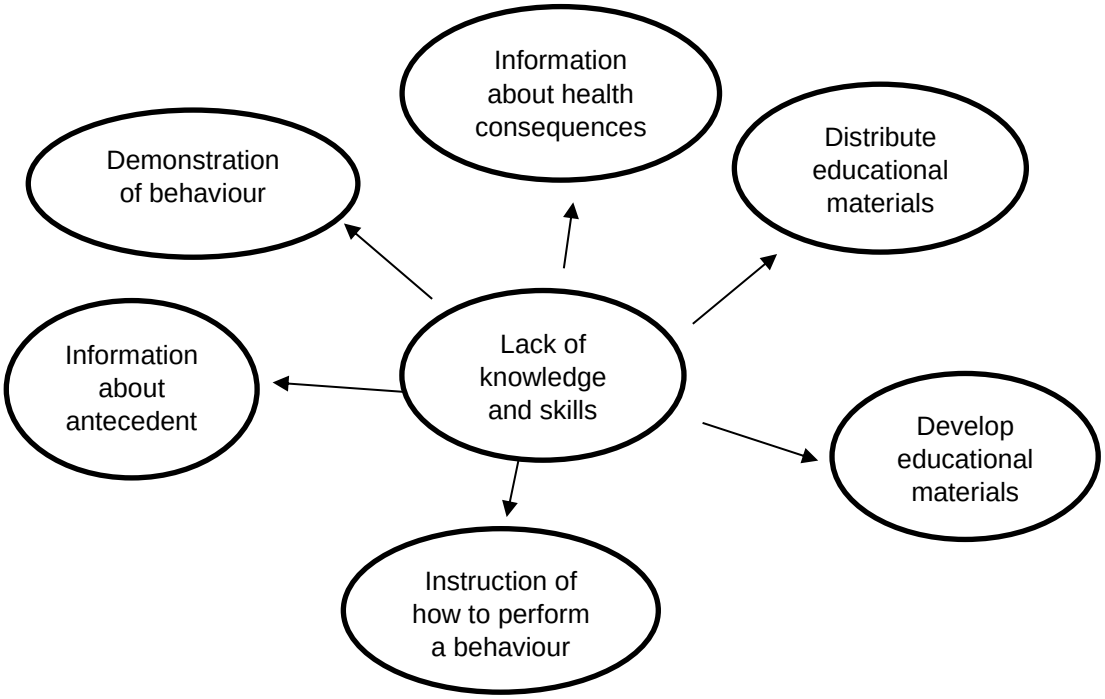

Figure 6-3: Behaviour change techniques and implementation strategies linked with lack of knowledge and skills determinants.

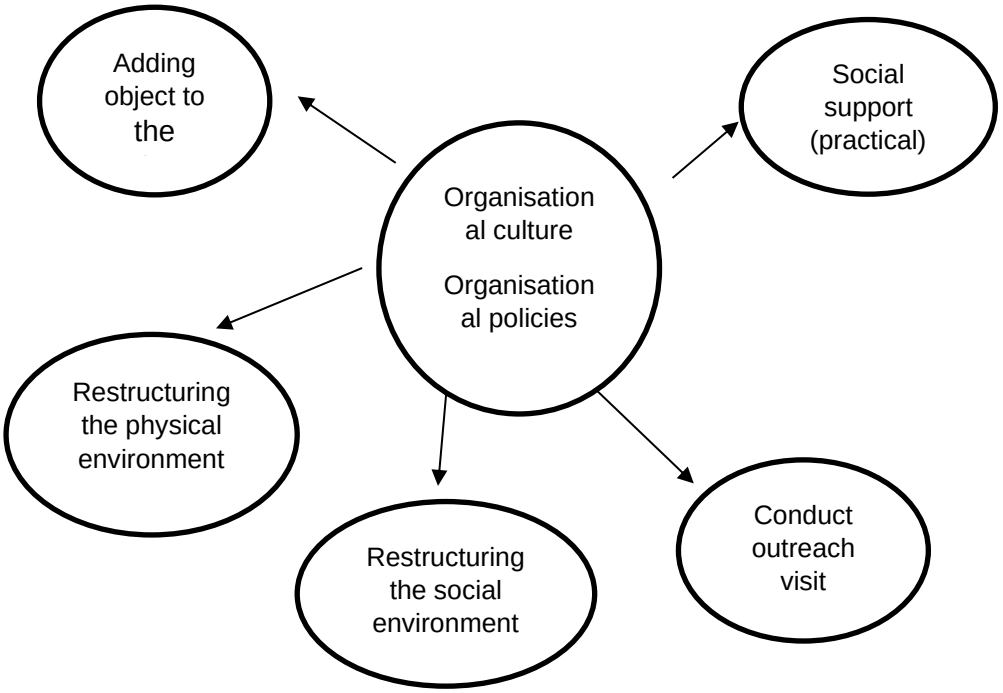

Figure 6-4: Behaviour change techniques and implementation strategies linked with organisational culture and policies determinants.

6.4.2 The selected behaviour change techniques and implementation strategies in the intervention planning

6.4.2.1 Educational workshop

To address the issue of physiotherapists lacking knowledge and skills, a behavioural change technique was chosen which involves developing an educational workshop. Figure 6-3 displays several techniques that could be used to improve the knowledge and skills of physiotherapists. However, it was challenging to pinpoint a single technique due to the multiple objectives involved in enhancing knowledge and skills, such as demonstrating the required behaviour, providing instructions on how to perform the behaviour, and providing information on PSCI as well as engagement and motivation. Therefore, the selected technique was to conduct educational workshops. This technique mainly supported the individual barriers and aimed to support the professional learning and development of physiotherapists in managing stroke patients with CI and to adopt the concept of engagement and rehabilitation in rehabilitation services. Based on the qualitative chapter, physiotherapists recommended designing and delivering educational workshops in the "education and training support*"* theme, where physiotherapists suggested workshops about PSCI and the concept of patient engagement and motivation as essential factors supporting applying engagement and motivation strategies for stroke patients with CI in rehabilitation practice.

6.4.2.2 Outreach visits

The main researcher programme team will plan visits and meetings with stakeholders in the PT departments to discuss the department's current policies and the environmental and social culture that might be associated with the impact of delivering effective PT rehabilitation programmes for stroke patients with CI. These might involve changing the department's physical structure and

internal policies, such as reducing the workload for therapists who deal with stroke patients with CI, increasing the number of sessions for stroke patients with CI, sending reminders about the session time, etc. It might also include changing the social culture within the department, such as providing a specialised group for stroke rehabilitation. The evidence of selecting outreach visits has come from the qualitative evidence where the barriers highlighted relate to the PT rehabilitation structure and organisational culture. Speculation about changes or improvements to current policies, social structure, and systems arises due to these barriers.

These changes are likely to enhance the rehabilitation services provided for stroke survivors with CI and also help physiotherapists in planning more effective rehabilitation programmes. This strategy was selected because of differences in the healthcare settings' capabilities and systems, therefore, applying the policy and environmental change should be compatible with the PT clinics' capabilities and social structure to achieve the optimal change that suits the intended settings.

6.4.2.3 Restructuring the physical environment

To address the PT department's lack of space and equipment barrier, the BCT involves restructuring the physical environment. This technique includes providing a bigger space for stroke rehabilitation and offering more equipment to support stroke patients' engagement and motivation to PT rehabilitation sessions. Restructuring the physical environment selection is also derived from the evidence obtained from the scoping review about the enriched environment as a strategy to support engagement and motivation for stroke patients with CI. Also, this strategy was highlighted in the "organisational culture" derived from the

qualitative study findings of the limited space and equipment in the PT department.

6.4.2.4 Amend/change stroke rehabilitation protocols

It is important to note that whilst there may not be specific BCTs for protocol or guideline changes, adjusting stroke rehabilitation protocols could be a useful strategy for promoting changes in policies and practices. This technique has the potential to provide the necessary support for these changes including updating the existing stroke protocols by adding information about CI after stroke. The recommendations will inform physiotherapists about what needs to be considered when stroke patients have cognitive impairment. The recommendation can include, for example, advice on considering the rehabilitation programme timeframe, assessing the level of engagement and motivation, using communication skills and continuous assessment of cognitive functions. These recommendations may help physiotherapists in their decision-making and planning skills. Changing protocols will be used as a strategy in the intervention due to the interview discussion with physiotherapists about the lack of using the stroke rehabilitation protocols and the current stage of not having updated protocols in the settings where the interviews were conducted. Applying this strategy will mutually target the individual and the environmental barriers by encouraging the PT departments to use updated protocols that enhance the quality of the rehabilitation services and physiotherapists to uptake the most suitable available evidence-based practice.

6.4.3 Mechanism of change development

In relation to the BCIs, the mechanism of action is defined as " the process through which the BCTs affect behaviour" (Michie et al., 2018). Understanding how the intervention can bring change is essential to deliver a more effective

intervention design (Moore and Evans, 2017). Therefore, linking BCTs or intervention strategies with their mechanisms of action can improve intervention planning and delivery. Previous research has demonstrated that BCTs can be linked to either a singular or multiple mechanisms of action, as evidenced by the use of TDF (Carey et al., 2019). Therefore, to highlight the linkage between BCTs and MoA, all chosen techniques and strategies were mapped into the TDF domains as shown in Table 6-2.

Table 6-2: Behaviour change techniques and their potential mechanism of action

Behaviour change technique	Mechanism of action (TDF domain link)
Educational workshops	• Knowledge • Skills • Reinforcement • Belief about capabilities
Outreach visits	• Social influences • Environmental context and resources • Social/professional role and identity
Restructuring physical environment	• Environmental context and resources • Reinforcement
Amend/ change stroke rehabilitation protocol	• Skills • Reinforcement • Environmental context and resources

In the current behavioural change intervention plan, the main mechanism expected from educational workshops is increasing knowledge and improving skills. Increasing physiotherapists' knowledge will make them more aware of stroke patients' needs and the importance of patient engagement and motivation during rehabilitation. Additionally, workshops will improve communication skills and provide resources for using outcome measurements to evaluate patient

engagement and motivation. This will increase confidence in dealing with stroke patients and support their engagement and motivation.

Outreach visit mechanisms are an essential tool for effecting change in policies and organisational culture. By emphasising the significance of PSCI, patient engagement, and motivation, as well as examining the department structure and policies that may have a negative impact, such mechanisms can achieve a shift in awareness among key stakeholders regarding the needs and services of stroke patients with CI. This, in turn, can lead to a transformation in the role of stakeholders and professionals, who can then work to change policies to better meet the needs of such patients.

Restructuring the PT department will provide stroke patients with CI with all the necessary resources to improve their engagement in rehabilitation sessions. It will also encourage physiotherapists to consider patient engagement and motivation, utilising all available resources and equipment to achieve that goal. Conducting outreach visits can help stakeholders (e.g., policymakers, clinical supervisors, and physiotherapy department managers) understand the importance of providing changes and services to improve patient engagement and motivation. It can also facilitate discussions about changing policies and social roles within the organisation.

Changing or amending protocols can reinforce the use of updated or newly developed protocols, motivating physiotherapists to apply evidence-based protocols. Additionally, this can enhance their skills in adapting and integrating changes into clinical practice.

Achieving these mechanisms could help overcome individual and environmental barriers, leading to positive results from designing and delivering BCIs. These

mechanisms will likely achieve success and result in changes in the behaviour of physiotherapists and the organisational culture of physiotherapy departments. This is because these mechanisms are theoretically associated with TDF domains (barrier domain) and are specific to rehabilitation settings. As a result, these mechanisms could contribute towards achieving the intervention outcomes of delivering engagement and motivation strategies for stroke patients with CI.

6.4.4 Outcomes development

The fourth element of IRLM is outcomes which refer to the impact of the intentional and purposive actions to implement new services, treatments, and services (Proctor et al., 2011). The outcomes for the planned BCI are divided into three parts: implementation, services and patient or clinical-related outcomes. The first element in the outcomes is implementation outcomes, which is to assess the BCI's acceptability and feasibility. Intervention acceptability in this context related to stakeholders' perception of the treatment, practice, service, or innovation is palatable, agreeable, or satisfactory (Proctor et al., 2011). It is essential because a successful intervention relies on the acceptability of the programme to those delivering the intervention (e.g., physiotherapists) and the recipients of the intervention (e.g., stroke patients) (Sekhon et al., 2017). Therefore, determining the intervention's acceptability with stakeholders is the first step in determining if the programme can be delivered according to the current plan or requires modifications to better fit within the current clinical settings' capabilities and readiness to change. The other implementation outcome is related to intervention feasibility. Feasibility refers to the intervention’s suitability or practicability in a specific setting (Rabin and Brownson, 2017). Therefore, determining the feasibility of BCIs is a crucial aspect for researchers to decide whether it can be implemented based on their plans, ideas, and available resources.

The services and patient/clinician outcomes will highlight the outcomes related to the physiotherapists, such as a change in knowledge, skills and overall performance when treating stroke patients with CI. The outcomes of changing physiotherapists' behaviour will include assessing the use of engagement and motivation outcomes when managing stroke patients with CI, as well as evaluating physiotherapists' confidence in applying engagement and motivation strategies during stroke rehabilitation sessions.

It will also measure the change and the impact of specific strategies, such as changing policies and social culture in supporting the rehabilitation services and environmental context, providing feedback on how changing policies or social culture affect stroke patients with CI rehabilitation services. Regarding patient-related outcomes, it is expected to improve their engagement and motivation level during the physiotherapy rehabilitation programme by assessing their engagement and motivation using engagement and motivation outcome measurements. Finally, the clinical outcomes will measure the adoption and application of the engagement and motivation tools and concepts with stroke patients with CI in the rehabilitation programmes in the selected settings. This could be measured through monitoring of using these tools with stroke patients during the rehabilitation programme.

6.5 Discussion

The IRLM developed in this chapter highlights that the intervention can be viewed in a visual format that describes the “what” (the engagement and motivation strategies, determinants of applying these strategies in local rehabilitation settings, and behaviour change intervention strategies) and the “how” (mechanism of change and outcomes). The results support the theory that IRLM is a useful tool that enables knowledge exchange and guides research

study designs (Smith et al., 2020a, Nelson et al., 2022), but it has not been tested. The current IRLM did not include the input of intervention strategies (such as dosage, duration, content, etc.) which could provide more insight into what is needed for the BCTs to be effective. Also, it did not provide improving patient engagement and motivation outcomes due to the project's current stage of synthesising and planning the intervention. During this phase of the project, the IRLM serves as a guide for the next step. Depending on the intervention design and evaluation stage, the IRLM may need to be revised and updated within the traditional logic model to better represent the process's complexity and provide more comprehensive overviews of the intervention process and evaluation. Doing this suggested adding explicit visual representation of the dependent and bidirectional relationships within the IRLM (Sarkies et al., 2020). Updating the current logic model in the various stages of the project is required to suit the aim and purpose of each stage of the intervention such as the development and evaluation stages.

There is a paucity of research on the applicability of TDF in the development of IRLM. The utilisation of TDF in designing IRLM in this chapter provides a valuable opportunity to connect results from previous research findings and effectively match determinants affecting physiotherapists' behaviour with BCTs. It has been noted that choosing particular BCTs aiming to change the desired behaviours can be difficult (Michie et al., 2021). The challenge of linking desired behaviour to specific behaviour change techniques (BCTs) has been mentioned in the literature (Tombor and Michie, 2017, Kok, 2018). Furthermore, advising the most effective BCTs for different intervention purposes, such as education or persuasion, cannot be obtained without understanding individual and organisational differences and cultural factors, as well as appropriate delivery methods (Armitage et al., 2021). Therefore, the selection of BCTs was based on

the findings from qualitative research and integrated with the research context. Overall, BCTs and implementation strategies selection were believed to fit with Kok et al. (2016) recommendations of selecting effective behaviour change methods, including their abilities to modify determinants that influence behaviour, and also be designed in a practical way that considers cultural and contextual considerations and maintains its effectiveness for the intended population.

Applying the TDF to the IRLM helped to gain a better understanding of how the selected techniques work by mapping the BCTs to the TDF domains. This allows placing the mechanisms in the logic model with a clear view of how they could change behaviours. Consequently, using the TDF helped consider the intervention determinants and provide a theoretically based mapping of the BCTs and implementation strategies to link targeted behaviours. It also helped guide the theoretical approach, the hypothetical pathway of the intervention components, mechanisms, and outcomes as summarised in the IRLM. However, the use of BCTs, their mechanisms and outcomes were presented as an intervention plan, therefore, the TDF needs to be used to map the intervention mechanisms and outcomes when refining the logic model in different stages of research, such as after engaging the stakeholders, designing, delivering and evaluating the intervention.

6.6 Conclusions and the next steps

A logic model was produced that clarifies the proposed BCI and provides detailed evidence-based information for physiotherapists to use when they wish to enhance the engagement and motivation of stroke patients with CI. In the next stage, a SE meeting was conducted to discuss the intervention plan and achieve a consensus on the intervention's acceptance and applicability in the local clinical settings. Therefore, a refined IRLM is provided in the next chapter.

7 A study to explore stakeholders' views regarding the use of Behaviour Change Interventions to improve rehabilitation engagement: a nominal group technique design

7.1 Introduction

This chapter reports the results of a stakeholder study employing the NGT with voting. It explored the perspectives of physiotherapy practice in the KSA on whether BCIs are suitable in rehabilitation settings to help patients become motivated and engaged in their treatment. This chapter contains background information about how the SE works in the research process, highlighting the method of applying the NGT in a research project and presenting the data collection process, analysis, and findings.

7.2 Background

SE in health research has become widely used in the last decade and has become a high priority for research funders and policymakers to enhance research design and practice (Absolom et al., 2015, Byrne, 2019). SE principals have a valuable role throughout the research process, and can contribute to the selection of appropriate research questions; policy and management concerns; designing and conducting research; applying evidence-based practice to healthcare settings; improving capability and environment, and changing policies and programmes (Glandon et al., 2017, Peters et al., 2017). In this context, the literature defines stakeholders as "an individual or group responsible for or affected by health and healthcare-related decisions that can be informed by research evidence" (Concannon et al., 2012). Stakeholders might be patients, funders, policymakers, healthcare professionals, communities, managers, researchers or others who might have influence and decisions on the processes (Forsythe et al., 2016). Meanwhile, stakeholder engagement is defined as an

iterative process of actively soliciting the knowledge, experience, judgement and values of individuals or groups selected to represent a broad range of direct interests in a specific topic to form a shared understanding and make decisions that are relevant, transparent, and effective (Deverka et al., 2012, Boaz et al., 2018). Engaging appropriate stakeholders effectively throughout the research process can help the researcher in considering the suitable resources, methods and requirements when applying the interventions in the healthcare settings. Therefore, SE can improve the research quality as it incorporates multiple perspectives in the planning and execution of studies (Ray and Miller, 2017).

SE has been used in stroke rehabilitation research for different purposes. For instance, Grampurohit et al. (2019) conducted an SE study to develop a new measurement for hand and arm function in people with neurological conditions. The SE aimed to identify the stakeholders' experience regarding upper limb functions in daily activities and provide opinions regarding a preliminary set of items to establish face and content validity for a new hand and arm outcome measurement. The stakeholders (n=24) were experts in neurorehabilitation (n=4, i.e., physiotherapists) and patients with neurological conditions (n=20, i.e., stroke, Parkinson's). The methods for SE included focus groups with rehabilitation experts and cognitive interviews and surveys for patients with neurological conditions. The findings provided insightful views on the hand and arm function measurement items which helped researchers to establish face and content validity for developing a comprehensive rehabilitation outcome measurement for hand and arm functions. Furthermore, another SE study was conducted by O'Donoghue et al. (2022) to identify the stakeholders' perspectives on designing and delivering cognitive rehabilitation interventions for post-stroke survivors. Semi-structured interviews were used with stakeholders (stroke patients, caregivers, healthcare professionals and academics) to identify the key

components to design and deliver an effective cognitive rehabilitation intervention. To design a post-stroke cognitive rehabilitation intervention, researchers utilised the findings from the SE to inform developing a feasibility trial examining patients and process outcomes. The provided examples highlighted the SE application for different purposes in research projects, such as planning, designing, delivering, and evaluating stroke rehabilitation interventions. Moreover, it highlighted the variations in research methods (i.e., focus groups, interviews, surveys, consensus methods) used for conducting SE research.

The current study aimed to use NGT with stakeholders to explore how a physiotherapy intervention, might benefit from BCI, to enhance stroke survivors with cognitive impairment engagement and motivation and how it might be delivered in the Saudi rehabilitation environment context.

The study objectives were:

- To work with stakeholders
- To identify the challenges and opportunities of applying each strategy of the BCIs in different clinical settings
- To identify the applicability of the BCIs to improve patient engagement and motivation in stroke patients with CI
- To use the feedback and discussion from the SE meeting in refining the intervention

7.3 Methods

7.3.1 Ethical approval

The principal researcher contacted the University of Nottingham, Faculty of Medicine and Health Sciences Research Ethics Committee (REC) senior

administrator Louise Sabir about the ethical process for running the SE. The ethical team confirmed that the SE does not require a research ethics committee review because it is conducted with or by people with relevant professional experience to inform on the best design, conduct and acceptability of the intended intervention in the context of local rehabilitation settings.

7.3.2 Stakeholder recruitment

The stakeholders were recruited from various regions and hospitals in the KSA. Engaging stakeholders from various hospitals could help gain better feedback on the intervention's applicability in PT rehabilitation settings with different capabilities and practices. The facilitator used clinical and academic networking to reach potential participants via a text message. The message provided information on the reason for contacting, the aim of the meeting, time length and meeting structure. After receiving the agreement from the stakeholders, the facilitator scheduled the meeting using an online tool (Doodle) by providing a list of dates and times for participants to choose the appropriate time that fits their schedule. The most selected date and time were used to confirm the meeting. The facilitator sent a confirmation message with a Microsoft Teams link to all participants to join the meeting.

7.3.3 Sample

A homogenous purposive sample method was used in this study. A homogeneous sample focuses on selecting participants who share similar characteristics, culture and experience (Etikan et al., 2016). Therefore, participants with specific criteria were selected to share their knowledge and ideas on the intervention's applicability including physiotherapists, academic researchers, and other stakeholders (e.g., heads of departments, quality managers). The physiotherapists' sample involved participants who previously

participated in the qualitative interview and other participants with experience in stroke rehabilitation. Involving the physiotherapists in the meeting was essential because they work with stroke patients with CI in daily practice, therefore, it was important to understand their perspective on the applicability of the BCI techniques in the current clinical practice. Moreover, it involved academics who are interested in stroke PT rehabilitation to provide views on the intervention design and delivery. Regarding the other stakeholders, they were currently in the position of head of the PT department, and quality manager or had previously worked in these roles. These stakeholders were included because they can be policymakers in the PT department and have experience in the process of applying a change in the practice, providing valuable insight into the intervention's applicability from an environmental and policy perspective. The sample number for the NGT can range from 2-14 participants in the group (McMillan et al., 2016). The participants were divided into two groups: Group One included physiotherapists and academic researchers, and Group Two had other stakeholders because of their roles and experiences differences to avoid the difficulty of managing the group with different backgrounds, as it might be difficult to elicit detailed information from all participants (Manera et al., 2019). A minimum of six participants was required as fewer participants might reduce the possibility of sharing enough information and discussion, especially if the group dynamic was lacking (Manera et al., 2019).

7.3.4 Consent

Despite not requiring an ethical review by the REC, best practices concerning ethics were taken into consideration. Firstly, a study information sheet was sent to participants before the meeting. Secondly, all participants verbally agreed to participate and record the meeting discussion. Finally, participants were ensured

that the information provided would be kept secure and confidential and would only be used for research purposes.

7.3.5 The Nominal Group Technique

The NGT is defined as a structured group process used to gain a consensus among participants who share and contribute ideas toward the topic or questions guided by the facilitator (Manera et al., 2019). NGT is one of the most commonly used consensus methods in research practice alongside the Delphi Technique (McMillan et al., 2016). The NGT is usually a face-to-face meeting and has a small number of participants with an ideal group number of between 6-12 participants (Harvey and Holmes, 2012). The NGT was used in this research for various reasons. Firstly, it is ideal for research focused on problem-solving and idea generation (McMillan et al., 2016). This allows participants to generate ideas for effective intervention design and delivery and to identify potential problems to consider in the intervention design stage. Another reason is that it has been useful in complex intervention design, such as refining logic models (Backhouse et al., 2022) and providing options for developing interventions (Volkmer et al., 2021, Young et al., 2021). Finally, it is considered a time-efficient and cost-effective method (Rankin et al., 2016).

NGT was selected in this context because it can be ideal for encompassing the aim of identifying the applicability of the intervention techniques from different perspectives (physiotherapists, researchers, managers). Also, to discuss these techniques application via providing feedback and ideas about the current services provided in the different rehabilitation settings. Therefore, it can highlight the challenges and better guide the intervention design in the project's next stage. The NGT was applied according to Manera et al. (2019) phases of NGT

which were idea generation, round-robin, group discussion, and voting. The description of each phase and how it was applied is provided in Table 7-1.

Table 7-1: Nominal group technique phases

Phase	Description
Idea generation	Each participant individually and silently writes down ideas on the subject
Round-robin	Participants take turns sharing their ideas and the facilitator records these on a flip chart
Group discussion	Each idea is discussed by the group to clarify meanings and explore the underlying rationale
Voting	Participants individually prioritise ideas by ranking, scoring or rating

7.3.5.1 Before the meeting

All stakeholders received the topic guide (Table 7-2) for this meeting three days before, as well as a short document on the BCIs that would be presented for discussion so that they had time to read and understand the questions and intervention techniques. This step was completed to ensure all participants understood the question guide and intervention plans and had contact if they had any queries.

Table 7-2: A topic guide for the physiotherapists and stakeholders meeting

Physiotherapists as stakeholders group topic guide	**Other stakeholder's group topic guide**
How effective do you think the following activities are, and what are the practical ways to improve them? **Educational workshop:** -How will you use the workshop information in the clinical practice? -What benefits will you gain from the workshop? -What is the best delivery scenario that can make the workshop more effective? **Changing protocols:** -How changing stroke physiotherapy rehabilitation protocol -Will change your and other physiotherapists' clinical practice? -What should the new protocol include to encourage you to use it? -What should the department do to support and evaluate the protocol's effectiveness? **Enhancing the department environment:** -What is the scope of the policy needs to be changed? -What should be changed in the department's social structure? -What should be changed in the department's physical structure?	How effective do you think the following activities are and what are the practical ways to improve them? **Educational workshop:** - What are the requirements for doing an educational workshop in the physiotherapy department? - What content do you need to have in the workshops to help you improve stroke patient engagement and motivation in the therapeutic programme? - How will you support physiotherapists in using the workshop information in the clinical practice? - What is the best delivery scenario to make the workshop more effective? **Changing protocols:** - What process should be followed to change or update protocols? In the current stroke physiotherapy rehabilitation protocol, - What are the parts you think they wouldn`t work (and why)? - What needs to be in there? Why? - What should the new protocol include to encourage physiotherapists to use it? - How will you know and evaluate the protocol's effectiveness? What kind of measurements are currently used for protocol evaluation?

	Enhance the Physiotherapy department environment: - Are there any specific policies related to stroke cases? - How easy or difficult changing the current policies in your department? - How possible is changing the department's organisational (social) culture? Can you give me an example of a change in your working setting? - How possible is changing the department's physical and environmental structure (e.g., equipment; providing more space; department restructuring?

7.3.5.2 Meeting structure

Two online meetings were performed on different dates and times, one meeting with physiotherapist stakeholders and academics, and the other with stakeholders from the PT department (quality managers, head of the department, and clinical supervisors). The first meeting was conducted with the physiotherapists' group, and the facilitator used the input from the meeting to inform and guide the meeting discussion with managers and groups to identify the conflict or agreement between groups regarding the intervention applicability in the rehabilitation settings. Each meeting took about 1.5 hours and was conducted via Microsoft Teams. The researcher started the meeting by clarifying the structure and the aim of the meeting, then explained each stage of the NGT and the participants' role in each stage. The researcher encouraged participants to share their ideas and discuss the BCI technique's applicability based on their clinical/managerial experience and knowledge. The meeting started with a short PowerPoint presentation about the research project (Appendix 13), highlighting the project's aim, methods, and findings. It also explained how the research

findings (scoping review and qualitative interview findings) were used to plan the intervention, as well as the BCI techniques and how they can achieve the research intervention outcomes. The NGT steps started after finishing the PowerPoint presentation as follows:

7.3.5.2.1 Idea Generation

This step is also called silence generation. All participants silently spent time, 20 minutes, preparing their ideas and information on the given topic.

7.3.5.2.2 Round-Robin

Participants individually shared their information about the given topic and questions. This step took around 40 minutes to complete in both groups. The facilitator asked participants who were ready to start to share their information and reminded them not to interrupt the speaker and wait their turn to discuss their ideas or group discussion to comment on other participants' thoughts. The first 3-4 participants in each group took between 5-10 minutes to share their information, the other participants spoke for 2-4 minutes because they were commenting on previous participant’s ideas without bringing new ideas. The facilitator took notes of the ideas and information which needed further discussion and clarification.

7.3.5.2.3 Group Discussion

This step allowed participants time to discuss the thoughts and suggestions highlighted in the individual information sharing, as well as to discuss any agreement/disagreement; this step took around 10 minutes.

The facilitator guided the group discussion and started highlighting the commonly shared information on each of the BCI techniques aiming to discuss the

challenges and gaps in current practice reported by participants regarding the applicability of the intervention techniques within the local clinical settings. Also, to clarify if different practices are applied within the physiotherapy rehabilitation clinics. Furthermore, the facilitator asked for more information on questions in the topic guide not highlighted by participants during the individual information-sharing stage.

7.3.5.2.4 Voting

The facilitator shared a file link (Appendix 14) for participants to vote on the importance of each of the BCI techniques based on the group discussion of the intervention applicability within the current rehabilitation settings. The voting document had open questions to allow participants to explain why they chose their answer and to justify the suitability/unsuitability of applying these techniques in the local clinical settings. Participants completed and sent the file to the facilitators and were assured that the voting would be anonymous and only used for the study purpose.

7.3.6 Data analysis

Descriptive statistics were used to represent the data from the voting question. The voting result reflected the participants' view on the importance of applying the techniques of BCI to achieve the intervention outcomes. Qualitative data analysis was used to analyse the meeting discussion. The qualitative data reflected the BCI intervention design and delivery in the local rehabilitation settings.

7.3.6.1 Descriptive statistics

All voting responses were added to the EXCEL spreadsheet and pie charts were designed for each intervention technique to illustrate the voting percentages.

7.3.6.2 Qualitative data analysis

The qualitative data were analysed using thematic framework analysis, a qualitative data analysis approach to systematically code, organise, analyse and identify themes from the data (Gale et al., 2013, Hackett and Strickland, 2018). Framework analysis is widely used in health research (Parkinson et al., 2016). The selection of applying the framework approach to analyse the SE meeting was due to its flexibility and adaptability, as well as not being aligned with a specific epistemological, philosophical or theoretical approach (Gale et al., 2013). Another reason was the nature of the qualitative data. The meeting discussed the applicability of three techniques for the BCI, therefore, the framework analysis was a suitable approach to structuring and managing the acquired data. The process of framework analysis application followed the six stages outlined by (Gale et al., 2013): transcription, familiarisation, coding, developing a working analytical framework, applying the analytical framework, and charting the data.

7.3.6.2.1 Transcription

The audio-recorded data were transcribed into English verbatim. Although the participants spoke Arabic, the data were transcribed directly into English due to their educational and lingual abilities as most of them had postgraduate degrees from overseas (e.g., UK and USA), therefore, they spoke both Arabic and English. For instance, one participant spoke only in English. Furthermore, the English language was mainly used by all participants in the specific terms essential to the discussion topic such as policies, workshops, protocols, content, environment, and organisation. Therefore, the equivalence of meaning across languages and cultures was not involved in the main topics highlighted in the meeting discussion. The data were transcribed by a bilingual researcher (primary researcher) and another bilingual clinician physiotherapist who worked in the UK to check the clarity and accuracy.

7.3.6.2.2 Familiarisation

The investigator became familiar with the data by listening to the audio records and reading through the transcripts several times, as well as revising the notes written during the meeting about the participants' thoughts and responses regarding the intervention techniques.

7.3.6.2.3 Coding

The researcher performed line-by-line coding using Microsoft Word, with inductive and deductive orientations assumed in the coding phase. Before coding, deductive orientation about the intervention's applicability, such as benefits, challenges, policies and systems, was the main concept for coding the data from this perspective. During coding, inductive orientation (open coding) was initially applied to the data, hence, the main researcher coded all the data to avoid losing any information which might be helpful in justifying or indicating participants' responses on the intervention's applicability.

7.3.6.2.4 Developing a working analytical framework

The main researcher developed a framework for framework analysis. This framework highlights the BCTs mentioned in the logic model chapter. The researcher combined two techniques, outreach visits and restructuring the physical environment, into one category called "changing the physiotherapy department environment." This is because the researcher believes that both techniques share the same aim of changing physiotherapy department policies and structure. As a result, the framework consists of three categories: educational workshops, changing protocols, and changing the physiotherapy department environment, to accommodate all the codes in this framework.

The codes were grouped into defined categories which were applied to different tables depending on the intervention technique (educational workshops, changing protocols, changing physiotherapy department environment) the categories represented. The researchers (FA & JY) meet to agree on the set of initial codes to apply to transcripts. An example of the applied analytical framework is provided in Table 7-3.

Table 7-3: Example of the developed analytical framework

CODE	DESCRIPTION	GROUP
Different options	The ability to deliver the workshops through different scenarios such as online, face-to-face, organisations	Physiotherapists
Provision of information	Information and skills require to achieve from workshops	Physiotherapists
Professional and organisational barriers	Perception of the factors affecting the workshops benefits such as individual commitment and organisational financial support	Stakeholders
Organising and planning	Space, speaker, appropriate content, organisational cooperation	Stakeholders
Knowledge and skills transfer	Content, language, information, practice, training	Stakeholders

7.3.6.2.5 Applying analytical framework

The analytical framework was applied to the transcripts and the researcher highlighted all information related to the represented code (e.g., different options, organising and planning) in different colours in Microsoft Word allowing the codes to be classified into the related categories. The categories were identified by putting all the coded data into a table with similar codes, then grouped and allocated to one category.

7.3.6.2.6 Charting the data

All codes and data charted into the analytical matrix which summarised all transcripts are provided in Table 7-4.

Table 7-4: Example of the developed analytical matrix

Intervention strategy	**Quote**	**Category**
Educational workshops	The workshop if the therapist is not convinced about the topic and the demand to change, they will not apply it	Professional and organisational barriers
	I want to talk about the educational workshops what we need is time for people to attend these workshops	
	In the hospital, usually the education department organises workshops for the internship and they are poorly attended by therapists	
Change protocols	For the stroke protocol in particular, it's really very challenging because we have a lot of pressure from the organisation to obtain accreditation so there are a lot of demands to change the protocols	Organisational needs
	A lot of need and pressure from the organisation to update and change protocols or we can't or they will not give us the accreditation, so we work on protocols for the accreditation purpose	
	The reality is as my colleague discussed because of the pressure and demand from organisations such as GCA and sebahi, usually, these protocols are not followed by PTs in the department in practice	
Change the physiotherapy department environment	For the environment in general, the challenges faced by the physiotherapy department can be divided into two parts, financial and capacity which are related to the area or the department space, for example, we can't open a specific area or gym for stroke patients due to the space limitation	Physiotherapy services needs
	In the environmental part discussed, there is a financial part about the budget and funds to use in the department	

7.3.6.2.7 Interpreting data

Themes were developed from the charted data, with each theme defined and described in Table 7-6.

7.4 Results

Nineteen participants agreed to attend the meeting but four participants (two participants from the physiotherapists' group and two participants from the stakeholders' group) did not attend the meeting due to illness (n=1), job commitments (n=2) and no specific reason (n=1). Therefore, fifteen participants joined the meeting, seven participants were in the physiotherapists' group and eight participants were in the stakeholders' group and their characteristics are shown in Table 7-5.

Table 7-5: Participant's characteristics

Criteria	Value
Number	15
Age	28-42 years (Mean= 34)
Gender:	
Male	10
Female	5
Education level:	
Undergraduate level	**2**
Master's degree level	**8**
PhD degree level	**5**
Current practice:	
Clinical	**7**

Academic	**4**
Management	**4**

7.4.1 Voting findings

Overall, the voting responses suggested that the participants agreed that all behaviour change techniques are applicable to enhance the engagement and motivation of stroke patients with CI with physiotherapy (Figure 7-1). The educational workshops and changing the physiotherapy department environment were agreed as extremely important (67%) or important (33%) behaviour change techniques to enhance professionals' skills and improve stroke rehabilitation services. Regarding changing the protocols, more than a quarter of the participants (27%) were not sure that changing protocols is an effective strategy to enhance physiotherapists' skills and stroke patient outcomes.

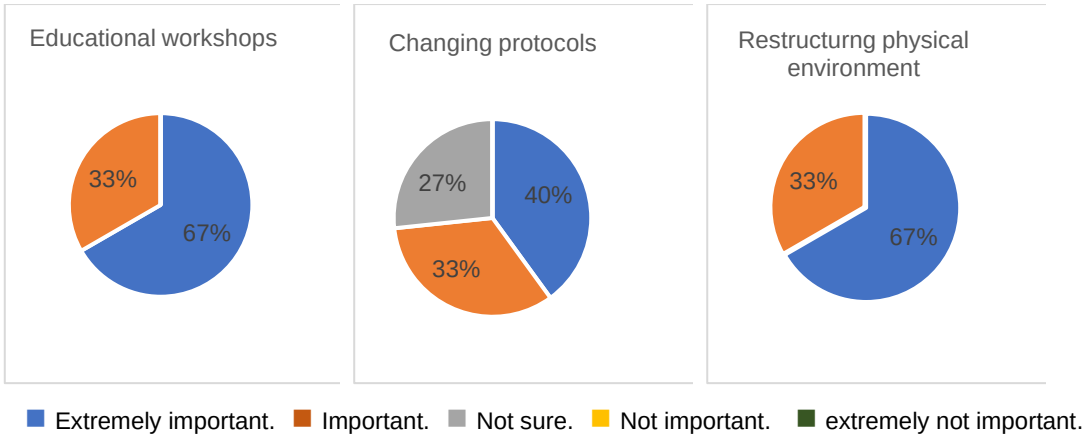

Figure 7-1: Voting results for the applicability of delivering educational workshops, changing stroke rehabilitation protocols and the physiotherapy department environment

These findings supported that all three BCI techniques are appropriate and can be applicable in local rehabilitation settings. In the next part, the qualitative data

will discuss the current challenges, opportunities, and processes for applying the BCI programme.

7.4.2 Nominal group findings

There was a total of six themes that developed from the qualitative data analysis as follows: varieties of options; efficacy cannot be guaranteed, realistic change, external organisational pressure, lack of professional commitment, and spatial and financial difficulties (Table 7-6).

Table 7-6: Identified themes of applying behaviour change intervention to rehabilitation settings from participants` perspectives

Theme	Description	Quote	Meeting Group
Variety of options	The perspective is that educational workshops can have different scenarios to deliver for physiotherapists, healthcare professionals, patients, and caregivers.	“The education programme, not costly, has different ways to deliver (online, conference programmes, workshops) and focus on targeting caregivers and PTs” P1	Physiotherapists
The efficacy can`t be guaranteed	The perspective that educational workshops have multiple aspects should be considered to achieve a positive impact and outcomes	“For the workshops and eventually the financial pressure is affecting the impact of the change and the workshops as you said to bring an expert in this specific topic it requires a high cost.” P15	Stakeholders
Realistic change	The perspective is not changing stroke rehabilitation protocols, rather than making small and simple changes to allow physiotherapists to consider stroke patient engagement and motivation in the rehabilitation programmes	“If I want to talk about changing protocols, choosing the appropriate source, considering the geographic feature, not all physiotherapy clinics are suitable for change”. P1	Physiotherapists
External organisational pressure	The fact that the protocols change is for accreditation purposes which external organisations usually provide for the quality of services	“The reality is as my colleague discussed because of the pressure and demand from the organisations such as GCA and sebahi usually these protocols are not followed by PTs in the department in the practice.” P13	Stakeholders
Lack of professional commitment	The perspective that physiotherapists do not adhere to the protocols in clinical practice	“What if you want to talk about the protocols for the healthcare providers, I think we can all agree that no one is following the protocols that are currently used in the hospitals.” P11	Stakeholders
Spatial and financial status	The current lack of financial support and space provided for the physiotherapy department to enhance the department's environment	“For the environment, in general, the challenges faced by the physiotherapy department can be divided into two parts, financial and capacity, which are related to the area or the department space. For example, we can't open a specific area or gym for stroke patients due to the space limitation.” P8	Physiotherapists and Stakeholders

7.4.2.1 Educational workshops

7.4.2.1.1 Theme 1: Variety of options for delivery

The physiotherapists' group highlighted different options for delivering educational workshops and noted that various options could be more effective in targeting a wider group of physiotherapists to improve their knowledge and skills, such as social media, specific organisations (e.g., Saudi Stroke Association), and hospital educational departments.

"The deliver mode, now we have the social media and the associations for stroke patients" P1.

This group insisted that the educational workshop should target more than physiotherapists, including stroke patients' caregivers because they can support patient engagement and motivation in the PT rehabilitation programme.

"We should engage the caregiver as well in workshops and educational programme, not only the PTs, because they have an important role".

The physiotherapists' group also suggested various information and structures that could be focused on and highlighted in the educational workshops. For instance, some physiotherapists agreed that the workshops' main content should focus on applying engagement and motivation outcome measurements in clinical settings.

"The second point is to learn how to do the measurement, also understand what specialities I can contact to get help regards improving patient's cognition" P2.

Moreover, other physiotherapists stated that the workshops should be designed based on the guidelines and protocols, as well as explain how to use these guidance and protocols in their practice.

“For the protocols are as it said it should be clear on design then the educational workshops will be based on the protocol at this stage so everyone can follow clear guidance and not only used the experience”. P4

7.4.2.1.2 Theme 2: The efficacy cannot be guaranteed

Stakeholders shared that the educational workshop content is usually inappropriate for clinical practice. Some stakeholders reflected that previous workshops' content was purely theoretical and not associated with clinical practice and skill. Therefore, physiotherapists could not benefit from this workshop style, as they should gain more practical skills to improve their performance when treating patients with different conditions.

“The content mostly a theoretically pure theoretical and anything related to practise nothing beneficial”. P12

The stakeholders also pointed out that physiotherapists should be motivated to attend and benefit from workshops. Some stakeholders highlighted that it is essential to convince physiotherapists about the importance of the workshop topic to encourage their attendance and contribution because they noted that physiotherapists who are not interested in the workshop topic and are not convinced about the need for change in the practice usually do not apply what they are taught and trained about in the workshops. Moreover, some participants commented on the importance of the time for the workshops as work pressures and not organising a convenient time for the workshop resulted in low attendance of physiotherapists.

“The workshop if the therapist not convinced about the topic and the demand to change, they will not apply it”. P8

“I want to talk about the educational workshops what we need is a time for people to attend these workshops.” P9

The stakeholders discussed that bringing expertise to a specific topic requires a high cost, therefore, financial pressure makes it challenging to achieve a positive impact and change in practice from educational workshops.

“For the workshops and eventually the financial pressure is affecting the impact of the change and the workshops as you said to bring an expert in this specific topic it’s require a high cost.” P15

7.4.2.2 Changing protocols

7.4.2.2.1 Theme 1: Realistic change

The physiotherapists' group discussed that changing the current protocols might be ineffective due to the necessity of giving the physiotherapists the time to adopt the new ideas and recommendations specific to stroke patient engagement and motivation. Furthermore, they questioned the suitability of the protocols for the geographic location because not all rehabilitation settings have the same staffing and capabilities, so it might be challenging to apply the new protocols in all settings.

“If we want to change the protocol it should be gradual and it's just a simple change because would need to adapt to the new protocols also the trainee can start, they can learn quicker because there isn't a lot of change.” P3

The physiotherapists pointed out some criteria to successfully apply protocols in clinical practice. For instance, some stakeholders suggested the need for evaluating the current protocols' use, knowing the barriers that are presented in these protocols and trying to avoid them with the new protocols. Moreover, one

physiotherapist suggested that new protocols should be accessible and easy to apply by physiotherapists in different rehabilitation settings.

“For the protocols are as it said it should be clear on design then the educational workshops will be based on the protocol at this stage so everyone can follow clear guidance and not only used the experience.” P4

7.4.2.2.2 Theme 2: Organisational pressure

All stakeholders agreed that changing the department's rehabilitation treatment protocols is due to organisational pressure. Stakeholders stated that there is significant pressure on PT departments to obtain accreditation. Changing protocols is required from a different external organisation to ensure standard quality for the PT department. This pressure caused the PT department to design protocols with specific criteria that fit the organisation's requirements.

“There are a lot of need and pressure from the organisation to update and change protocols or they will not give us the accreditation, so we work on protocols for the accreditation purpose.” P8

7.4.2.2.3 Theme 3: Lack of professional commitment

The irregular change in protocols affected the utility of the protocols in clinical practice. The stakeholders agreed that there is no commitment from physiotherapists to use the protocols in the current clinical practice. Sometimes that is due to not encouraging the physiotherapists and showing them the new protocols and how they should use them in the department. Furthermore, it might be due to the physiotherapists' behaviour which relies on practical skills and previous knowledge to treat patients.

“In the clinic practise from physiotherapists what I see is physiotherapist not following the protocols they always do the assessment and treatment without using the stroke protocols in the department.” P8

7.4.2.3 Changing the physiotherapy department environment

7.4.2.3.1 Theme: Spatial and financial status

All participants from both groups clarified that changing the department structure and providing more facilities can be challenging due to space limitations and lack of funds for the PT department. Some participants stated that their main challenge now is the space limitation in PT departments, leading to the difficulty in providing more facilities and restructuring the department. This might be due to the hospital administration's priorities focusing on the other departments, such as the emergency department. Furthermore, it might be due to the scope of the hospitals when they are not specialised rehabilitation settings.

“There is a limitation in the spaces is in hospitals that now they start to get some space from physiotherapy department for other department such as nursing and etc we try to maintain the spaces that we have now so if we want to provide the larger space or more space that will be difficult in the current time.” P13

The participants also stated that the environmental change should have no financial requirements, such as more facilities. However, if there is a specific budget for the department, the amount of the change should not be high and, therefore, it should only target the minimum level of change.

“It should be not highly cost, and it doesn't require having more facilities.” P2

7.5 Discussion

The stakeholder engagement aimed to evaluate the logic model and the applicability of applying BCIs to improve stroke patients with CI engagement and motivation in PT programmes. The results suggest that the intervention can be applicable in local clinical settings, with components of the intervention discussed. NGT has been used in previous research to develop complex interventions (Backhouse et al., 2022, Bateman et al., 2021). NGT has facilitated practical, relevant discussions and provided perspectives on the design and acceptability of the intervention. It has also enhanced our understanding of the context in which the intervention will be designed and implemented.

Firstly, regarding the educational workshops, the main priority was changing the physiotherapists' behaviour and practice. Therefore, not surprisingly, there was high agreement on the importance of delivering educational workshops to enhance physiotherapists' practice. Moreover, educational workshops have been proven in other studies to improve patient outcomes (Forsetlund et al., 2021).

There are environmental and individual barriers to delivering effective educational workshops, such as place, cost, and professional commitment. The cost of educational and training workshops was also highlighted in the extended literature as a barrier (Nielsen et al., 2014, Driver et al., 2017). The place issue in this context was related to organisational factors. Organisational barriers, such as digital infrastructure and logistical obstacles, were highlighted as impeding the implementation of educational programs in clinical practice (Thibault, 2020, Charow et al., 2021, Reis et al., 2022). The organisational culture in the current study could relate to interaction and communication with the education and training department and the lack of infrastructure for delivering the workshops. Furthermore, professional commitment arises from the perspective of adherence to educational and training workshops due to the traditional delivery style.

However, there are various modes to deliver educational workshops, such as lectures, meetings, printed educational materials (Jones et al., 2018)Therefore, designing educational workshops will be modified to consider the needs of the physiotherapists and the environmental barriers. There will be involvement from the rehabilitation team in PT rehabilitation settings to provide their suggestions and preferences for the educational workshop design in the next stage.

Secondly, changing stroke rehabilitation protocols was the other technique voted on and discussed. The stakeholder meeting provided multiple issues combined with changing stroke rehabilitation protocols. These issues included protocol diversities between rehabilitation settings, the organisational pressure of designing protocols with specific guidance, and the therapists' adherence to applying them in clinical practice Therefore, changing the current stroke protocols can be complicated as it will need further investigation of the rehabilitation protocols practice in the KSA, which has limited evidence in the literature due to the lack of research on stroke PT practice in the KSA (Alatawi, 2021). Consequently, changing protocols will not be considered in the development of BCI. Instead, the planned changes in stroke protocols, which mainly provided recommendations for PSCI, and outcome measurements for engagement and motivation will be provided as a part of the educational workshops.

Lastly, changing the PT department environment was recognised as an essential and applicable behaviour change technique to enhance stroke rehabilitation practice. However, it may not be applicable in restructuring the department and providing more facilities due to the lack of space and financial difficulties. The findings from this study support the existing evidence, which suggests that providing an enriched rehabilitation environment is a complex task, as it involves multiple components, such as physical construction (e.g., room dimensions), ambient features (e.g., noise and temperature controls), and interior design (e.g.,

equipment) as well as the complex health systems and policies (Nordin et al., 2021, Bernhardt et al., 2022, Anåker et al., 2024). Additional challenges in enhancing the stroke rehabilitation unit, such as variations between rehabilitation clinics and cost constraints, have also been noted (McDonald et al., 2018). Consequently, creating a new environment or modifying the stroke rehabilitation department in the local setting appears to be a complex process as it requires an organisational process of planning, designing and funding. Therefore, the intervention design will focus on changing policies for stroke rehabilitation because one of the barriers explained in the meeting was not having specific policies for stroke cases in PT rehabilitation departments. Changing policies that target patient needs, the proper use of resources, and equity of access can improve healthcare services performance (Sanderson et al., 2019). Thus, providing policies for stroke rehabilitation might enhance the treatment outcomes and service delivery. Also, changing the environment might focus on the department's social culture, such as creating a stroke team. This might enhance organisational culture which can support implementing evidence-based intervention, change clinical practice and improve treatment outcomes (Körner et al., 2015). Similar to the educational workshops, the rehabilitation team will be involved in the design stage to offer practical and valuable suggestions for suitable changes in the rehabilitation environment to support enhancing stroke patients with CI engagement and motivation in the PT programmes.

7.5.1 Logic model update

Based on the data gathered from the SE meetings, the logic model was updated and is presented in Figure 7-2. The stroke rehabilitation protocol was changed and the refined logic model moved due to the difficulties of delivering it in the intervention.

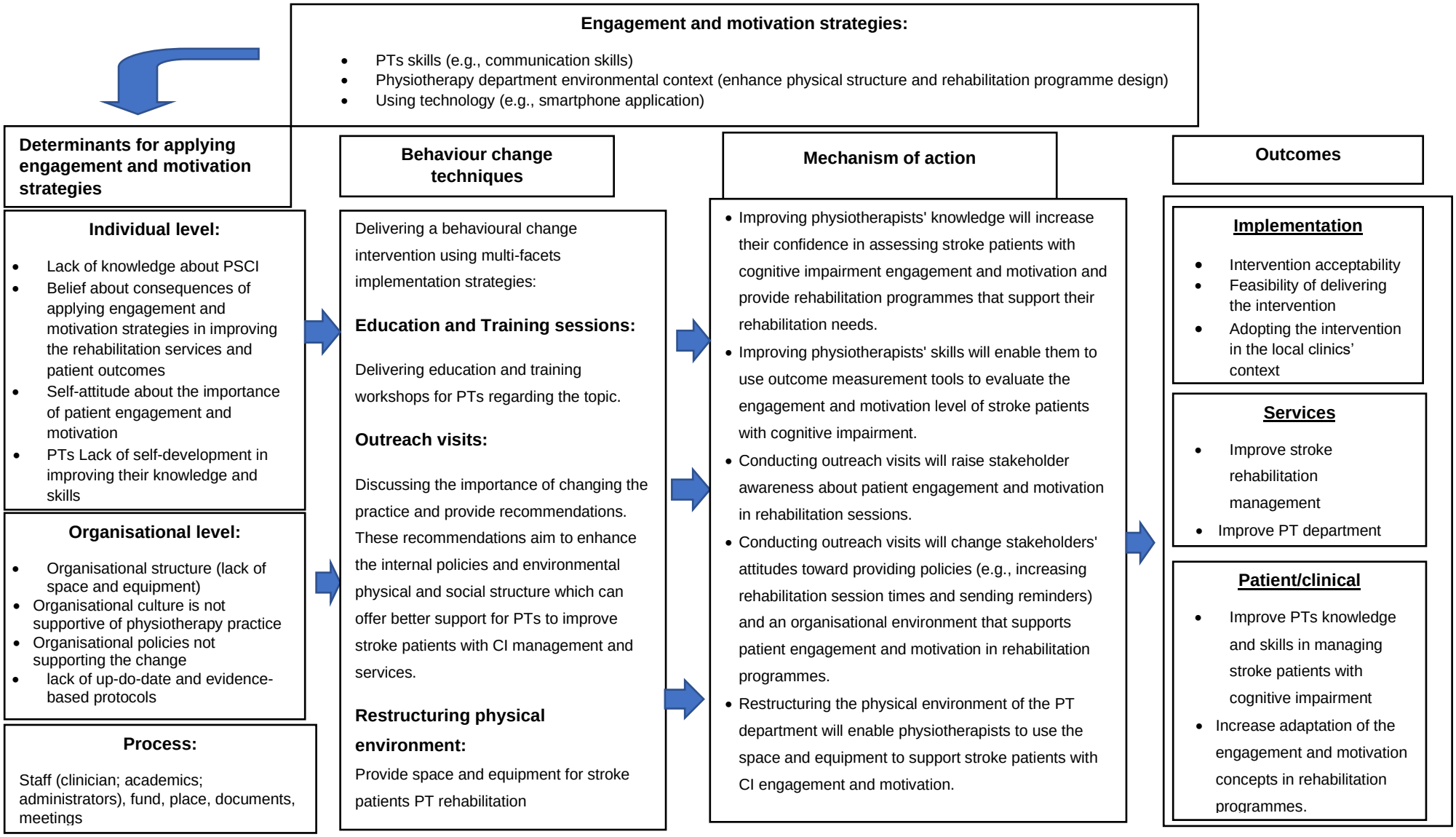

Figure 7-2: Refined logic model

7.5.2 How will SE impact the intervention design and delivery?

- The SE study informed that changing stroke rehabilitation protocols might not be applicable due to the complex process of changing protocols and external organisational pressure on designing protocols with specific criteria.

- SE informed the processes required to deliver educational workshops and suggested various modes to deliver the workshops and target groups that need consideration in the workshop design stage.

- SE informed that restructuring the PT department and improving the facilities provided for stroke patients might not be applicable. Therefore, the intervention focus will target changing the policies and enhancing the social culture to improve the physiotherapy department environment.

- SE meetings strengthen the networking and connection with multi-stakeholders (clinicians, academics, and managers) to support the intervention design and delivery in the rehabilitation settings.

7.6 Conclusion

Generally, stakeholders supported the intervention and felt it was clinically relevant to their setting. The intervention proposed in the initial logic model was altered to make it implementable in the KSA. The findings provided information essential for a future feasibility trial design on the topic of intervention delivery in the KSA rehabilitation settings.

8 Thesis Discussion and Conclusion

8.1 Introduction

This chapter discusses the PhD thesis findings, providing a concise summary of the results, as well as discussing the role of using theory in this study and the gap in evidence regarding PSCI in PT rehabilitation. Furthermore, it highlights the complex nature of patient engagement and motivation concepts and explores the significance of BCIs in engagement and motivation. The chapter also provides research implications and research strengths and limitations.

This study aimed to develop an intervention to enhance the engagement and motivation of stroke patients with CI in the PT rehabilitation programmes in the KSA. The research questions were:

- What are the strategies used in PT rehabilitation programmes to enhance the engagement and motivation of stroke survivors with CI?
- What are the barriers and facilitators to apply engagement and motivation enhancement strategies in PT practice in the KSA?
- To what extent is delivering an intervention applicable in the local rehabilitation context to improve the engagement and motivation of stroke survivors with CI in PT rehabilitation programmes?

8.2 Summary of the findings

In this study, the MRC framework (Skivington et al., 2021) guided the development and design of an intervention employing a systematic, theoretical-based, and mixture of methods approach to explore the topic and develop the intervention. Although the study only focused on the development stage of the MRC framework, future research may consider the feasibility, evaluation, and implementation stages, as discussed in the further research section. The study

followed the guidance provided by (O'Cathain et al., 2019) to develop the intervention. Table 8-1 lists the key actions for complex intervention development provided by (O'Cathain et al., 2019) and whether these actions were achieved in this study, along with details on how and where they were accomplished.

Table 8-1: Key actions of developing a complex intervention and their achievement in this study

Key action	Achievement	Where / how
Plan the development process	✓	The research plan was developed based on the researcher's interest in the topic and gaps in the research regarding PSCI in a Saudi rehabilitation context
Involve stakeholders	✓	The research involved stakeholders including quality managers, physiotherapists, managers, and clinical researchers in the intervention plan discussion in Chapter 7
Bringing a team together	✓	The research included academic supervisors who were experts in research methodology, process and intervention development, as well as local physiotherapists who were involved in piloting the topic guide for the interviews and SE meetings
Review published research evidence	✓	The scoping review was undertaken (Chapter 3) to review the published research and identify relevant interventions to enhance the

		engagement and motivation of stroke patients with CI and identify gaps in the evidence
Draw on existing theories	✓	This study applied TDF to guide the intervention development
Articulate programme theory	✓	A logic model was applied to synthesise the research findings and visualise the intervention plan
Undertake primary data collection	✓	Qualitative data collection was undertaken to identify the facilitators and barriers to applying engagement and motivation strategies
Understand context	✓	The qualitative interviews and SE studies were conducted to understand the context of physiotherapy stroke rehabilitation in KSA clinics
Pay attention to the future implementation of the intervention	✓	The stakeholders provided insights regarding the intervention plan's applicability, cost, accessibility and future sustainability
Design and refine intervention	✓	A plan for designing BCI was developed based on the scoping review and qualitative study findings. The intervention plan was further refined after the stakeholders' involvement.
End of the development phase	✓	The development plan was completed

This project took a pragmatic approach and used mixture of methods approach, which allowed for flexibility in selecting methods (such as a scoping review,

qualitative interviews, and nominal group technique) to explore the study topic and create an intervention plan based on the evidence gathered.

In summary, CI after stroke is common and impacts rehabilitation outcomes, with the engagement and motivation of stroke patients with CI essential to improve PT rehabilitation outcomes (Yoshida et al., 2021, Lowder et al., 2022a). This thesis supported that patient engagement and motivation is a complex intervention which depends on individual and environmental factors to improve them, with several strategies identified that could support patient engagement and motivation. These strategies were related to the rehabilitation department environment (e.g., enriched environment) and rehabilitation professional competence (communication skills, knowledge).

In the KSA, there is limited evidence regarding PSCI rehabilitation. The current study identified that physiotherapists' lack of knowledge and skills, the organisational culture and policies are significant factors influencing the application of strategies to enhance the engagement and motivation of stroke patients with CI in therapeutic sessions in the Saudi rehabilitation context. Applying BCIs can minimise the individual and organisational barriers that can support or hinder patient engagement and motivation.

8.2.1 Scoping review findings

The scoping review in Chapter 3 identified four strategies to enhance the engagement and motivation of stroke patients with CI including therapeutic interactions and communication, an enriched environment, using technology, and applying strategy training. However, there was a general lack of evidence on how effective any of these strategies were to improve patient engagement and motivation. Most studies included in the scoping review were related to therapeutic interaction and communication. Therapeutic interaction and communication are not typically positioned as an engagement/motivation

strategy in the literature but do meet the definitions for the purposes of this study. Since it is not traditionally thought of as a strategy, the evidence around its use in engagement and motivation, such as what skills, knowledge, and traits rehabilitation practitioners should use is lacking.

The studies included in the scoping review were derived from studies from different designs, including qualitative interviews, observational, feasibility, pilot, and randomised controlled studies. The outcome measurements were inconsistent; there was no group comparison in the pilot and feasibility studies and no follow-up in the included studies. Consequently, further research is essential to evaluate the engagement and motivation of stroke patients with CI in rehabilitation programmes. Also, measuring patients' engagement and motivation in clinical trials is essential in future trials regarding PSCI rehabilitation.

8.2.2 Qualitative study findings

The qualitative study in Chapter 5 explored the facilitators and barriers to applying engagement and motivation strategies for stroke patients with CI. The facilitators were “Promising impacts”, “Professional responsibilities and treatment priority”, “Positive connections with patients and their families”, “Training and educational support”, and “Physiotherapists self-attitude”. The barriers were “Information and case identification”, “Organisational culture”, “Patient belief and circumstances”, and “Physiotherapists` awareness and self-confidence”.

The key findings from the qualitative study were that the physiotherapists valued the importance of good communication and interaction to support engagement and motivation and their role in patients’ rehabilitation outcomes. However, there was a significant lack of knowledge about PSCI and the concept of engagement and motivation. The participants also showed a lack of self-confidence in improving the engagement and motivation of stroke patients and tried different ways and strategies to achieve that.

Also, the findings support the organisational culture as a barrier which involved the lack of professional interaction between professionals and multidisciplinary cooperation also impacted the application of engagement and motivation strategies with stroke patients with CI. The PT department structure, such as the lack of space for stroke cases and equipment, hinders physiotherapists from supporting stroke patients with CI in therapeutic sessions. Subsequently, an intervention plan was developed based on these barriers.

8.2.3 Stakeholder engagement findings

Stakeholder engagement was conducted in Chapter Seven to discuss the applicability of delivering BCIs targeting the physiotherapist and organisational culture-related barriers that affect applying engagement and motivation strategies with stroke patients with CI. The key findings were that delivering BCIs can be applicable in the Saudi rehabilitation context. Some challenges were raised regarding the techniques selected for the BCI, so amending, or changing the protocols in the intervention plan were removed, according to the stakeholders' varied responses and the factors raised in the meeting, such as the physiotherapists' negative attitude regarding using the rehabilitation protocols, the long process to change protocols, and the frequent changes in the rehabilitation protocols and organisational pressure to develop protocols for accreditation purposes. The other techniques of the BCI were accepted and agreed to be applicable to deliver in local physiotherapy rehabilitation contexts.

8.3 Role of the TDF in exploring the determinants and developing an intervention

Incorporating theory or a theoretical framework can improve the robustness and rigour of research and the findings' impacts (Stewart and Klein, 2016). The TDF (Michie et al., 2005) was used in this PhD research to develop the intervention. Firstly, it was used to guide the exploration of the facilitators and barriers. It has

been suggested that the use of TDF helps understand why certain practices are being followed and what could prevent the adoption of evidence-based care (Francis et al., 2012). The TDF is typically used to assess barriers and facilitators related to a specific clinical behaviour with the goal of developing interventions to promote change (Tavender et al., 2014, Presseau et al., 2017). The use of TDF in this study enabled the exploration of individual and environmental facilitators and barriers to applying engagement and motivation in physiotherapy rehabilitation programmes. It guided the development of question guides and data analysis by mapping all themes into the specific TDF domains. Applying TDF allowed using the qualitative findings to develop an intervention specifically targeting key barriers identified in the data analysis.

The TDF has a second application which involves mapping BCTs to the barriers that need to be addressed to change specific behaviours. This framework has been widely accepted as a reliable way to link BCTs to barriers and facilitators, which makes it an effective tool for designing BCI (Michie et al., 2008, Cane et al., 2015). TDF has been used to guide the selection of BCTs and the designing of interventions aimed at changing healthcare professionals' behaviours (Steinmo et al., 2015, Konnyu et al., 2020), and in this particular study, it was instrumental in helping to make decisions about mapping the selected BCTs to the behaviour that needed changing. However, there is a lack of a standard process on how to choose BCTs for addressing barriers (Dyson and Cowdell, 2021). The selection of BCTs specifically targeted major barriers to change, such as the lack of knowledge among physiotherapists and the culture within the organisation. Although there were many BCTs to choose from, the selection process focused on the most significant behaviour. Additionally, more than one technique was often used within a single BCT, such as educational workshops that helped improve both knowledge and skills, for example, instruction on how to

perform behaviour, information about antecedents and information about health consequences. By mapping the BCTs to one or more domains, it became clear how complex the process of designing BCI can be. This mapping process also helped stakeholders to better understand the intervention development and the reasoning behind the selection of specific BCTs. In conclusion, the TDF played an important role in facilitating the development of the intervention in the different stages of the PhD process. It structured the qualitative study topic guide and data analysis to explore the facilitators and barriers to applying engagement and motivation strategies in physiotherapy rehabilitation practice. Additionally, it guided the selection of the intervention components by mapping the BCTs to the TDF domains.

8.4 PSCI in physiotherapy rehabilitation programmes

This study indicated that there is a gap in the rehabilitation services provided for stroke patients with CI in the KSA. The physiotherapists involved in this study demonstrated a significant lack of knowledge about PSCI. This knowledge gap includes being able to define PSCI, describing its symptoms, using appropriate terminology to define the different domains of CI, and knowing what outcome measurements to use to measure cognitive functions and the impact of PSCI on functional outcomes. These findings support other studies that have highlighted gaps in stroke management knowledge among healthcare practitioners in the KSA (Aleisa et al., 2014, Bindawas and Vennu, 2016b). Qualitative studies conducted nationwide have also highlighted healthcare professionals' lack of knowledge about CI after stroke, which impacted decision-making about rehabilitation needs, goals and outcomes (Longley et al., 2018, Chen et al., 2021).

The findings of the PhD thesis study revealed a deficiency in services provided for stroke patients with CI due to a lack of interaction among professional teams.

Physiotherapists mentioned inadequate communication with other rehabilitation teams, such as physicians and social workers. Participants of the qualitative study also mentioned a lack of awareness of physicians and hospital management about the role of PT services. The physicians' lack of cooperation, beliefs, and awareness about physiotherapy has also been raised in previous studies (Al-Eisa et al., 2016, Alshehri et al., 2018). Physicians are the decision-makers in stroke patient management, therefore, the referral to PT, occupational therapy, or speech and language therapy should be requested by physicians. However, stroke rehabilitation can be a complex process and physicians (e.g., neurologists) might be less familiar with all the rehabilitation aspects (Belagaje, 2017). Therefore, multidisciplinary teamwork is essential to decide patients' needs and treatment goals for better outcomes.

The stroke rehabilitation team should be composed of physicians, nurses, physiotherapists, occupational therapists, psychologists, and social workers (Dworzynski et al., 2015). Physiotherapists in this study highlighted that they do not have psychologists involved within the rehabilitation team, with no direct contact with other rehabilitation professionals. The multidisciplinary team is required in PSCI to enhance the services and maximise patient outcomes. However, the lack of clarity in service provision regarding PSCI assessment, care, and follow-up makes it even more challenging to ensure optimal care.

PT rehabilitation services for stroke patients with CI are overlooked due to the organisational and individual barriers highlighted above. Also, there are no published guidelines and recommendations regarding PSCI management. The following recommendations are based on this PhD findings:

1. There is a need to improve physiotherapists' knowledge about CI after stroke and its impact on rehabilitation programmes.

2. There is a need to apply a multidisciplinary approach to stroke management.

3. There is a need to increase decision-makers awareness, such as physicians and hospital management, about the role of physiotherapy and other rehabilitation teams in stroke management.

4. There is a need to conduct research in the KSA about PSCI to cover aspects such as prevalence, short-term and long-term care, and rehabilitation treatments. There is also a need to include stroke patients with CI in stroke physiotherapy trials to maximise the benefits of evidence-based practice in PSCI physiotherapy management.

5. There is a need to provide guidelines and recommendations for PSCI management and rehabilitation in the KSA.

8.5 The complexity of the patient engagement and motivation concepts in stroke rehabilitation programmes

The current study aimed to develop an intervention to improve stroke patient engagement and motivation in stroke rehabilitation programmes. The evidence suggested that patients should be adequately engaged and motivated during treatment sessions to optimise rehabilitation programme effectiveness (Lequerica and Kortte, 2010a, Choi and Twamley, 2013). Based on the findings of the scoping review, there was noticeably limited evidence measuring engagement and motivation in the clinical trials. Furthermore, there was a lack of qualitative evidence discussing the combination of both concepts and their role in supporting effective physiotherapy rehabilitation programmes for stroke patients with CI. The current study combines motivation and engagement, as they are believed to reflect each other. For instance, increased motivation leads to active

engagement and vice versa. However, there was no evidence linking engagement and motivation in stroke rehabilitation for patients with CI.

In this study, it appears that the concept of the engagement of stroke patients with CI is related to patient interaction and effort during the rehabilitation programmes. The most reported strategy for enhancing the engagement of stroke patients with CI in rehabilitation programmes was therapeutic interaction and communication. Physiotherapists in the qualitative study mentioned interaction with patients as the main way to support patient engagement in rehabilitation sessions. Indeed, the therapeutic interaction and connection with patients are considered central to active engagement in rehabilitation programmes (Kayes et al., 2022a). It is also suggested as the most significant factor that influences patient engagement (Holdsworth et al., 2014). However, the qualitative evidence of developing the therapeutic interaction and connection requires physiotherapists to engage in the rehabilitation process, present and give feedback, understand patients' needs and have knowledge and skills to build trust in therapists' decisions and opinions (Miciak et al., 2018, Sivertsen et al., 2022b). Therefore, rehabilitation professionals should possess the knowledge and skills to manage stroke-related impairments to achieve a positive connection with stroke patients with CI and support their motivation and engagement in rehabilitation programmes.

Engagement in rehabilitation sessions is a complex process that can stem from different sources such as affective, cognitive, and behavioural sources (King et al., 2019). Most studies focused primarily on affective engagement (how to communicate and build a connection with patients?), leaving a significant gap in understanding how to enhance cognitive (e.g., optimise patient engagement during performing the rehabilitation tasks) and behavioural engagement (e.g., increase patients' confidence), which are crucial during the therapeutic tasks.

Evidence suggests that specific cognitive domains can impact patient engagement in rehabilitation programs, particularly for patients with CI (Skidmore et al., 2010a, Williams et al., 2021). Therefore, there is a significant gap in specifying cognitive domains, how they affect engagement and motivation to rehabilitation, and applicable strategies for specific domain CI.

In this study, during interviews with physiotherapists and the SE meeting, it became evident that there is a lack of understanding about engagement in the rehabilitation program, indicating that the concept is not adequately considered in rehabilitation practice. Therefore, there is a need to improve physiotherapists' understanding of engagement and provide them with resources for assessing engagement in rehabilitation, such as outcome measurements. Additionally, further research is necessary to understand how engagement is achieved in therapeutic sessions in Saudi clinical settings and the cultural, professional, and organisational factors that affect patient engagement.

The current study identified limited evidence that measures stroke patients with CI motivation in clinical trials and discussed strategies that improve it. This supported the research on neurorehabilitation for cognitively impaired populations that stated the lack of evidence on facilitating and maintaining motivation throughout the rehabilitation process (Kusec et al., 2019). The role of external factors such as the rehabilitation environment structure and positive feedback from rehabilitation therapists in supporting motivation has been addressed (Poltawski et al., 2015a, Yoshida et al., 2021). The current study identified external factors such as the organisational culture and physiotherapists' knowledge as barriers that could affect motivating stroke patients with CI for the PT rehabilitation programmes. Therefore, improving the rehabilitation environment and physiotherapists' knowledge and skills is essential to facilitate stroke patients’ motivation in PT rehabilitation sessions. Internal motivation is

also crucial as it is a significant factor in improving patient task performance during rehabilitation sessions (Cerasoli et al., 2014). Therefore, more research is essential to identify strategies to enhance stroke patients with CI's internal motivation in rehabilitation sessions.

8.6 Behaviour change interventions and their role in supporting patient engagement and motivation

Patient engagement and motivation are influenced by individual behaviours. For instance, rehabilitation engagement represents the patient's behaviour throughout the rehabilitation process, including their interaction, attendance, active listening, compliance, and adherence to the home programme (Danzl et al., 2012, Bright et al., 2015). Also, motivation is an important predictor for creating and maintaining patients' behaviours (Higgins et al., 2017). The contextual factors have a significant impact on improving the engagement and motivation of stroke patients with CI in PT rehabilitation in the Saudi context, such as physiotherapists' knowledge and skills and the organisational culture. These barriers reflect the complexity of engaging and motivating the patient and the lack of adopting them in clinical practice. Therefore, this requires changing individuals and organisational behaviours to apply new practices and services (Atkins et al., 2017). Designing a BCI is appropriate for reducing barriers to applying engagement and motivation strategies of stroke patients with CI in rehabilitation practice. BCIs can be applied in healthcare settings to change HCPs' behaviours or policies and practices (Colquhoun et al., 2017, Mather et al., 2022). BCIs are considered a cost-effective intervention and can target single or multiple barriers (Squires et al., 2014). Therefore, developing BCI in this study context would have the benefits of reducing the individual and environmental barriers and lead to improved engagement and motivation for stroke patients with CI in rehabilitation programmes.

8.6.1 Educational workshops

BCTs, such as educational workshops, can improve physiotherapists' knowledge and skills. Educational workshops, including learning and training, have been suggested to reduce HCPs' behaviour-related barriers, such as knowledge, skills, attitudes, and beliefs and support evidence-based practice (Chauhan et al., 2017b, Mickan et al., 2019). Several studies indicated better ways to support educational workshops' effectiveness. For instance, in their review of interventions to change healthcare providers' behaviours, Gupta et al. (2021) proposed criteria for successful educational workshops including (1) being tailored to the relevant context and practice, (2) allowing for interactive participation, (3) being delivered in small groups or individual settings, (4) being provided by a credible and trustworthy individual, and (5) having follow-up engagement after initial training. According to the stakeholders in the current study, the content of the workshops (e.g., theoretically articulated, practice relatedness) is the main issue that impedes the applicability and effectiveness of conducting and delivering educational workshops. The content of the workshops has been reported as the most fundamental issue impacting the effectiveness of educational workshops to change HCPs' behaviour (Lambert et al., 2017, Hatfield et al., 2020). Unfortunately, there is no available evidence on conducting and delivering educational workshops for physiotherapists in the Saudi context literature to understand a suitable structure and delivery to successfully support behaviour change intervention in the local context. Therefore, the educational workshop style and structure were discussed with stakeholders to understand the clinical practice in rehabilitation settings and design content that suits their needs and intervention aims. Also, the content of the educational workshop will consider the criteria for delivering effective educational workshops from the existing literature.

8.6.2 Restructuring and changing policies

It is essential to adapt to the PT rehabilitation environment and overcome any organisational culture barriers to effectively apply engagement and motivation strategies for stroke patients with CI. This may entail modifying the physical and social context, such as providing an enriched environment, which is suggested to enhance the engagement and motivation of stroke patients and improve functional outcomes (Raghavan et al., 2016, Rosbergen et al., 2017). In this study, environmental restructuring was identified as a valuable BCT to counter the effects of organisational obstacles on evidence-based practices. By targeting environmental barriers, previous evidence argued that behaviours are highly likely to change as these environmental changes trigger healthcare professionals' awareness and motivation to perform the actions (Eccles et al., 2005). Thus, physiotherapists are likely to change their behaviours and use the learned information and resources to support the engagement and motivation of stroke patients with CI. However, stakeholders acknowledged that the financial implications of restructuring the physical environment and providing space can be challenging. Therefore, it is necessary to adopt a flexible approach to selecting environmental restructuring, concentrating on items that relate to organisational capabilities and policies.

The current BCI aims to address the behaviours of physiotherapists, such as their knowledge and skills, and prioritise patient engagement and motivation. Educational workshops are expected to provide the information and skills necessary to support patient engagement and motivation, thereby enhancing the knowledge, skills, and confidence of physiotherapists. Additionally, restructuring the social environment and implementing policies are expected to enable physiotherapists to use their knowledge and skills. These changes in physiotherapists' behaviours and rehabilitation environment will enhance the

interaction between patients and therapists and provide environmental support, which are key factors in stroke patient engagement and motivation. As a result, the researcher believes that BCI is expected to improve patient engagement and motivation in rehabilitation programs by tailoring physiotherapists' behaviours and the physiotherapy environment.

8.7 Implications

Developing BCIs can help improve patients' outcomes in stroke PT rehabilitation practice. The intervention can have multiple implications on the professional, organisational, and research level.

8.7.1 Achieving the Ministry of Health Vision

The current research was conducted to align with the organisational needs and vision of the Saudi government Vision 2030 in early 2016, a comprehensive plan aimed at enhancing the lives of Saudi citizens through sustainable development. The healthcare sector transformation programme is a key component of this vision, with its focus on creating a more comprehensive, effective, and integrated healthcare system. To achieve this goal and enable the healthcare transformation to contribute to Vision 2030's objectives, the Saudi government encourages healthcare professionals and researchers to engage in high-quality research to drive necessary changes in the healthcare system and education (Saudi Vision 2030, 2023). Thus, by highlighting current stroke rehabilitation services and conducting research on previously unaddressed topics, we can support changes in services and outcomes.

8.7.2 Implications for practice

A key recommendation of this thesis is that there is a need to improve the organisational culture in the healthcare settings in the KSA. The current study findings support the need to improve the multidisciplinary approach in stroke rehabilitation services. This includes improving the communication between the

rehabilitation team and shared multidisciplinary decisions to support stroke patients' recovery. This study also supports the need to enhance policies and internal department environment, such as space and equipment provision to support the engagement and motivation of stroke patients who have CI in the rehabilitation programmes. It also supported the need to enable physiotherapists with the necessary resources and environment to drive their behaviour to support patient engagement and motivation in therapeutic programmes.

Another key recommendation of this research is to provide educational support to enhance physiotherapists' knowledge of CI after stroke and the concept of patient engagement and motivation in rehabilitation programmes. This research supports providing PSCI in the educational curriculums, thereby increasing physiotherapists' awareness and knowledge. Also, it could support the PT department leaders to take action to improve physiotherapists' knowledge in topics related to stroke rehabilitation, including PSCI and provide suitable resources and educational materials to help physiotherapists' learning and professional development.

The implications of this study could improve research on PSCI. The current research highlighted limited evidence in PSCI research in the KSA, as well as the organisational and individual barriers to PSCI rehabilitation. Therefore, this could encourage researchers and health professionals to undertake further investigation and develop a more robust body of evidence on PSCI rehabilitation within the Saudi context.

8.7.3 Tailoring behaviour change interventions to specific cultural contexts

One of the study implications is it could support the opportunity of designing BCI in the Saudi context. The evidence of developing BCI using a theoretical framework has not been tested and undertaken in non-Western countries (Dyson

and Cowdell, 2021). Nevertheless, evidence is absent regarding the utilisation of BCI in the KSA rehabilitation context. By developing theoretically informed BCI in Saudi local rehabilitation settings, we can gain a greater understanding of how cultural norms and systems impact its effectiveness.

8.8 Future research

According to the MRC framework, the next steps in designing a complex intervention are to assess its feasibility and accessibility, evaluate it, and implement it.

The next step in this project is to test the feasibility of the developed intervention. The intervention will involve designing educational workshops focusing on patient engagement and motivation. These workshops will highlight the impact of PSCI on the rehabilitation process, provide outcome measurements for engagement and motivation, and offer various strategies to support engagement and motivation. Additionally, the intervention will include changes to social structure or the implementation of policies to support stroke patients with CI engagement and motivation in PT rehabilitation programs.

Regarding the evaluation, intervention users, including physiotherapists and other key stakeholders, will be involved in discussing their views on the intervention. Also, suitable tools will be used to test if the intervention benefits in changing physiotherapists' behaviours (e.g., knowledge, skills) to support patient engagement and motivation.

If the intervention is feasible and successful in achieving the intended outcomes, recommendations will be provided to the key stakeholders to support its implementation in the local rehabilitation settings.

There are remaining topics extracted from this research including exploring the experience of stroke patients with CI of being engaged in rehabilitation sessions

and conducting a study to understand how engagement and motivation are achieved in rehabilitation practice in the Saudi context, as well as to identify the motivators for stroke rehabilitation in stroke patients who have CI.

8.9 Covid-19 impact statement on research activities

COVID-19 had a significant impact on many postgraduate students. Regarding my PhD, the COVID-19 period affected my progress and productivity, especially in terms of my qualitative study progress.

Recruitment for the qualitative interviews needed to be extended due to delay in gaining the appropriate ethical approvals. In addition, I needed permissions from the hospital sites which was delay due to competing priorities in Covid-19.

Furthermore, COVID-19 restrictions were applied in hospitals, such as social distancing. Therefore, the physiotherapists were not available simultaneously because their time was divided (shifts) between them, which affected my approach to potential participants for my research. These restrictions and processes led to delays in the data collection and research timeline.

The pandemic had a profound impact on the interview process. For instance, the mandatory use of face masks posed a challenge in observing participants' facial expressions during the discussions. This limitation hindered my ability to ask follow-up questions based on participants' expressions, thereby affecting the depth of information provided by participants.

These impacts presented challenges for the PhD process, particularly regarding the timeline. It was not possible to utilise the best available resources and peer reviews to support qualitative research data collection and analysis. It also influenced my writing and training development because I could not access the university facilities such as libraries. These challenges, however, did not

contribute to changing the research aim and methodology. Instead, it caused stress about the PhD's progress and timelines.

8.10 Strengths and limitations

The main strength of this PhD was the systematic nature and theoretical underpinning of the research project. This PhD has comprehensively explored engagement and motivation strategies used in rehabilitation to support stroke patients with CI, exploring barriers and facilitators to apply the identified strategies in the Saudi rehabilitation settings and building intervention plans based on these findings. This evidence has been obtained by mixture of methods research using multiple research activities, including a scoping review, qualitative interviews, programme theory development, and a nominal group technique to explore and develop the intervention.

A possible limitation related to the scoping review is the high number of excluded studies. The search strategy identified a high number (n=16084) of studies. This might lead to excluding studies that might fit the inclusion criteria. However, the reason for having such a large number was due to the variety of topics needed to search. For instance, the researcher tried to explore all possible studies related to CI after stroke by searching all terms related to the impairment in specific cognitive domains, such as memory dysfunction and spatial neglect. Therefore, this led to a large number of records unrelated to the research topic which required more time to scan and screen the search results.

Possible limitations of the qualitative study were related to the participants' selection criteria and data analysis process. Regarding participant selection criteria, the study only recruited physiotherapists working with stroke patients to collect focused and purposeful data exploring the research topic and how engagement and motivation strategies are used in clinical practice. Including other stakeholders in the physiotherapy department, such as physiotherapy

department managers or policymakers, might provide a rich understanding of organisational and environmental factors that impede the application of engagement and motivation strategies for stroke patients with CI in rehabilitation sessions. Also, due to COVID-19 restrictions, planning interviews and space preparation had to follow hospital protocols to minimise virus spread, which affected the recruitment timing and number of participants included in the study. However, the researcher ensured that the number of participants was sufficient to generate data and fit the selection criteria. Thus, adopting face-to-face and online interviews could facilitate recruiting more participants in the qualitative study. The other potential limitation was the potential bias during data analysis due to the transcription and translation processes being performed only by the main researcher. However, much effort was made to reduce the potential bias during translation and transcription by having a bilingual professional to check the transcription and translation.

The qualitative study faced potential limitations related to the sampling and recruitment techniques. The purposive sampling technique, while useful, had limitations in terms of generalizing the findings, as participants were chosen from specific rehabilitation settings. Regarding the recruitment technique, the researcher relied solely on an active approach with the physiotherapists in the recruitment strategy. This involved direct face-to-face contact with physiotherapists and reaching out to the heads of departments. However, due to clinical commitments and varying working hours caused by COVID-19 restrictions, it wasn't possible to reach all physiotherapists. This delayed participant recruitment and affected their motivation to participate. Other recruitment methods, such as giving presentations, sending out flyers, and providing monetary incentives, could have been considered to enhance physiotherapists' motivation to participate in the interviews. Despite these

limitations, efforts were made to support participants` recruitment, including building rapport with physiotherapists and involving clinical gatekeepers.

8.11 Conclusion

The research aim was to develop a theoretically informed intervention to enhance the engagement and motivation of stroke patients with CI in the PT rehabilitation programmes. To address this, the study was conducted according to the MRC framework for developing and designing complex interventions. Overall, various external aspects were identified to support patient engagement and motivation and these aspects were highlighted in the strategies to support stroke patients with CI in rehabilitation. Therefore, the rehabilitation environment and professional competencies are essential for effective engagement and motivation strategies. In the current study, there were significant environmental and individual barriers that impacted engaging and motivating stroke patients with CI in the Saudi context.

Patients with a stroke and CI are often not included in clinical trials, therefore more research is needed to increase the inclusion of these patients in clinical trials to improve evidence-based practice in stroke rehabilitation for stroke patients with impairments associated with CI. The PT rehabilitation treatment for PSCI subjects can be challenging since many patients struggle with staying motivated and engaged during rehabilitation sessions. Therefore, rehabilitation professionals should prioritise strategies to promote the engagement and motivation of stroke patients with CI during rehabilitation programs. Additionally, measuring patient engagement and motivation during rehabilitation is crucial as these factors can predict patient outcomes. Given the gap identified in the rehabilitation practice for stroke patients with CI in the KSA, there is a need to undertake and fund further research related to PSCI rehabilitation to enhance the awareness and knowledge of rehabilitation professionals about the impact,

diagnosis, and management of stroke patients with CI during rehabilitation programmes. Also, there is a need to raise awareness about patient engagement and motivation in rehabilitation and highlight the engagement and motivation strategies and outcome measurements used to support and determine patient engagement and motivation. Due to the complexity of engagement and motivation concepts and the individual and professional barriers identified in this study's hospital settings context, BCIs can play the role of improving stroke patients with CI engagement and motivation in rehabilitation programmes through improving physiotherapists' knowledge, skills, and rehabilitation environment organisational culture.

9 References

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10 Appendixes

10.1 Appendix 1: Scoping review search strategy:

10.1.1 AMED search strategy last update 31.03.2023

Set	Search statement
1.	stroke/
2.	Cerebrovascular accident/
3.	cva.mp.
4.	Cognition disorders/ or cognitive impairment.mp.
5.	attention deficit.mp.
6.	Memory/ or Memory disorders/ or memory deficits.mp.
7.	Spatial neglect/
8.	Perceptual disorders/ or Visual perception/
9.	Aphasia/
10.	Apraxia/ or motor apraxia.mp.
11.	Executive dysfunction.mp.
12.	Treatment outcome/ or Rehabilitation/ or Exercise therapy/
13.	physiotherapy.mp. or Physiotherapists/
14.	PT.mp.
15.	Occupational therapy.mp.
16.	OT.mp.
17.	Physical Therapy.mp.
18.	Engagement.mp.
19.	Engage*.mp.
20.	Motivation/
21.	motivate*.mp.
22.	Adherence.mp.
23.	compliance.mp.
24.	1 or 2 or 3 or 4 or5 or 6 or 7 or 8 or9 or 10 or 11
25.	12 or 13 or 14 or15 or 16 or 17
26.	18 or 19 or 20 or21 or 22 or 23
27.	24 and 25 and 26
28.	limit 27 to (english and yr="2000 -Current")

10.1.2 Madeline and EMBASE search strategy last updated 31.01.2023

Set	Search statements
1.	Stroke.mp. or cerebrovascular accident/
2.	cva.mp.
3.	Cognitive impairment.mp. or cognitive defect/
4.	Memory deficits.mp. or amnesia/
5.	neglect/ or spatial neglect.mp.
6.	Perceptual disorder.mp. or perception disorder/
7.	apraxia/ or motor apraxia.mp.
8.	Conduction aphasia/ or primary progressive aphasia/ or aphasia/ or aphasia test/ or cortical sensory aphasia/ or aphasia.mp. or progressive non fluent aphasia/
9.	executive function/ or executive dysfunction.mp.
10.	rehabilitation equipment/ or rehabilitation.mp. or rehabilitation care/ or rehabilitation nursing/ or community-based rehabilitation/ or rehabilitation patient/ or vocational rehabilitation/ or rehabilitation robot/ or rehabilitation/ or cognitive rehabilitation/ or rehabilitation research/ or rehabilitation center/ or stroke rehabilitation/ or home rehabilitation/
11.	physiotherapy.mp. or physiotherapy/ or physiotherapy practice/ or home physiotherapy/
12.	PT.mp.
13.	Occupational therapy.mp. or occupational therapy/
14.	OT.mp.
15.	Physical Therapy.mp.
16.	Engagement.mp.
17.	Engage*.mp.
18.	motivation.mp. or motivation/
19.	motivate*.mp.
20.	Adherence.mp.
21.	Patient participation/ or participation.mp. or community participation/
22.	compliance.mp. or "compliance (physical)"/
23.	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
24.	10 or 11 or 12 or 13 or 14 or 15
25.	16 or 17 or 18 or 19 or 20 or 21 or 22
26.	23 and 24 and 25
27.	limit 26 to (english language and yr="2000 -Current")

10.1.3 CINAHL search strategy last update 31.03.2023

Set	Search statements
1.	(MH "Cognition") OR "cognitive impairment" OR (MH "Cognition Disorders")
2.	(MH "Attention") OR "attention deficit"
3.	(MH "Memory") OR "memory deficits"
4.	(MH "Spatial Perception") OR (MH "Unilateral Neglect") OR (MH "Unilateral Neglect (Saba CCC)") OR (MH "Unilateral Neglect (NANDA)") OR "spatial neglect"
5.	(MH "Perceptual Disorders") OR "perceptual disorders"
6.	(MH "Gait Apraxia") OR (MH "Apraxia, Ideomotor") OR (MH "Apraxia, Dressing") OR (MH "Aphasia, Transcortical Motor") OR (MH "Apraxia") OR "motor apraxia"
7.	(MH "Executive Function") OR "executive function"
8.	(MH "Aphasia") OR "aphasia" OR (MH "Aphasia, Broca") OR (MH "Aphasia, Conduction") OR (MH "Aphasia, Wernicke")
9.	(MH "Rehabilitation") OR "rehabilitation" OR (MH "Rehabilitation Centers") OR (MH "Rehabilitation Patients") OR (MH "Home Rehabilitation")
10.	"physiotherapy" OR (MH "Physical Therapy Practice, Research-Based") OR (MH "Physiotherapy Evidence Database") OR (MH "Physical Therapy")
11.	PT
12.	(MH "Occupational Therapy Practice, Research-Based") OR (MH "Occupational Therapy Practice, Evidence-Based") OR (MH "Occupational Therapy Service") OR (MH "Occupational Therapy") OR (MH" Home Occupational Therapy") OR (MH "Education, Occupational Therapy") OR (MH "Occupational Therapy Practice") OR "occupational therapy or ot"
13.	(MH "Motivation") OR "motivation" OR (MH" Motivational Interviewing")
14.	"Motivate*"
15.	(MH "Family Involvement (Iowa NIC)") OR "engagement or involvement"
16.	"Engage*"
17.	(MH "Patient Compliance") OR (MH "Guideline Adherence") OR (MH "Compliance, Physical") OR (MH "Compliance with Therapeutic Regimen (Saba CCC)") OR "adherence or compliance"
18.	"participation"
19.	"stroke or cerebrovascular accident or cva" OR (MH "Stroke Patients") OR (MH "Stroke Units") OR "Stroke")
20.	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S19
21.	S9 OR S10 OR S11 OR S12
22.	S13 OR S14 OR S15 OR S16 OR S17 OR S18
23.	S20 AND S21 AND S22

10.2 Appendix 2: Study eligibility form

Title:

Criteria	Statement	Finding
Language	Is the study published in English?	Yes No Not clear
Participants	Did the participants in this study diagnose with stroke and having cognitive impairment?	Yes No Not clear
Setting	Did the study clarify whether the patient discharge from inpatient clinic, living in a home care, or living in their home?	Yes No Not clear
programme	Is there any details regard the programme used in the study?	Yes No Not clear
Outcomes	Did the study measure patients` engagement, motivation, or participation in the rehabilitation programme?	Yes No Not clear

- Reviewer name:
- Date of screening:
- Decision: Included □ Excluded □ Not sure □
- The reason for selection:
  ……
  ……

10.3 Appendix 3: CASP tool checklist

10.3.1 CASP checklist for qualitative studies:



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Summertown Pavilion, Middle Way Oxford OX2 7LG

CASP Checklist: 10 questions to help you make sense of a Qualitative research

How to use this appraisal tool: Three broad issues need to be considered when appraising a qualitative study:

- Are the results of the study valid? (Section A)
- What are the results? (Section B)
- Will the results help locally? (Section C)

The 10 questions on the following pages are designed to help you think about these issues systematically. The first two questions are screening questions and can be answered quickly. If the answer to both is "yes", it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a "yes", "no" or "can't tell" to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

Referencing: we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Qualitative) Checklist. [online] Available at: URL. Accessed: Date Accessed.*

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Paper for appraisal and reference: .....

Section A: Are the results valid?

1. Was there a clear statement of the aims of the research?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- what was the goal of the research
- why it was thought important
- its relevance

Comments:

2. Is a qualitative methodology appropriate?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- If the research seeks to interpret or illuminate the actions and/or subjective experiences of research participants
- Is qualitative research the right methodology for addressing the research goal

Comments:

Is it worth continuing?

3. Was the research design appropriate to address the aims of the research?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- if the researcher has justified the research design (e.g. have they discussed how they decided which method to use)

Comments:

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4. Was the recruitment strategy appropriate to the aims of the research?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- If the researcher has explained how the participants were selected
- If they explained why the participants they selected were the most appropriate to provide access to the type of knowledge sought by the study
- If there are any discussions around recruitment (e.g. why some people chose not to take part)

Comments:

5. Was the data collected in a way that addressed the research issue?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- If the setting for the data collection was justified
- If it is clear how data were collected (e.g. focus group, semi-structured interview etc.)
- If the researcher has justified the methods chosen
- If the researcher has made the methods explicit (e.g. for interview method, is there an indication of how interviews are conducted, or did they use a topic guide)
- If methods were modified during the study. If so, has the researcher explained how and why
- If the form of data is clear (e.g. tape recordings, video material, notes etc.)
- If the researcher has discussed saturation of data

Comments:

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6. Has the relationship between researcher and participants been adequately considered?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- If the researcher critically examined their own role, potential bias and influence during (a) formulation of the research questions (b) data collection, including sample recruitment and choice of location
- How the researcher responded to events during the study and whether they considered the implications of any changes in the research design

Comments:

Section B: What are the results?

7. Have ethical issues been taken into consideration?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- If there are sufficient details of how the research was explained to participants for the reader to assess whether ethical standards were maintained
- If the researcher has discussed issues raised by the study (e.g. issues around informed consent or confidentiality or how they have handled the effects of the study on the participants during and after the study)
- If approval has been sought from the ethics committee

Comments:

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8. Was the data analysis sufficiently rigorous?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- If there is an in-depth description of the analysis process
- If thematic analysis is used. If so, is it clear how the categories/themes were derived from the data
- Whether the researcher explains how the data presented were selected from the original sample to demonstrate the analysis process
- If sufficient data are presented to support the findings
- To what extent contradictory data are taken into account
- Whether the researcher critically examined their own role, potential bias and influence during analysis and selection of data for presentation

Comments:

9. Is there a clear statement of findings?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
- If the findings are explicit
- If there is adequate discussion of the evidence both for and against the researcher's arguments
- If the researcher has discussed the credibility of their findings (e.g. triangulation, respondent validation, more than one analyst)
- If the findings are discussed in relation to the original research question

Comments:

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Section C: Will the results help locally?

10. How valuable is the research?

HINT: Consider

- If the researcher discusses the contribution the study makes to existing knowledge or understanding (e.g. do they consider the findings in relation to current practice or policy, or relevant research-based literature
- If they identify new areas where research is necessary
- If the researchers have discussed whether or how the findings can be transferred to other populations or considered other ways the research may be used

Comments:

10.3.2 CASP checklist for RCTs



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Summertown Pavilion, Middle Way Oxford OX2 7LG

CASP Checklist: 11 questions to help you make sense of a Randomised Controlled Trial

How to use this appraisal tool: Three broad issues need to be considered when appraising a trial:

- Are the results of the study valid? (Section A)
- What are the results? (Section B)
- Will the results help locally? (Section C)

The 11 questions on the following pages are designed to help you think about these issues systematically. The first three questions are screening questions and can be answered quickly. If the answer to both is "yes", it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a "yes", "no" or "can't tell" to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

Referencing: we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Randomised Controlled Trial) Checklist. [online] Available at: URL. Accessed: Date Accessed.*

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Paper for appraisal and reference:.....

Section A: Are the results of the trial valid?

1. Did the trial address a clearly focused issue?

Yes ☐
Can't Tell ☐
No ☐

HINT: An issue can be 'focused' In terms of
- the population studied
- the intervention given
- the comparator given
- the outcomes considered

Comments:

2. Was the assignment of patients to treatments randomised?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- how this was carried out
- was the allocation sequence concealed from researchers and patients

Comments:

3. Were all of the patients who entered the trial properly accounted for at its conclusion?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- was the trial stopped early
- were patients analysed in the groups to which they were randomised

Comments:

Is it worth continuing?

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4. Were patients, health workers and study personnel 'blind' to treatment?

Yes ☐
Can't Tell ☐
No ☐

Comments:

5. Were the groups similar at the start of the trial

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
• other factors that might affect the outcome, such as; age, sex, social class

Comments:

6. Aside from the experimental intervention, were the groups treated equally?

Yes ☐
Can't Tell ☐
No ☐

Comments:

Section B: What are the results?

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7. How large was the treatment effect?

HINT: Consider
- what outcomes were measured
- Is the primary outcome clearly specified
- what results were found for each outcome

Comments:

8. How precise was the estimate of the treatment effect?

HINT: Consider
- what are the confidence limits

Comments:

Section C: Will the results help locally?

9. Can the results be applied to the local population, or in your context?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
- the patients covered by the trial are similar enough to the patients to whom you will apply this
- how they differ

Comments:

10. Were all clinically important outcomes considered?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
- there is other information you would like to have seen
- if not, does this affect the decision

Comments:

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11. Are the benefits worth the harms and costs?

Yes	
Can't Tell	
No	

HINT: Consider
- even if this is not addressed by the trial, what do **you** think?

Comments:

10.4 Appendix4: COREQ checklist

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with Participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Yes
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Purposive + snowball
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	Face- to- face
Sample size	12	How many participants were in the study?	12
Non-participation	13	How many people refused to participate or dropped out? Reasons?	3
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	Hospital
Presence of non-Participants	15	Was anyone else present besides the participants and researchers?	No
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	All presented in table page 95
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Yes

Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	NO
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	Yes
Field notes	20	Were field notes made during and/or after the interview or focus group?	No
Duration	21	What was the duration of the inter views or focus group?	30-45 min
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	No
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	2
Description of the coding Tree	25	Did authors provide a description of the coding tree?	Yes
Derivation of themes	26	Were themes identified in advance or derived from the data?	From data
Software	27	What software, if applicable, was used to manage the data?	Nvivo
Participant checking	28	Did participants provide feedback on the findings?	No
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings?	Yes
		Was each quotation identified? e.g. participant number	Yes
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Yes
Clarity of major themes	31	Were major themes clearly presented in the findings?	Yes
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

10.5 Appendix 5: ethical approval University of Nottingham

University of Nottingham
UK | CHINA | MALAYSIA

Faculty of Medicine & Health Sciences
Research Ethics Committee
Faculty Hub
Room E41, E Floor, Medical School
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham, NG7 2UH
Email: FMHS-ResearchEthics@nottingham.ac.uk

28 October 2020

Fahad Alshaibani
PhD Student
Division of Rehabilitation, Ageing and Wellbeing
B115, Medical School
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham
NG7 2UH

Dear Fahad Alshaibani

Ethics Reference No: FMHS 53-0720 **– please always quote**	
Study Title: What facilitators and barriers to implement different strategies to enhance stroke patients with cognitive impairement engagement and motivation to physiotherapy treatment programme in Saudi Arabia: A qualitative study. **Short Title:** Post Stroke Cognitive Impairment (PSCI)	
Location of Study: King Abdulaziz Specialized Hospital – Taif and King Faisal Hospital, Taif, Saudi Arabia	
Chief Investigator/Supervisor: Professor Pip Logan, Rehabilitation Research and Occupational Therapist, Division of Rehabilitation, Ageing and Wellbeing, School of Medicine.	
Lead Investigators/student: Fahad Alshaibani, PhD Student	
Other Key Investigators/Collaborators: Dr Jennifer Yates, Assistant Professor in Mental Health, Institute of Mental Health, School of Medicine, Dr Katie Robinson, AHP Clinical Lead, Nottingham University Hospitals NHS Trust.	
Proposed Start Date: 01/11/2020	**Proposed End Date:** 31/10/2021

Thank you for submitting your responses to the comments made by the Committee at its meeting on 10 July 2020 and the following documents were received:

- FMHS REC Application form and supporting documents version 1.0: 28.05.2020
- Revised Protocol V1.0: 21.10.2020
- Translated versions of the Participant Information Sheet and Consent form dated 21.10.20
- Translation Confirmation Letter dated 21.10.20

These have been reviewed and are satisfactory and the study has been given a favourable opinion.

A favourable opinion has been given on the understanding that:

1. All appropriate ethical and regulatory permissions are respected and followed in accordance with all local laws of the country in which the study is being conducted and those required by the host organisation/s involved
2. The protocol agreed is followed and the Committee is informed of any changes using a notice of amendment form (please request a form).
3. The Chair is informed of any serious or unexpected event.
4. An End of Project Progress Report is completed and returned when the study has finished (Please request a form).

Yours sincerely

Dr John Williams, Associate Professor
Chair, Faculty of Medicine & Health Sciences Research Ethics Committee

10.6 Appendix 6: Ethical approval from local health affairs department

وزارة الصحة
Ministry of Health

مديرية الشئون الصحية بمحافظة الطائف
Directorate of Health Affairs - Taif
ادارة البحوث والدراسات
Research and Studies Department

' Ethical approval '

IRB Registration Number With KACST , KSA. **HAP-02-T-067**
Approval number : **411**
Date : **01/09/2020**
DEAR RESEARCHER:

	Researcher's Name	Researcher's Character
1	Fahad Alshaibani	Principal Investigator

I am pleased to inform you submission dated **(16.SEP.2020)** for the study titled , **(What are the facilitators and barriers to implement different strategies to enhance stroke patients with cognitive impairment engagement and motivation to physiotherapy treatment programme in Saudi Arabia: A qualitative study),** was reviewed and was approved. please note that this approval is from the research ethics perspective only. you will still need to get permission from the manager of hospital or an external institution to commence data collection.

we wish you well as you proceed with the study and request you to keep the IRB informed of the progress on a regular basis , using the IRB log number shown above.

PLEASE BE ADVISED that regulations require that you submit a progress report on your research every 1 month, you are also required to submit any manuscript resulting from this research for approval by IRB before submission to journals for publication.

BEST REGARDS,,,,

NABIL MOHAMMED AL-THOBITI
DIRECTOR OF RESEARCH AND STUDIES DEPARTMENT

مديرية الشئون الصحية بمحافظة الطائف
وزارة الصحة Ministry of Health
لجنة اخلاقيات البحوث

10.7 Appendix 7: Participant's information sheet:

University of Nottingham
UK | CHINA | MALAYSIA

Faculty of Medicine & Health Sciences
School of medicine
115, B Floor, Queen medical Centre

Derby Rd, Lenton,
Nottingham NG7 2UH

Supervisors:
Professor Pip Logan. Email: pip.logan@nottingham.ac.uk
Dr Jennifer Yates. Email: Jennifer.Yates@nottingham.ac.uk
Dr Katie Robinson. Email Katie.Robinson@nottingham.ac.uk

Lead researcher:
Fahad Alshaibani
PhD student in Rehabilitation and Ageing, University of Nottingham
Email: msxfa18@nottingham.ac.uk

Study Title: What are the facilitators and barriers to implement different strategies to enhance stroke patients with cognitive impairment engagement and motivation to physiotherapy treatment programme in Saudi Arabia: A qualitative study

PARTICIPANT INFORMATION SHEET

Research Ethics Reference: FMHS 53-0720
Version 1.0 Date: 25/05/2020

We would like to invite you to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. One of our team will go through the information sheet with you and answer any questions you have. Please take time to read this carefully and discuss it with others if you wish. Ask us anything that is not clear.

What is the purpose of the research?

The purpose of this research to understand the facilitators and barriers for applying a motivation and engagement strategy for stroke survivors with cognitive impairment in Saudi Arabia, which are essential for developing different strategies in physiotherapy department to enhance patients outcomes and rehabilitation services.

Why have I been invited to take part?

You have been invited to take part in this research because you have the experience in stroke management and is important in this study to know how you motivate patients and encourage them to engage with rehabilitation tasks. We will be recruiting up to 12 participants in this study.

Do I have to take part?

No. It is up to you to decide if you want to take part in this research. We will describe the study and go through this information sheet with you to answer any questions you may have. If you agree to participate, we will ask you to sign a consent form and will give you a copy to keep. However, you would still be free to withdraw from the study at any time, without giving a reason and without any negative consequences, by advising the researchers of this decision. This would not affect your legal rights.

1. What will happen to me if I take part?

If you agree to take part in the study, you will be contacted by phone. We will arrange a convenient and day for you, then you will receive a message to confirm that. The interview should approximately take from 30 to 45 minutes and will take place in a private and quite room in your hospital setting. The interview will involve asking you questions about how physiotherapists understand the importance of patient engagement and motivation, the impact of cognitive impairment on rehabilitation process, and identifying their perspective about barriers and facilitators to apply different strategies to enhance the engagement and motivation of stroke survivors with cognitive impairment. If not possible to do the interview in the hospital due to the COVID19 situation, you will be contacted by phone to arrange for the meeting and we will agree a conferencing programme (e.g. skype, zoom) to do the interview.
If you are still happy to take part, then you will then be asked to sign a consent form.

2. Are there any risks in taking part?

We belief there will be no risks in taking part in the study

3. Are there any benefits in taking part?

There will be no direct benefit to you from taking part in this research, but your contribution may help the current stroke Physiotherapy rehabilitation practice in Saudi Arabia by providing different strategies to enhance the engagement and motivation in rehabilitation process, thereby, enhance rehabilitation outcomes.

4. Will my time/travel costs be reimbursed?

Participants will not receive an inconvenience allowance to participate in the study

5. What happens to the data provided?

All information which is collected about you during the course of the research will be kept strictly confidential, stored in a secure and locked office, and on a password protected database. Any

information about you which leaves the institution will have your name and address removed (anonymised) and a unique code will be used so that you cannot be recognised from it.
Your personal data (address, telephone number) will be kept for be retained for 6-12 months after the study concludes to allow us to inform you of the findings of the study and possible follow-up studies (unless you advise us that you do not wish to be contacted).

All other data (research data and records) will be kept securely for 7 years. After this time your data will be disposed of securely. During this time all precautions will be taken by all those involved to maintain your confidentiality, only members of the research team will have access to your personal data.
We would also like to seek your consent so that the data may be stored and used in possible future research during and after 7 years– this is optional ().

6. What will happen if I don't want to carry on with the study?

Even after you have signed the consent form, you are free to withdraw from the study at any time without giving any reason and without your legal rights being affected. Any personal data will be destroyed.

7. Who will know that I am taking part in this research?

Data will be used for research purposes only and in accordance with the General Data Protection Regulations. Any audio digital recordings and electronic data will be anonymised with a code as detailed above. Electronic storage devices will be encrypted while transferring and saving of all sensitive data generated in the course of the research. All such data are kept on password-protected databases sitting on a restricted access computer system and any paper information (such as your consent form, contact details and any research questionnaires) would be stored safely in lockable cabinets in a swipe-card secured building and would only be accessed by the research team.

Under UK Data Protection laws the University is the Data Controller (legally responsible for the data security) and the Chief Investigator of this study (named above) is the Data Custodian (manages access to the data). This means we are responsible for looking after your information and using it properly. Your rights to access, change or move your information are limited as we need to manage your information in specific ways to comply with certain laws and for the research to be reliable and accurate.

You can find out more about how we use your information and to read our privacy notice at:

https://www.nottingham.ac.uk/utilities/privacy.aspx/

Designated individuals of the University of Nottingham may be given access to data for monitoring and/or audit of the study to ensure we are complying with guidelines.

With your consent, we will keep your personal information on a secure database in order to contact you for future studies. [*please indicate you agree to this on the consent form]*

Anything you say during an interview will be kept confidential, unless you reveal something of concern that may put yourself or anyone else at risk. It will then be necessary to report to the appropriate persons.

8. What will happen to the results of the research?

The research findings will be used to develop another study, also they will be written up as a dissertation and submitted to the University of Nottingham for the degree of Doctorate of Philosophy in Rehabilitation and Ageing. Furthermore, the findings will be submitted for publication to allow other healthcare professionals to benefit from the study. Note that you would not be identified in any such report or publication.

9. Who has reviewed this study?

All research involving people is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given favourable opinion by the Faculty of Medicine and Health Sciences Research Ethics Committee.

10. Who is organising and funding the research?

This research is being organised by the University of Nottingham and funded by Taif University.

11. What if there is a problem?

If you have a concern about any aspect of this project, please speak to the researcher Fahad Alshaibani email: msxfa18@nottingham.ac.uk. or the supervisor Professor Pip Logan email: pip.logan@nottingham.ac.uk., who will do their best to answer your query. The researcher should acknowledge your concern and give you an indication of how he/she intends to deal with it. If you remain unhappy and wish to complain formally, you can do this by contacting the FMHS Research Ethics Committee Administrator, Faculty Hub, Medicine and Health Sciences, E41, E Floor, Medical

School, Queen's Medical Centre Campus, Nottingham University Hospitals, Nottingham, NG7 2UH or via E-mail: FMHS-ResearchEthics@nottingham.ac.uk.

12. Contact Details

If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact:

Fahad Alshaibani
Division of Rehabilitation, Ageing and Wellbieng
115, B Floor, Queen medical Centre
Derby Rd, Lenton,
Nottingham NG7 2UH
Tel: 0096655
Email: msxfa18@nottongham.ac.uk.

10.8 Appendix 8: Qualitative study consent form:

University of Nottingham
UK | CHINA | MALAYSIA

Faculty of Medicine & Health Sciences
School of medicine
115, B Floor, Queen medical Centre
Derby Rd, Lenton,
Nottingham NG7 2UH

Participants Consent Form
Final version 1.0: 26.05.2020

Title of Study:
What are the facilitators and barriers to implement different strategies to enhance stroke patients with cognitive impairment engagement and motivation to physiotherapy treatment programme in Saudi Arabia? A qualitative study

REC ref: (please add when approved)

Name of Researcher:
Fahad Alshaibani, PhD student in the Rehabilitation and Ageing at the University of Nottingham.
Email: msxfa18@nottingham.ac.uk
Supervisors:
Professor Pip Logan. Email: pip.logan@nottingham.ac.uk
Dr Jennifer Yates. Email: Jennifer.Yates@nottingham.ac.uk
Dr Katie Robinson. Email: Katie.Robinson@nottingham.ac.uk

Name of Participant:

1. I confirm that I have read and understand the information sheet version number 1 dated 26.05.2020 ☐
2. for the above study which is attached and have had the opportunity to ask questions.
3. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without disadvantage. ☐
4. I understand that relevant sections of my data collected in the study may be looked at by the research group and by other responsible individuals for monitoring and audit purposes. I give permission for these individuals to have access to these records and to collect, store, analyse and publish information obtained from my participation in this study. I understand that my personal details will be kept confidential. ☐
5. I understand that the interview will be audio recorded using a digital device and that anonymous direct quotes from the interview may be used in the study reports. ☐
6. I understand that information about me recorded during the study will be made anonymous before it is stored. It will be uploaded into a secure database on a computer kept in a secure place. Data will be kept for 7 years after the study has ended and then destroyed. ☐
7. I understand that what I say during the interview will be kept confidential unless I reveal something of concern that may put myself or someone else at any risk. It will then be necessary to report this to the appropriate persons. ☐
8. I agree to take part in the above study. ☐

Name of Participant	Date	Signature
Name of Person taking consent	Date	Signature

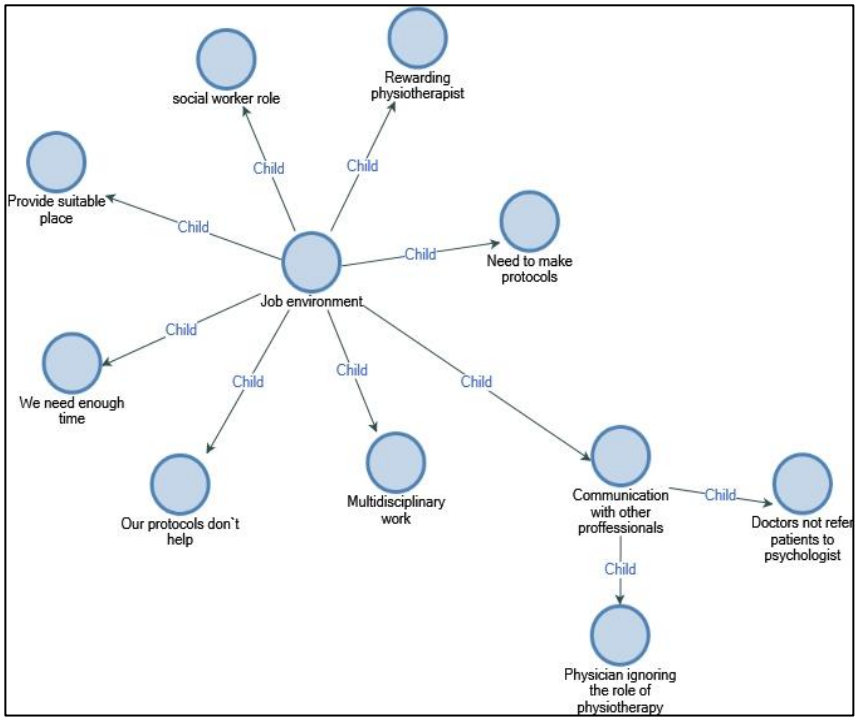
2 copies: 1 for participant, 1 for the project notes.

10.9 Appendix 9: Example of qualitative study initial codes:

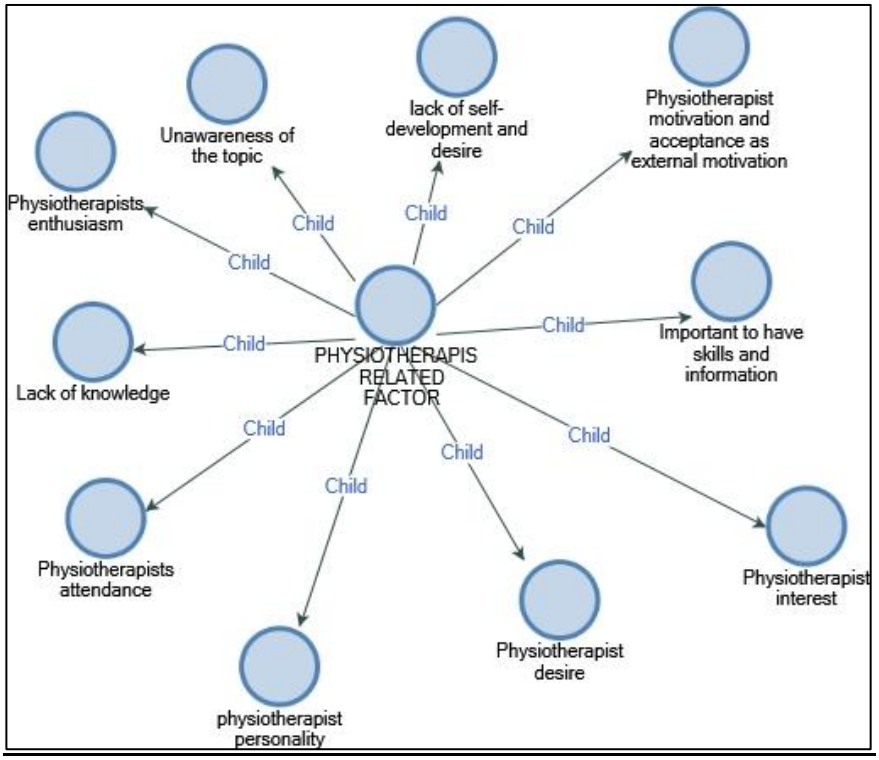
Name	Memo Link	Files	References	Created On	Created By
Accelerate results		2	2	14/09/2021 13:39	FA
Acceptance to the treatment		1	1	14/09/2021 13:39	FA
Acceptance to PT		1	1	14/09/2021 13:39	FA
according to the patient condition		1	1	14/09/2021 13:39	FA
Achieve ministry of health vision		1	1	14/09/2021 13:39	FA
Achieve satisfaction and results		1	1	14/09/2021 13:39	FA
Achieve positive outcomes		1	1	14/09/2021 13:39	FA
Achieve result		1	1	14/09/2021 13:39	FA
Activating the teamwork role		1	1	14/09/2021 13:39	FA
Acute stage		1	1	14/09/2021 13:39	FA
Add to physiotherapy service		1	1	14/09/2021 13:39	FA
Affect desire		1	1	14/09/2021 13:39	FA
Affect rehabilitation program		1	1	14/09/2021 13:39	FA
Affect result and interaction		1	1	14/09/2021 13:39	FA
Because the treatment		1	1	14/09/2021 13:39	FA
Become a discussion		1	1	14/09/2021 13:39	FA
Cognitive impairment is rare		1	1	14/09/2021 13:39	FA
Cognitive impairment means patient response		1	1	14/09/2021 13:39	FA
Difficult to engage and motivate patient		1	1	14/09/2021 13:39	FA
First thing I care about		1	1	14/09/2021 13:39	FA
It varies		1	1	14/09/2021 13:39	FA
It will greatly affect the results		1	1	14/09/2021 13:39	FA
Job environment		1	1	14/09/2021 13:39	FA
Job role		1	1	14/09/2021 13:39	FA
Lack of attention and spatial neglect		1	1	14/09/2021 13:39	FA
Lack of knowledge		1	1	14/09/2021 13:39	FA
more experience specialists		1	1	14/09/2021 13:39	FA
More facilities		1	1	14/09/2021 13:39	FA
More research and communication with expert		1	1	14/09/2021 13:39	FA

10.10 Appendix 10: qualitative study data analysis (searching for themes)

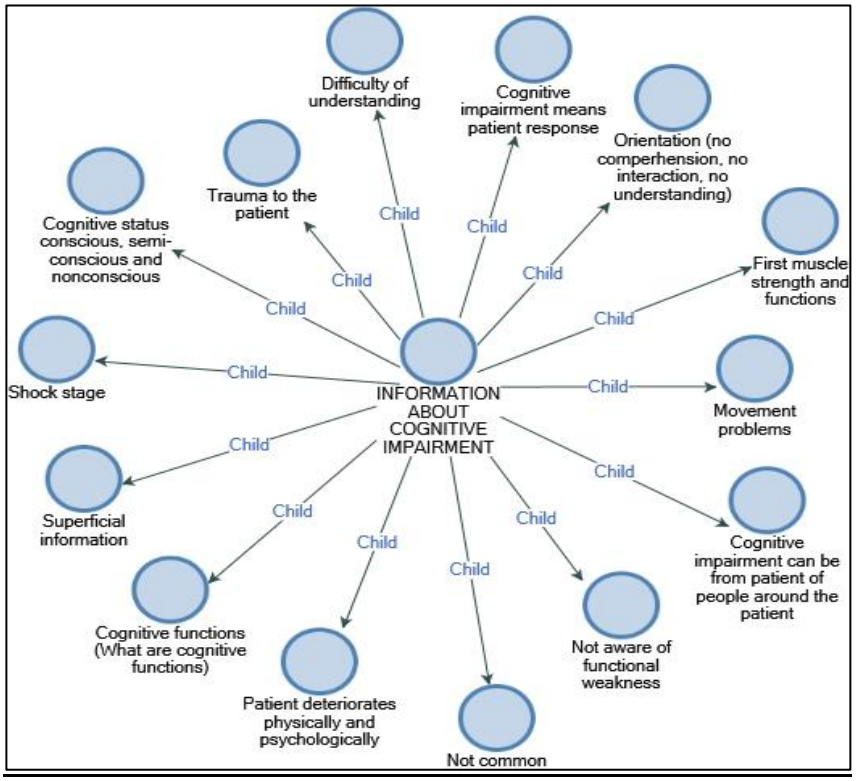
10.10.1 Example 1 of qualitative analysis categorisation process



10.10.2 Example 2 of qualitative study categorisation process



10.10.3 Example 3 of categorisation process



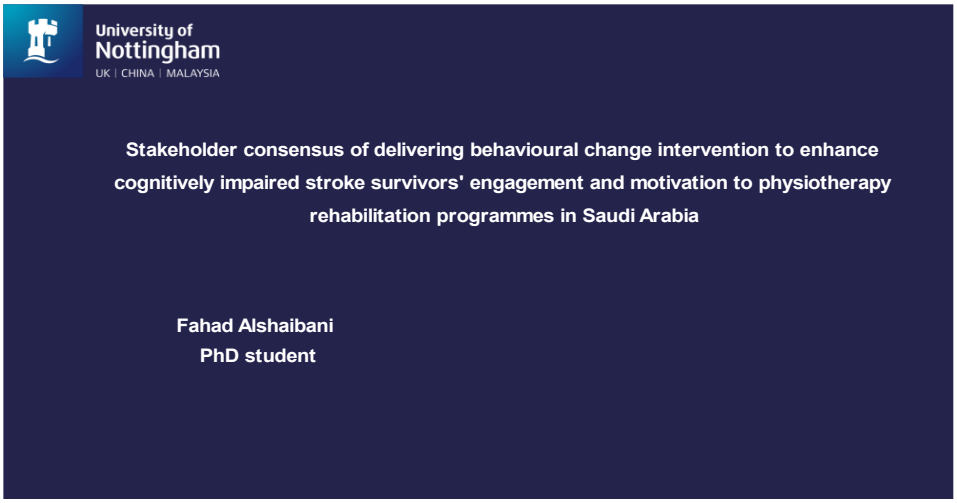
10.11 Appendix 11: BCTs taxonomy

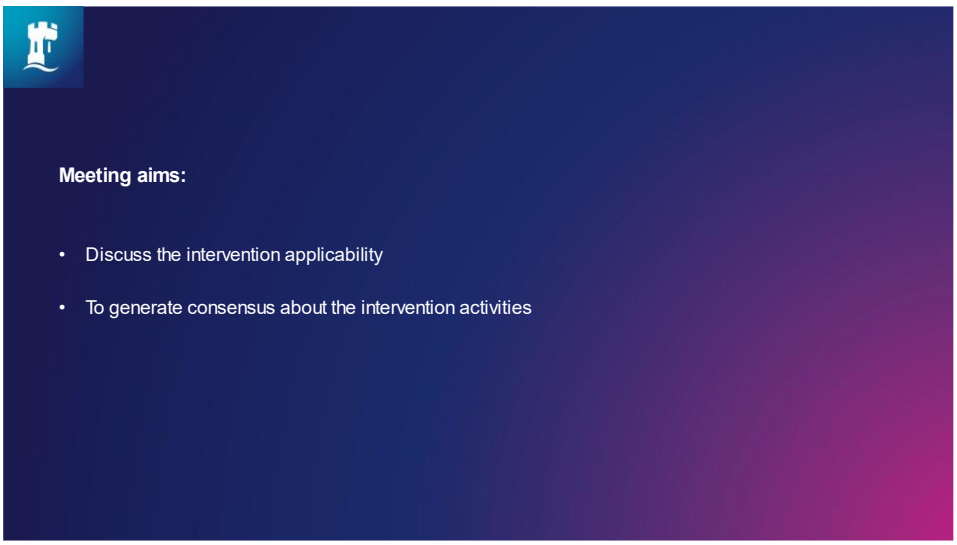
1. Goals and planning	6. Comparison of behaviour	16	12. Antecedents
1.1. Goal setting (behavior) 1.2. Problem solving 1.3. Goal setting (outcome) 1.4. Action planning 1.5. Review behavior goal(s) 1.6. Discrepancy between current behavior and goal 1.7. Review outcome goal(s) 1.8. Behavioral contract 1.9. Commitment	6.1. Demonstration of the behavior 6.2. Social comparison 6.3. Information about others' approval		12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.3. Avoidance/reducing exposure t cues for the behavior 12.4. Distraction 12.5. Adding objects to the environment 12.6. Body changes
2. Feedback and monitoring	**7. Associations**	**17**	**13. Identity**
2.1. Monitoring of behavior by others without feedback 2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour 2.4. Self-monitoring of outcome(s) of behaviour 2.5. Monitoring of outcome(s) of behavior without feedback 2.6. Biofeedback 2.7. Feedback on outcome(s) of behavior	7.1. Prompts/cues 7.2. Cue signalling reward 7.3. Reduce prompts/cues 7.4. Remove access to the reward 7.5. Remove aversive stimulus 7.6. Satiation 7.7. Exposure 7.8. Associative learning		13.1. Identification of self as role model 13.2. Framing/reframing 13.3. Incompatible beliefs 13.4. Valued self-identify 13.5. Identity associated with change behavior
3. Social support	**8. Repetition and substitution**	**18**	**14. Scheduled consequences**
3.1. Social support (unspecified) 3.2. Social support (practical) 3.3. Social support (emotional)	8.1. Behavioral practice/rehearsal 8.2. Behavior substitution 8.3. Habit formation 8.4. Habit reversal 8.5. Overcorrection 8.6. Generalisation of target behavior 8.7. Graded tasks		14.1. Behavior cost 14.2. Punishment 14.3. Remove reward 14.4. Reward approximation 14.5. Rewarding completion 14.6. Situation-specific reward 14.7. Reward incompatible behavior 14.8. Reward alternative behavior 14.9. Reduce reward frequency 14.10. Remove punishment
4. Shaping knowledge	**9. Comparison of outcomes**	**19**	**15. Self-belief**
4.1. Instruction on how to perform the behavior 4.2. Information about Antecedents 4.3. Re-attribution 4.4. Behavioral experiments	9.1. Credible source 9.2. Pros and cons 9.3. Comparative imagining of future outcomes		15.1. Verbal persuasion about capability 15.2. Mental rehearsal of successful performance 15.3. Focus on past success 15.4. Self-talk
5. Natural consequences	**10. Reward and threat**	**19**	**16. Covert learning**
5.1. Information about health consequences 5.2. Salience of consequences 5.3. Information about social and environmental consequences 5.4. Monitoring of emotional consequences 5.5. Anticipated regret 5.6. Information about emotional consequences	10.1. Material incentive (behavior) 10.2. Material reward (behavior) 10.3. Non-specific reward 10.4. Social reward 10.5. Social incentive 10.6. Non-specific incentive 10.7. Self-incentive 10.8. Incentive (outcome) 10.9. Self-reward 10.10. Reward (outcome) 10.11. Future punishment		16.1. Imaginary punishment 16.2. Imaginary reward 16.3. Vicarious consequences
	11. Regulation		
	11.1. Pharmacological support 11.2. Reduce negative emotions 11.3. Conserving mental resources 11.4. Paradoxical instructions		

10.12 Appendix 12: Implementation strategies taxonomy (n= 73)

Access new funding	Change accreditation or membership requirements	Conduct local consensus discussions	Develop an implementation glossary
Alter incentive/allowance structures	Change liability laws	Conduct local needs assessment	Develop and implement tools for quality monitoring
Alter patient/consumer fees	Change physical structure and equipment	Conduct ongoing training	Develop and organize quality monitoring systems
Assess for readiness and identify barriers and facilitators	Change record systems	Create a learning collaborative	Develop disincentives
Audit and provide feedback	Change service sites	Create new clinical teams	Develop educational materials
Build a coalition	Conduct cyclical small tests of change	Create or change credentialing and/or licensure standards	Develop resource sharing agreements
Capture and share local knowledge	Conduct educational meetings	Develop a formal implementation blueprint	Distribute educational materials
Centralize technical assistance	Conduct educational outreach visits	Develop academic partnership	Facilitate relay of clinical data to providers
Facilitation	Involve executive boards	Make training dynamic	Mandate change
Fund and contract for the clinical innovation	Intervene with patients/consumers to enhance uptake and adherence	Obtain formal commitments	Promote network weaving
Identify and prepare champions	Involve patients/consumers and family members	Organize clinician implementation team meetings	Provide clinical supervision
Identify early adopters	Make billing easier	Place innovation on fee for service lists/formularies	Provide local technical assistance
Increase demand	Model and simulate change	Prepare patients/consumers to be active participants	Provide ongoing consultation
Inform local opinion leaders	Obtain and use patients/consumers and family feedback	Promote adaptability	Purposely reexamine the implementation
Recruit, designate, and train for leadership	Shadow other experts	Tailor strategies	Use capitated payments
Remind clinicians	Stage implementation scale up	Use advisory boards and workgroups	Use data experts
Revise professional roles	Start a dissemination organization	Use an implementation advisor	Use data warehousing techniques
Use mass media	Use train-the-trainer strategies	Work with educational institutions	Visit other sites
Use other payment schemes			

10.13 Appendix 13: Stakeholder engagement study PowerPoint presentation





Agenda

- Introducing speaker and participants
- Information about the study
- Individual information share
- Group discussion
- Voting and conclusion

Research motivation

- Cognitive impairment after stroke is common
- Impact physiotherapy programme effectiveness
- Cognitively impaired stroke survivors are less motivated and engage in fewer therapeutic sessions

(Gaynor et al., 2018; Kringle et al., 2018 ; Rapolienė et al., 2018)

Project plan





Engagement and motivation strategies

Logic Model design



Behavioural Change Intervention

- Implement research evidence into practice depends on changing human behaviours at individual, organizational, and population level (NICE,2007)
- BCI define as " *coordinated sets of activities designed to change specific behaviour patterns Michie,2011)"*
- Examples:
  - Improve OA patient's adherence to PA (Willett et al., 2019)
  - Increase UL training intensity for stroke patients (Connell et al.,2015)

Behaviour change intervention

- Aim:

Improve stroke patient with CI engagement and motivation in PT programme

- Intervention activities:

Activity	Aim	Mode of delivery	Behaviour target
Educational workshops	To improve PTs knowledge and skills	Face-face	• Knowledge • Skills • Behaviour regulation
Amend protocols	To improve rehabilitation programme planning and PTs decision making skills	Protocol updating	• Reinforcement
Change PT department environment	To improve PT department physical and social culture environment	Meeting with stakeholders, provide recommendations	• Environmental context and resources • social influence • Reinforcement

References

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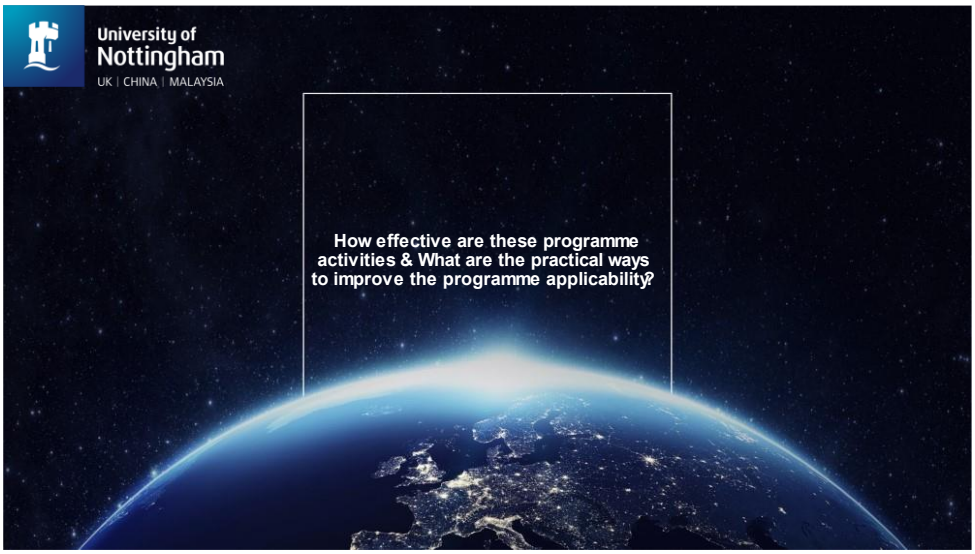

Topic Guide

Question guide:

- How effective are these programme activities & What are the practical ways to improve the programme applicability?
  - A. Educational workshop:
    - a. What are the requirements of doing educational workshop in physiotherapy department?
    - b. What content you need to have in the workshops to help you improve stroke patient engagement and motivation in therapeutic programme?
    - c. How will you support physiotherapists to use the workshop information in the clinical practice?
    - d. What is the best delivery scenario can make the workshop more effective?
  - B. Changing protocols:
    - a. What process followed to change or update protocols?
    - b. In the current stroke physiotherapy rehabilitation protocol,
      - i. what are the parts you think they wouldn`t work (and why)?
      - ii. What needs to be in there? Why?
    - c. What should the new protocol include to encourage physiotherapists to use it?
    - d. How will you know and evaluate the protocol effectiveness? What kind of measurements are currently used for protocol evaluation?
  - C. Enhance Physiotherapy department environment:
    - a. Are there any specific policies related to the stroke cases?
    - b. How easy or difficult changing the current policies in your department?
    - c. How possible is changing the department organisational (social) culture? Can you give me an example of a change in your working setting?
    - d. How possible is changing the department physical and environmental structure (e.g., equipment; provide more space; department restructuring)?

10.14 Appendix 14: Stakeholder engagement voting question

Stakeholder consensus of designing behaviour change intervention

Your opinion and vote are important for designing the intervention

* Indicates required question

1. How important are the educational workshops to increase the behavioural change intervention effectiveness ? *

Mark only one oval.

- ◯ Extremely important
- ◯ Important
- ◯ Not sure
- ◯ Not important
- ◯ Extremely not important

2. Why? *

Please feel free to answer either in English or Arabic

3. How important are the changing protocols are to increase the behavioural change intervention effectiveness ? *

Mark only one oval.

- ◯ Extremely important
- ◯ Important
- ◯ Not sure
- ◯ Not important
- ◯ Extremely not important

4. Why?
Please feel free to answer either in English or Arabic

_____

_____

_____

_____

_____

5. How important is to enhance Physiotherapy department environment to increase the behavioural change intervention effectiveness ? *

Mark only one oval.

- ◯ Extremely important
- ◯ Important
- ◯ Not sure
- ◯ Not important
- ◯ Extremely not important

6. Why?
Please feel free to answer either in English or Arabic

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