Delivering intensive rehabilitation in stroke: factors influencing implementation

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Abstract

Background

The evidence-base for stroke rehabilitation recommends intensive and repetitive task-specific practice, as well as aerobic exercise. However, translating these evidence-based interventions from research into clinical practice remains a major challenge.

Objective

To investigate factors influencing implementation of higher intensity activity in stroke rehabilitation settings

Design

A cross-sectional qualitative study.

Methods

Semi-structured interviews with rehabilitation therapists who had experience of delivering a higher intensity intervention as part of a clinical trial (DOSE), from four sites, across two provinces, in Canada. An interview guide was developed and data analysed using implementation frameworks.

Results

Fifteen therapists were interviewed before data saturation was reached. Therapists and patients generally had positive experiences regarding high intensity interventions. However, therapists felt they would adapt the protocol to

accommodate their beliefs about ensuring movement quality. The requirement for all patients to have a graded exercise test, and the use of sensors, e.g. heart rate monitors, gave therapists confidence to push patients harder than they normally would. Paradoxically, a system that enables routine graded exercise testing, and the availability of staff and equipment contribute challenges for implementation in everyday practice.

Conclusions

Even therapists involved in delivering a high intensity intervention as part of a trial wanted to adapt it for clinical practice. Hence it is imperative that researchers are explicit regarding key intervention components and what can be adapted to help ensure implementation fidelity.

Changes in therapist's beliefs and system level changes (staffing and resources) are likely to be required to facilitate higher intensity rehabilitation in practice.

Introduction

In stroke rehabilitation, best evidence is for intensive repetitive task practice[1,2]. Intensity refers to the work rate, effort level, or metabolic demand of exercise. In stroke rehabilitation, key aspects of intensity include number of repetitions and work rate[3]. The number of repetitions is an important component driving functional recovery and neuroplasticity, and may facilitate the upregulation of biomarkers such as brain derived neurotrophic factor to promote motor and cognitive recovery[4,5]. In addition to increasing repetitions, aerobic exercise has been demonstrated to be beneficial to improve both aerobic conditioning and walking capacity[6]. Therefore, cardiovascular exercise methods that consist of functional tasks, such as walking, have the potential to address both aerobic and repetitive task training elements.

Despite a range of robust evidence (including systematic reviews and meta-analyses) in support of repetitive task training and aerobic exercise[1,7-9] and the inclusion of these type of interventions recommended in guidelines[10-12], the reality is that most patients in stroke rehabilitation wards spend most of their time sitting or lying, doing very little[13,14]. A study by Rand et al[15], found that patients in the sub-acute stage post-stroke, walked a median of 63 steps during their inpatient rehabilitation physical therapy sessions, equating to only a few minutes of walking exercises and hence insufficient in terms of repetitions or work rate to drive neuroplastic changes or improve aerobic capacity. This was echoed in an observational study of therapy sessions which found patients spent a negligible amount of time (2.8+/-0.9 min) in an aerobic training zone[16]. Despite the recognition by physical therapists that aerobic exercise and hence higher intensity rehabilitation is important, clinical implementation remains challenging[17]. A small number of

studies have explored this evidence-practice gap by exploring reasons for not implementing intensive exercise[17,18]. This study aims to do the opposite; to capitalize on an opportunity to study the actual implementation of a high intensity intervention delivered by front-line physical therapists as part of an on-going clinical trial.

The Determining Optimal post-Stroke Exercise (DOSE) study is a multi-site, randomized clinical trial in progress that assesses the feasibility of implementing intensive, task-specific, physical therapy during inpatient rehabilitation[19]. Participants are individuals admitted to inpatient rehabilitation within the first 10 weeks post-stroke (typically 2-3 weeks post-stroke) who meet study eligibility criteria (adult, hemiparesis in the lower extremity, able to ambulate ≥5m with assistance, and able to understand and follow directions). Participants are randomized into one of three groups:

1. Standard Care: Standard physical therapy (PT) care
2. DOSE1: Standard PT care replaced by an innovative exercise program (1 hr/day) that focuses on blending aerobic exercise within task-specific walking activities. At least 30 minutes of this session was dedicated to upright gait-related activities in an aerobic zone, while the rest of the time could address other aspects (e.g., upper extremity function, transfers, etc).
3. DOSE2: Standard PT care replaced by two hr/day innovative exercise program (same content as Group 2). One hour is completed in the morning and 1 hour is completed after regular inpatient therapy hours.

Each treatment program is conducted five days/week for four weeks. The objective is for participants to undertake progressive, graded exercises using repetitive functional activities that challenge cardiovascular fitness, mobility, and balance. A heart rate

monitor (Mio Alpha) and step counters (Stepwatch Activity Monitor and Fitbit One) were worn during the treatment sessions to monitor progression towards 30-60 min of continuous mobility activities in an aerobic zone (≥40% heart rate reserve) using the available equipment in a standard stroke rehabilitation setting (e.g., parallel bars, treadmill). All participants received a physician supervised cardiac screening (graded exercise test) prior to enrolment in the study.

The DOSE study is a multi-site study being undertaken across four provinces in Canada. As opposed to many rehabilitation trials where interventions are delivered by research therapists employed solely on the research project, the DOSE intervention is being delivered by front-line clinicians (physical therapists and rehabilitation assistants) as part of their usual clinical care (with financial compensation for any treatment sessions conducted after regular inpatient therapy). This study aims to utilise the opportunity to explore factors influencing implementation of a high intensity intervention, using the DOSE intervention as an exemplar, but obtaining insights about the realities of implementing this kind of intervention per se into everyday clinical practice.

Methods

Study Design

A cross-sectional study design was used with data collected via semi-structured interviews. Semi-structured interviews are a widely used form of qualitative interviewing, utilising a topic guide which provides a framework for directed, though flexible, open-ended questions [20-23]. The Standards for Reporting Qualitative Research: A Synthesis of Recommendations was used[24].

Participant Selection

Eligible participants included physical therapists and rehabilitation assistants who were currently using, or had previous experience of delivering the DOSE intervention as part of a stroke rehabilitation clinical trial (ClinicalTrials.gov Identifier: NCT01915368). Sites were included if they had more than five study participants. Potential participants were identified through the lead investigator of the DOSE study (TK) and invited by email to take part in a telephone interview. Those who responded to the invitation and provided informed consent were put in contact with the research team who conducted the interview.

Data Collection

The Normalisation Process Theory and the Consolidated Framework for Implementation Research (CFIR) were used in the development of the interview guide for the study (Appendix 1), based on an interview guide that was used previously to evaluate the implementation of a stroke rehabilitation intervention [25]. Normalisation Process Theory can be used to understand the dynamic processes involved in enabling a new intervention to become embedded in routine practice[26], such as the DOSE intervention. The CFIR provides a menu of constructs that have been associated with effective implementation[27] and includes the domains: Characteristics of the individuals (therapy staff), characteristics of the intervention, inner setting (stroke rehabilitation settings), and outer setting (e.g. patients and external policy factors).

The interviews were conducted by the lead author (LC) via telephone and Skype. Participants were not known to the interviewer. Participants were informed of the

reason for the study, and were asked to consider their thoughts in relation to the DOSE intervention, but also high intensity interventions in general, and how/ if they should be implemented in clinical practice (outside of a research trial). Participants were aware that the interviewer was not part of the DOSE research team and wanted an honest perspective, to learn lessons for implementation and that criticisms were welcomed. All participants provided written informed consent and received a $100 (CDN) honorarium to compensate them for their time.

The interview guide was reviewed and piloted with researchers (n=2), and physical therapists (n=2). Interviews were digitally recorded and transcribed verbatim to enable in-depth analysis.

Researcher characteristics and reflexivity

The interviewer is a clinician-scientist, being both an experienced researcher and physiotherapist in stroke rehabilitation. As such, she was aware of a number of potential issues which may influence how well the DOSE model is implemented. To reduce any associated bias, two further qualitative researchers were involved in the analysis and interpretation of the data. The second researcher was also a physiotherapist, who trained as a Biomedical Health Scientist and specialised in Human Movement (Master of Science). The third researcher had a background in health and social services research, with no clinical training.

Data Analysis

Interview transcripts were imported into NVivo 11 for analysis. The CFIR was used to code the data, with additional free codes developed where the coding frame was

considered to have gaps. The transcripts were coded separately by the first**,** third and fourth authors. In order to establish a shared understanding and interpretation of the coding framework, all three researchers coded the same single transcript. The coded transcript was compared and any variance in interpretation of data and application of codes was discussed to arrive at a mutual decision. Three further transcripts were analysed separately and reviewed as a team to check for consistent interpretation and application of the coding framework, before remaining transcripts were coded separately.

Ethical Approval

This study was approved by the relevant university research ethics boards (UBC Behavioral Research Ethics Board H16-02449; UCLan Science, Technology, Engineering, Medicine and Health Board STEMH 560).

Results

Twenty-three potential participants from four different sites were invited to take part by email. On average the staff invited represented about a quarter to half the clinical physical therapy team at each site, with the “evening” session included therapists from not only the unit, but also within the health authority and greater physical therapy and rehabilitation assistant community**.** Four people did not reply to the email invitation and therefore the reasons for non-participation are unknown. In total, from the 19 respondents, 15 interviews were conducted across four sites from November 2016 to January 2017. Data collection ended upon achieving data saturation, which was agreed through ongoing analysis by three researchers. Participants were predominantly physical therapists (n=12), with three rehabilitation

assistants. .They had a mean age of 37 (SD 9.2) years, and had been qualified for 12.1 (SD10.0) years, specializing in neurology for 9.1 (SD 7.9) years. They provided a mixture of the day and evening DOSE intervention sessions across all the 4 sites**.** The 12 physical therapists were a mixture of seniority, with five having education to a Bachelor's degree level, six to a Masters level and one doctoral level of education. All participants felt they were working in a research supportive and research active clinical unit.

Factors, derived from the CFIR, are summarised in Table 1. The most frequently coded domain was the characteristics of the individuals (therapists) (187), followed by the intervention characteristics (147), the inner setting (121) and then the outer setting (62, of which 45 related to the patients).

<Insert Table 1 here>

These findings will now be detailed further, presented according to the CFIR domains, together with supporting quotes. Participants are identified by their participant code.

Characteristics of the Individuals

Individual's opinions towards the intervention played a large part in whether they felt it was implementable. Their self-efficacy and stage of change also influenced how likely they were to implement high intensity interventions. All therapists recognised they were from research-active departments.

Generally, therapists were positive towards the concept of intensity, but were not always sure how to actually deliver it:

D11 *"we're very keen, I think, to increase intensity, we're just not always sure how to do it…. we want to exercise them because we know it's good for brain recovery but we're worried about the heart and then we kind of go in circles"*

The beliefs of the therapists was a predominant factor influencing implementation, as recognised by **D10:**

"You wind up in this, what I think is an ethical dilemma of giving treatment that you know follows the protocol but if you were using your own clinical sessions you would not"

Therapists were not specifically asked about their treatment approach, but most people alluded to it. Five people mentioned a treatment approach, namely Bobath/ Neuro-developmental treatment[28], with only one stating they came from a Bobath background, and four stating they were not Bobath trained. The approach was talked about in terms that represented a belief system, for example, using terms like devout, and pure:

D02: "*I'm not hard-lined pure Bobath at all, and I think that it is really important to take on board things like more walking, more activity"*

This underpinned a conflict for most therapists between quantity versus quality of movement, with not believing in Bobath meaning a therapist was more inclined to implement high intensity interventions:

D10: *"I like the idea of getting people moving and refining the movement instead of the Bobath approach of they can only do it if it's perfect."*

In terms of self-efficacy, therapists felt more confident in delivering higher intensity interventions because of both the screening and monitoring involved with the DOSE protocol. The graded exercise (stress) test was recognized as a key component of the intervention, in that it both gave therapists the confidence to work patients at a higher intensity, and also was used to define heart rate parameters for the patients exercise intensity. This necessitates the requirement for heart rate monitoring to objectively measure how hard patients are working:

D05: *"I just feel confident with the stress test, so there's that medical clearance. To be able to push these patients to know they're able to achieve their max heart rate without any concern"*

D03: *"the stress test … it made me not nervous at all to treat patients"*

There were mixed opinions with regards to the implementation of higher intensity interventions outside of the study, with most therapists stating they would adapt the intervention. This was in terms of focus and how hard they would make patients work gain better movement quality (or movement control) prior to walking:

D04: *I think I would still tend to hedge upon probably maybe stepping back a bit and trying to get that better control before I did the treadmill walking"*

When asked about what they did after a patient finished the DOSE intervention but was still an in-patient: D11:

"No I did not usually carry on doing DOSE stuff. I kind of went back to things I like to do…. I think I would still do some aerobic exercise, but not as much focus on always the standing and walking pieces as we did with the DOSE."

However, some recognised their practice had already changed:

D15: "people were like, "oh when you do this protocol it will change your practice", and I was like "oh will it really?", and it really did. I don't know I think they (other therapists) have to do it themselves and then see the difference."

Intervention Characteristics

The importance of research evidence, seeing the effect of the intervention, adaptability of the protocol and the use of the graded exercise test were main contributors to the 'intervention characteristics'. Therapists discussed evidence in terms of clinically seeing an improvement, and there were conflicting opinions about the importance of research evidence:

*D10: "*a lot of the frontline therapists are not reading the primary literature. They're relying on somebody as a middle-man to tell them what the implementation looks like."

D15: "*I think the research is important. Like having articles come out that support it."*

By being involved in delivering higher intensity interventions as part of a clinical trial, therapists were given the opportunity to trial the intervention and reflect on their current practice. Though there was recognition that the trial results had not been published yet, generally therapists felt that higher intensity interventions were of benefit for their patients and that they saw an improvement:

D10: *"It was amazing sometimes when I had patients that had a stroke two months ago and they were getting more steps per day than most of the Canadian population"*

Therapists felt that to incorporate high intensity interventions outside of the study, they may need to adapt the research protocol. There was conflict with the protocol focussing on the whole task of walking with step and HR monitoring, with this being the first part of the session. Some therapists thought that "pre-gait" activities (e.g., weight-shifting, standing, trunk exercises) were essential to benefit the quality of walking, though recognised doing this first may reduce the intensity:

D13: *"one thing that I wasn't totally sold on for how the intervention happened was just doing the walking first and then having more opportunity for the pre-gait later in the session …. And I generally like the opposite, … So probably the order I would do differently if it was implemented."*

The therapists felt that since at least 30 minutes of the regular physical therapy time was used for the DOSE protocol, and standard therapy time was not extended, they still needed to accommodate all aspects of physical therapy, and sometimes there was insufficient time to do this:

D11: *"It's hard with the DOSE to fit in, if people have a lot of upper extremity pain, if you need to teach their family members transfers or practice stairs, do a home visit, and do education. I had troubles fitting that in sometimes with the DOSE."*

Graded exercise test gave therapists the advantage of knowing they could push the patient harder than they normally would have (termed by the CFIR as more radical). Paradoxically, the need for a graded exercise test and the equipment (step and heart

rate monitors and ideally body weight supported treadmills) made the intervention more difficult to implement outside of the study.

The frequency and duration of sessions was considered difficult to implement outside of the study in terms of staffing:

D12: "More staffing. …with having the extra session there's only so many of us and there's only so many hours in a day. So I definitely think if it was going to become a practice that our staffing would have to really increase"

Therapists liked the structure and graded progression of the DOSE manual and paperwork, particularly tips and a bank of sample functional exercises that might work for different patients. The structured format helped support different therapists treating the same patients:

D02: *"It's really organized, everything seems to be set out so that its very clear. So the packets with the patients is very self-explanatory, so if we're sharing care of the patients with the physio that shows up for that day, it's very easy to find out what the person did the day before"*

Inner Setting

Therapists recognised that in order to implement higher intensity interventions and the pre-requisite of the graded exercise (stress) test, it would be important to have sufficient resources, both in terms of staffing and equipment, with buy-in from the whole team and good communication networks:

D12: "with having the extra session there's only so many of us and there's only so many hours in a day. So I definitely think if it was going to become a practice that our staffing would have to really increase"

D13, "*obviously the availability of the equipment affects how much you can really do with your patients that are not in the study"*

D15, "I think the team has to be all on board because it would be a big shift in how we prioritize treatments and choose who to see and how we schedule them."

This also includes leadership engagement, to help ensure an environment which was supportive and enabling change. Participants recognised they worked in research intensive departments, which might be more open and supportive than non-research active departments:

D10: "*to actually implement this, the way that it's being designed right now, we would need buy-ins from the administrative level to be able to do the stress testing and all that"*

D12, *"Oh our manager is very into research and studies and looking into the future"*

Outer Setting

Type of patient, perceived patient's need and external policy and guidelines played important roles in the 'outer setting'.

It was recognised that not all patients were suitable for high intensity interventions, with therapists having opinions about who would benefit from this kind of intensity, with it being particularly suitable for younger patients:

D11: *"I would want to include all sorts of different people, but there's got to be a way to make it more digestible for someone who has never done exercise, because it could be really scary"*

D07: "So probably your younger population that were quite fit to begin with would be all over that type of intensity."

The patients themselves were thought to be positive towards the high intensity intervention. Therapists were often surprised at how hard patients could work and tolerate the intensive regime:

D12: "I think the clients really enjoyed it too because they left feeling that they accomplished a little bit of something that they were working hard on"

D13: "I was pleasantly surprised by how much they could push through"

External Policy & Guidelines were also mentioned. The Canadian guidelines for stroke state a graded exercise test should be undertaken which was recognised as a challenge for implementation:

D11: *"based on what I understand from guidelines they would consider it (the stress test) to be a necessity. I think the difficulty is that it's not realistic if you're thinking about implementation and how to get it into practice.."*

D08: I think it would have to be more resources given to the rehabilitation aspect of the team and I think there has to be almost…it could be a provincial level or a federal level overhaul of what rehab should be looking like for clients so that it can be approved and the infrastructure can be changed and time would allow it"

Discussion

The key factors that emerged to influence implementation were the therapists' beliefs about the intervention, together with system level factors in terms of staffing and access to resources such as the graded exercise test and monitoring equipment. This had wide-reaching implications, as no matter how many positive trials are undertaken, implementation is likely to stall without considering these wider issues.

Therapists wanted to change the content of the intervention when they implemented it in their everyday practice. Generally this involved shifting the focus away from quantity, more to quality (e.g. with pre-gait activities of part-tasks). Therapists are autonomous practitioners, with their preferred treatment methods not necessarily aligning with clinical practice guidelines. A recent study by Van Kessel et al[29], found implementation of circuit class and seven-day therapy in stroke rehabilitation was influence by individual beliefs rather than evidence. We must consider how we can influence knowledge and beliefs, especially if publications have limited influence. This challenge is worth considering when developing interventions and implementation strategies, and perhaps needs to be considered more when developing guidelines. Arguably, therapists in this study are 'early adopters'[30] and more open to the concept of intensity than the wider population of therapists. The demographics of the staff in terms of level of education and years of experience are similar to those reported in other studies of stroke rehabilitation staff [31]. However, participants still clearly expressed conflict with quality versus quantity of movement, and if or how they would continue to use high intensity interventions in their future practice. This was less evident with those therapists who did not believe in the Bobath approach. Being involved in the study and having opportunity to 'trial' the

intervention, was sufficient for some to change their beliefs. However, most intended to step back or pare down the intervention when they would use it in clinical practice. This highlights the importance of fidelity, and defining the key components and the 'adaptable periphery'[32] to guide clinicians, as we know adaptations will happen (and in fact facilitate uptake)[33]. An example highlighting this in stroke rehabilitation is a formative evaluation of the Graded Repetitive Arm Supplementary Programme (GRASP)[31], an evidence-based upper limb intervention[34]. This found that although the uptake of GRASP was good, key components of the intervention were modified when implemented by therapists in routine clinical practice. For example, when the GRASP was provided to non-stroke patients (e.g. spinal cord injury, brain injury patients); the exercises were often provided separately as opposed to providing the full manual, and the dose, when monitored, was less than the recommended amount.

The graded exercise test was reported as key to enable therapists to safely deliver a high intensity intervention, which echoed the findings in a recent Canadian survey[18]. However, due to the resources required, this does pose a considerable barrier to implementation. No studies to date have reported major adverse events that were directly attributable to the cardiovascular training[9], which presents questions whether it is a necessary pre-requisite or more to guide target heart rate zones and give therapists and patients the confidence to work harder. Existing guidelines are contradictory, for example, the Canadian and American guidelines both recommend graded exercise testing with ECG monitoring before beginning an exercise program.[6,12] Whereas the UK guidelines define aerobic exercise as; "Low to moderate intensity exercise that can be sustained for long periods of time (e.g.

cycling, swimming or walking)" and do not mention the need for pre-exercise testing.[10]

Changing clinical practice is notoriously difficult, with an often cited 17 year lag between evidence getting into everyday practice[35]. Rehabilitation interventions tend to be complex interventions, i.e. interventions comprising several components acting either independently or interdependently[36]. Successful implementation of complex interventions, such as DOSE, relies on changing the behaviours of those responsible for their implementation[36] and is correspondingly complex. Behaviours do not occur in isolation, but in a system, and as this study demonstrates, these are inter-related and multi-factoral[37]. Hence, in respect of trying to change clinical practice, it is not always clear which factor(s) to target and which to target first. Michie et al [37] propose considering the likely impact of changing the behaviour, how easy it is to change and the 'spillover' effect (positive or negative) on other behaviours. In rehabilitation, it is not clear if the target should be at the level of the therapists (e.g beliefs) or system factors (e.g. resources and staffing), or a combination of the two. Implementation research is required to explore this.

Limitations

The data collected in this study relied on the healthcare professionals' ability to recall events from a few weeks to two years prior to the interviews. Participants in this study were invited volunteers, thus introducing a self-selection bias where therapists perhaps with stronger opinions on the programme and/or its implementation are over-represented in the study findings. As the data is self-report in nature there is

also the risk of a social desirability bias. However, prior to, and during the interviews it was highlighted to participants that the interviewer was independent to the DOSE team, the data collected would be anonymised and that it would not be possible for them to be identified in the hope that they would be as candid as possible. We recognise that as an exploratory qualitative study, we have identified reported factors but cannot assume causality.

Whilst there are a number of validated higher intensity exercise programs for stroke[38,39], it is not clear at what point an intervention is 'ready' for implementation, and it has been recognised that researchers should consider implementation strategies *a priori*, ideally in partnership with the end users of the intervention.[40] Intensity per se is a key concept, and some of the issues are relevant to other intensive rehabilitation interventions, such as repetitive task training and the quantity versus quality debate.

Conclusions

Even therapists involved in delivering a high intensity intervention as part of a trial wanted to adapt it for clinical practice. Hence it is imperative that researchers are explicit regarding key intervention components and what can be adapted to help ensure implementation fidelity.

Therapist's beliefs on the need for pre-gait activities, as well as ensuring movement quality pose barriers to implementing high intensity interventions in everyday clinical practice. System level changes are likely to be required, in terms of staffing and access to resources, to facilitate higher intensity rehabilitation in practice.

Conflict of Interest statement: The Authors declare that there are no conflicts of interest.

Authors' contributions

The initial research proposal together with compiling applications for ethical approval, and designing the interview guide was developed by LC with input from TK and JE. Data collection was carried out by LC. LC, JJ, and CT undertook the analysis. All authors contributed to writing up the findings, and critically reviewing the final version for publication.

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1 Table 1: Factors influencing implementation of a high intensity intervention (DOSE)

Consolidated Framework for Implementation Research (CFIR)	
Characteristics of Individuals	
Knowledge and Beliefs	**- DOSE fit better with some people's belief system than others due to conflict with quality of movement versus quantity of movement** **- Some people's beliefs changed once they had trialled the intervention**
Self-Efficacy	**Therapists gained confidence to 'push people harder' due to:** **- The graded exercise test making them confident patients had the 'all clear'** **- Seeing patients able to work harder** **- Using heart rate monitors and step counters as objective measures**
Individual Stage of Change	**- Most individuals were in the preparation or contemplation stage of change** **- Some recognised their practise had already changed** **- Others still felt they would 'step back' to their everyday clinical practice**
Other Personal Attributes	**- Most therapists had some previous exposure to research and were keen to be involved.** **- Two participants felt obliged to take part in the trial**
Intervention Characteristics	

Evidence Strength and Quality	**- Practical experience of using the intervention tended to outweigh publications.** **- Some mention of the importance of having underpinning research**
Relative Advantage	**Graded exercise test gave therapists the advantage of knowing they could push the patient harder**
Adaptability	**Research protocol needs to be adaptable for clinical reality (e.g., more focus on upper limb/ education for some patients)** **- Therapists thought that "pre-gait" activities were essential, though recognised doing this first may reduce intensity.**
Complexity	**- Graded exercise test and the monitoring of heart rates enabled therapists to push patients harder than they normally would have (more radical).** **- The need for a graded exercise test and the equipment make the intervention more difficult to implement** **- The frequency and duration of sessions was considered difficult to implement outside of the study**
Design Quality and Packaging	**- Therapists liked the structure and detail of the manual and paperwork, particularly tips and ideas.**

	- The structured format helped support different therapists treating the same patients.
Inner Setting	
Structural Characteristics	**- Concerns regarding staffing to enable the duration of therapy outside of the study** **- Shift required in how therapists prioritize treatment and buy-in from all therapists and managers when scheduling to allow for longer sessions.**
Networks and Communication	**- Communication important to ensure treatment schedules work to allow for longer sessions**
Culture	**- Recognition that these therapists worked in research intensive departments**
Readiness for Implementation	**- Leadership engagement recognised as important to support the resources required**
Available Resources	**- Need for graded exercise test, and ideally equipment (HR monitors, step counters, treadmills, harnesses)**
Outer Setting	
Patient Needs and Resources	**- Recognition that this type of intervention will not be suitable for all (especially elderly with co-morbidities).** **- Patients generally liked the high intensity and felt they accomplished something.**

	- The therapists were surprised how hard patients worked and tolerated intensive regime.
External Policies and Guidelines	**The Canadian guidelines for stroke state a graded exercise test should be undertaken which poses a challenge for implementation**

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