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Title: Physical activity participation in community dwelling stroke survivors: synergy and dissonance between motivation and capability. A qualitative study.

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Declarations

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Abstract

Objectives: Benefits of physical activity (PA) on fitness, functioning, health and secondary prevention after stroke are compelling. However, many stroke survivors remain insufficiently active. This study explored survivors' perspectives and experiences of PA participation to develop an explanatory framework that physiotherapists and other health professionals can use to develop person-specific strategies for PA promotion.

Design: Qualitative study using semi-structured in-depth interviews. Data was audio-recorded and transcribed. Analysis followed the Framework Approach.

Setting: Community setting, interviews conducted within participants' homes.

Participants: Community dwelling stroke survivors [n=38] six months or more after the end of their rehabilitation, purposively selected by disability, PA participation and socio-demographic status.

Results: Findings suggest that survivors' beliefs, attitudes, and physical and social context generated synergy or dissonance between motivation (desire to be active) and capability (resources to be active) with regard to PA participation. Dissonance occurred when motivated survivors had limited capability for activity, often leading to frustration. Confidence to achieve goals and determination to overcome barriers, acted as activity catalysts when other influences were synergistic. We illustrate these

relationships in a dynamic explanatory model that can be used to support both novel interventions and personal activity plans.

Conclusions: This study suggests a shift is required from purely pragmatic approaches to PA promotion towards conceptual solutions. Understanding how synergy or dissonance between motivation and capability influence individual survivors' behaviour will support physiotherapists and other health professionals in promoting PA. This study provides a model for developing person-centred, tailored interventions that address barriers encountered by stroke survivors.

Introduction

Stroke is a global health problem. Annually 16 million stroke events occur worldwide and 62 million stroke survivors live with stroke consequences [1]. Stroke causes motor and functional impairment, restricting participation in social and leisure activities, negatively influencing survivors' quality of life [2]. Risk of stroke recurrence is high, at 26% five years post-stroke [1].

Regular participation in physical activity (PA) can ameliorate recurrence, improve functional mobility, walking capacity [3], muscle strength [3], bone density [4] and quality of life [5]. Stroke guidelines recommend survivors undertake three aerobic, flexibility and strengthening exercise sessions per week for health benefits [6]. In response, post-rehabilitation exercise services have been developed, often led by physiotherapists. Despite such developments, around 70% of survivors undertake minimal post-rehabilitation PA [7], causing low fitness levels compared to age-matched peers. This deconditioning compounds stroke effects, worsening physical disability [6]. Understanding beliefs, attitudes, barriers and facilitators to PA behaviour is therefore vital.

Previous qualitative studies and surveys highlight *pragmatic* and clinical barriers and facilitators to PA, including physical effects of stroke, social and instrumental support, transport availability, and costs [8-10], however beliefs and attitudes, which are important determinants of PA, have not been fully explored after stroke [10] . Existing evaluations of barriers to PA were conducted mainly with African American populations [11], with survivors within other studies [12], members of existing stroke

groups [12] or conveniently selected ambulatory survivors [13-15]. These studies may not present sufficiently diverse perspectives to fully understand the challenges faced by survivors. Views of survivors purposefully selected to have diverse disabilities, age ranges and socio-demographic status should thus be elicited.

Physiotherapists frequently play a role in PA promotion after stroke. Our previous qualitative study shows that physiotherapists often see survivors' PA motivation as un-modifiable and report little expertise in addressing survivors' motivation and health behaviours [16]. Those views seem to influence how physiotherapists' promote PA with survivors; particularly their efforts to support survivors whom they believe have low motivation. Therefore, if physiotherapists are to successfully support stroke survivors to be active, they require the skills to fully understand and explore issues survivors face to participation in PA.

This study explored attitudes, beliefs, barriers and facilitators to PA of a purposefully selected sample of survivors, to seek to understand influences on PA participation. Specific research questions were:

- What are stroke survivors' beliefs about the role and importance of PA in stroke recovery?
- What are survivors' experiences, beliefs and attitudes towards PA after rehabilitation and what meanings do they ascribe to PA?
- What barriers and facilitators to participation in PA do survivors experience? How do these influence decisions to engage in PA?

We also aimed to develop an explanatory model to enhance understanding of PA after stroke and to guide development of tailored, acceptable PA interventions within physiotherapists' scope of practice.

Methods

A qualitative design was used to explore stroke survivors' beliefs, experiences and barriers to PA [17, 18]. In-depth interviews allowed interviewees' responses to be probed and clarified, providing data grounded in interviewees' lives. We also conducted focus groups with carers and physiotherapists. Comparison between physiotherapists' and survivors' views is reported elsewhere [16].

East of Scotland Research Ethics Service granted ethical approval (reference 10/S1401/47).

Sampling and Recruitment

Community dwelling stroke survivors were eligible for participation six months after discharge from rehabilitation, if able to provide informed consent. We sampled by gender, age, physical disability and deprivation to capture views from survivors for whom these factors may have influenced PA participation [19].

Community stroke liaison nurses from two Scottish health boards sent invitation letters to 260 potential participants. The study researcher contacted ninety respondents by telephone for screening, and preliminary match to sampling criteria. The researcher (TO) was a female health psychologist experienced in qualitative

research in healthcare settings . Full screening for those matching sampling criteria was conducted at participants' homes before interview. Screening tools for sampling criteria [20-24] are described in Supplementary Information, Table A. Previous work [25] suggested we would reach the point at which no new ideas emerge with 30-40 participants; therefore target recruitment was 36 participants.

Data Collection

Face-to-face semi-structured interviews of one hour were conducted by TO at participants' homes, with 38 survivors. Two participants were interviewed using Talking Mats Framework [TMF]®*, a communication tool adapted to match topic guides [26]. Interviews were audio recorded and TMF® interviews were video-recorded. All were fully transcribed.

Topic guide

The topic guide (see Supplementary Information, Table B) drew on psychological concepts known to influence health behaviours. Leventhal's Common-Sense Model of Illness Representation (CSM) suggests beliefs about cause and consequences of illness inform how individuals develop coping strategies and action plans to deal with their illness, and how they appraise expected outcomes [27]. We examined these concepts in relation to stroke and physical activity. We also drew on the concept of self-efficacy within Bandura's Social Cognitive Theory, concerned with confidence to achieve expected outcomes [28]. Self-efficacy is known to influence uptake and maintenance of PA [6]. Although drawing on the concepts, we were not limited by them, and also examined barriers and facilitators more generally, aiming to maintain

an essentially inductive approach. Emerging issues were included in subsequent interviews, maintaining an inductive approach. Documented field-notes also informed data interpretation.

Data Analysis

Framework Approach [29, 30] guided data analysis and NViVO 9 software facilitated data organization. Framework was selected because it is particularly useful for conducting applied qualitative research and for analysis by teams of researchers. TO read and coded transcripts according to a) initial research questions b) explanatory theoretical concepts described above. She was also alert to emergent issues. Two additional researchers [JM, TK] applied coding to nine transcripts each, providing inter-coder verification and establishing agreement about the coding framework. We opted to review the eighteen transcripts to ensure participants across the sampling framework were represented, and that half the transcripts were reviewed by two researchers. Researchers next aggregated codes into higher order themes informed by research questions, apriori theoretical concepts and emerging issues. The thematic framework was applied to all transcripts by TO. Themes were agreed and added as they emerged from subsequent interviews until all transcripts were indexed. Data were summarised and inserted into thematic charts organised by case, major themes and sub-themes[29] . The final thematic framework was refined by agreement between all researchers [JM, TO, TK, SJ, BW]. Constant comparison across themes and between cases ensured systematic data comparison for mapping and refinement of higher order concepts[29]. New relationships between concepts were sought until our final conceptual model was defined. Where disagreements

occurred, researchers clarified concepts and searched transcripts to inform accurate text interpretation. Analytical themes are presented in Supplementary Information, Table C, and in a final conceptual model Figure 1. A final group session with stroke survivors [n=5] and carers (n=4) established credibility, accuracy and completeness of our interpretation [18].

Results

Participant Characteristics

We recruited 19 male and 19 female participants aged between 23 and 85 years, and 8 months to 30 years post-stroke (Table 1). Twenty-one participants were categorised by Carstairs Index as having high socioeconomic status, and Barthel Index scores ranged from 60 to 100, denoting diverse physical disabilities.

Findings

Barriers and facilitators coalesced around motivation (defined as 'desire to be active') and capabilities (defined here as 'resources to be active'). These concepts emerged from survivors' attitudes and experiences of PA, and their physical, social and environmental context. Survivors appeared to experience motivation and capability as synergistic or dissonant, and interaction between motivation and capability seemed to determine survivors' PA participation. Dissonance occurred when motivated survivors had limited capability for PA, causing frustration, or, when survivors had capability but little desire for activity. Confidence to achieve goals and determination to overcome barriers acted as activity catalysts when other influences

were synergistic. Below, we explain concepts before illustrating in an explanatory model their influence on PA participation.

Influences on Physical Activity Motivation

Beliefs, experiences and attitudes to PA and stroke recovery

Beliefs and attitudes ascribed to PA reflected its value relative to stroke recovery, which in turn influenced motivation.

PA as incidental to recovery

Many survivors viewed stroke recovery as a natural process over which they had little control (Table 2, quote a). Some survivors, often older, only participated in PA that was integrated and incidental to everyday living. Intentionally engaging in PA to enhance recovery was uncommon, and activity was associated with "getting by" in everyday life (Table 2, Quote b). Attitudes stemmed from the mental and physical effort of PA that was additional to already difficult lives (Table 2, Quote c).

Insert Table 2 about here

PA as central to recovery

Other survivors prioritised PA as structured, planned exercise. They were often younger, motivated to participate in organised exercise, with clear expectations of physical benefits, despite disability (Table 2, Quote d). They attributed stroke to

medical conditions or lifestyle behaviours that could be ameliorated by PA. Consequently, PA appeared important for recovery and future prevention, and benefits were relevant to post-stroke life.

PA as a social facilitator

Some survivors, often younger, expressed social and occupational drivers for recovery, including family, work, and social roles, representing desire for fulfilling lives. PA was thus prioritised for its potential to facilitate participation in wider life roles despite effort involved (Table 2, Quote e).Other survivors expressed more direct social benefits of PA. These survivors enjoyed PA, viewing it as pleasurable activity and were motivated by return to the social sense of self that it offered (Table 2, Quote f) or because it passed time (Table 2, Quote g).

Role of pre-stroke PA behaviour

These beliefs were frequent if survivors had undertaken pre-stroke PA, saw it as part of their identity and *expected* physical benefits of PA to influence recovery, (Table 2, Quote h). However, attempts to return to pre-stroke activities were sometimes undermined by frustration resulting from lost skills. Failure to achieve expected benefits sometimes led to loss of enthusiasm (Table 2, Quote i). Conversely, survivors who had never been active did not see PA as part of their identity, making purposeful engagement unlikely (Table 2, Quote j).

In summary, beliefs about stroke cause, recovery, enjoyment and expectations of benefits influenced desire, or motivation to participate, beyond daily tasks.

Although physical disability influenced actual activity, many survivors were motivated, irrespective of disability, if other drivers were strong.

Perception of Capability for Physical Activity

Translation of motivation into actual activity appeared dependent on perceptions of capability for PA. Capability stemmed from appraisal of internal and external influences representing barriers or facilitators to activity. *Intrinsic influences* included physical effects, emotional and cognitive responses to stroke, and confidence in an individual's ability to engage in any specific activity. *Extrinsic influences* included support from others, and environmental barriers or facilitators. These influences are described below with exemplary quotes in Table 3.

Insert Table 3

Intrinsic Influences on capability

Direct effects of stroke

Physical effects of stroke, including weakness and balance problems, influenced perceived capability, presenting barriers to activity. Several survivors also reported that communication difficulties reduced their confidence to attend organised classes. Physical effects of stroke were often compounded by co-morbidities or fatigue, which limited capability, preventing even motivated survivors from being active (Table 3, quote a).

Cognitive and emotional effects of stroke

Mood

The influence of mood on survivors' PA stemmed sometimes from post-stroke depression and in some cases from previous mental health problems. Many survivors experienced low post-stroke mood, or depression, negatively influencing perceived capability for PA. This was sometimes related to perceptions of physical and social impacts of stroke, (Table 3, quote b). In contrast, some survivors with pre-existing mental health problems prioritised PA to maintain and improve mood, as they had done pre-stroke, and they saw achieving and maintaining capability for PA as vital to their wellbeing.

Fear

Fear of negative consequences of PA also influenced perceived capability for PA and could prevent survivors from translating motivation into action. Fear often stemmed from perceptions of poor balance and possibility of falling (Table 3, quote 5c). For others, fear of another stroke caused by PA was weighed against concern of inactivity causing another stroke. This led to careful consideration before committing to PA. Development of coping strategies around fear was important (Table 3, quote 5d).

Embarrassment

Embarrassment stemmed from survivors' self-consciousness about exercising in public places and how others might perceive them. The gym environment, with mirrors and emphasis on conforming to images of physical perfection exacerbated

307 embarrassment and many survivors were uncomfortable exercising or even going
308 there (Table 3, quote e).
309
310 *Psychological influences*
311
312 *Confidence*
313 Confidence commonly influenced PA participation. Where survivors felt confident to
314 try activities, physical disabilities presented doubts about success, generating
315 caution. Where attempts at activity were unsuccessful, confidence was lowered,
316 perceived capability for PA undermined, and motivation was lost. In this way,
317 capability and motivation were linked (Table 3, quote 5f). Conversely, survivors
318 became confident by mastering difficult activities. Success translated to confidence
319 in general capability to be active, enhancing motivation (Table 3, quote g).
320
321 *Determination*
322 Determination to overcome stroke and recover sense of self was linked to
323 confidence. This expression of willpower enhanced perceived capability and
324 motivated some survivors, even those with severe disability, to engage in activity to
325 overcome stroke. In turn, confidence or self-efficacy improved and motivation to
326 continue was enhanced. Younger survivors with family commitments commonly
327 expressed determination, but older survivors also demonstrated determination for
328 recovery (Table 3, quote h). Some older survivors simply accepted their situation
329 however (Table 3, quote i). Their capability *and* motivation were affected by co-
330 existence of age, co-morbidity, disability and limited interest in PA.

Extrinsic influences on capability

Social Support

Role of Health Professionals

Participants viewed health professionals, particularly physiotherapists as facilitators of PA. However therapy could be facilitatory or frustrating. It was time-limited, and self-management advice was not always provided. Frustration was common when physiotherapists did not tailor self-directed exercises to survivors' disabilities (Table 3, Quote j). Conversely, effective self-management support for PA enhanced survivors' capability and confidence (Table 3, quote k).

Role of family members

Family often provided instrumental support to enable motivated survivors to be active. However survivors valued this support in different ways. Over-protective family appeared to undermine survivors' autonomy, which sometimes led to resentment (Table 3, quote l). Some family members were directive, which whilst resented by some, spurred others to activity because it reflected normal interactions within relationships (Table 3, quote m). Survivors valued caring approaches that supported their autonomy to be active in ways they desired (Table 3, quote n).

Role of other survivors

Opportunities for PA with other survivors were valued and enhanced perceived capability to be active. Other survivors provided moral support and were viewed as role models for what could be achieved. Seeing others recover, provided survivors

with a frame of reference for their own recovery potential (Table 3, quote o). However, some survivors, typically male, preferred to exercise alone, reporting this as their lifelong preference (Table 3, quote p).

Environmental Influences

Environmental barriers to PA stemmed from transport availability and accessibility (Table 3, quote q), lack of knowledge of opportunities, high costs of organised activity, inclement weather and inconvenient timing of opportunities (Table 3, quote r). These were pragmatic barriers to capability influencing whether participants shifted from motivation to activity.

Synergy and Dissonance between Motivation and Capability

Many survivors overcame pragmatic barriers to PA through adjusted expectations of what was possible (Table 3, quote s). However, where performance of previously valued activities was perceived unsatisfactory, dissonance between motivation and capability for PA could cause *frustration* (Table 3, quote t). In response, some survivors selected more achievable activities; others expressed determination to overcome barriers (Table 3, quote u); whereas those with fewer concrete beliefs about PA and recovery, just accepted limitations and frustration as part of post-stroke life (Table 3, quote v). In contrast, where capability and motivation were synergistic and barriers could be overcome, survivors chose to be active despite physical and other challenges (Table 3, quote w).

Discussion

Synergy and dissonance between motivation and capability appear critical to understanding stroke survivors' attitudes to PA, as we illustrate in our explanatory model (Figure 1). Our model (Figure 1) illustrates the dynamic nature of these interactions and provides a framework to inform physiotherapists' understanding of PA participation that will guide development of person-centred approaches facilitating survivors' PA.

Although motivation and capability have been previously identified as influencing post-stroke PA [15, 31] we believe our model provides a more nuanced explanation of interactions between pragmatic and conceptual issues faced by survivors. Findings suggest addressing survivors' beliefs about PA, by providing information about its role in stroke recovery, coupled with motivational, behavioural and pragmatic support to address capability, will enable physiotherapists to better facilitate survivors' PA participation. The findings endorse recommendations that skills to understand and support behaviour change should be within physiotherapists' toolkit [32].

As predicted by Leventhal's model [27], which in part informed our topic guide, survivors with few coherent beliefs about stroke cause, prevention and recovery appeared least likely to prioritise PA, and least motivated to address barriers influencing their capability for PA. This passive synergy between motivation and capability meant they were unlikely to use PA as a coping strategy for recovery.

Others, whose stroke beliefs supported PA, created synergies between motivation and capability leading to PA participation, often despite limiting disabilities. Findings illustrate complex influences on survivors' motivation and illustrate why physiotherapists must understand how survivors' beliefs influence their behaviour.

Data also illustrated how confidence to overcome *pragmatic, environmental* barriers to PA, such as transport and negotiating leisure centres, appeared to influence perceived capability. Confidence to address barriers in turn enhanced *motivation* for activity, illustrating the synergistic relationships between motivation and capability. As we predicted, the finding aligns with Bandura's social cognitive theory [28], which proposes self-efficacy, or confidence to *successfully* undertake activities, determines motivation *and* translation of motivation into behaviour. Physiotherapists are important facilitators of PA after stroke [16, 33]. Our data suggests exploring survivors' self-efficacy for PA and finding activities survivors can successfully undertake despite disabilities, will enhance physiotherapists' facilitation of behaviour change.

Although not anticipated apriori, self-determination was an emergent theme within our analysis. Survivors with high determination reported being motivated to overcome diverse barriers to PA capability, leading to synergy between motivation and capability that facilitated activity. The finding aligns with Deci's self-determination theory [34] in proposing that autonomous determination for outcome achievement predicts sustained activity. Self-determination theory has been shown in a systematic review of motivational interviewing in physiotherapy to be a

successful way to improve adherence to physiotherapy-led PA in other conditions [32]. Our findings endorse the importance to physiotherapists of understanding the role played by self-determination in PA after stroke, and suggest this theory should also inform physiotherapists' assessment of survivors' attitudes and beliefs about PA, and the development of new tailored interventions to support survivors' PA.

Frustration occurred when survivors reported dissonance between high motivation and low capability. The finding aligns with another qualitative study involving five young stroke survivors, in suggesting frustration emerges from tension between desire for recovery and limitations imposed by stroke-related impairment [35]. For physiotherapists, ascertaining outcomes survivors want to achieve from PA, and addressing barriers to achievable goals may foster determination and generate synergy between motivation and capability. This may require physiotherapists to be creative in seeking activities that enable participation despite limited physical capability.

Age seemed to influence determination, with older survivors citing effort and old age as accepted limitations to capability. Such acceptance of age-related limitations may reflect adjustment to declining capabilities as life progresses [36, 37]. The challenge to physiotherapists is to promote PA by seeking to understand older survivors' motivation and tailoring strategies to address attitudes and barriers faced by older survivors.

Reflecting other qualitative studies, cost, transport, opportunities, and inclement weather were external barriers to capability [12, 38]. Congruently, systems wide approaches, drawing on socio-ecological models, linking health, social care, sport and leisure services, and design of accessible environments are necessary to provide accessible options for survivors irrespective of age, demographic status, weather and personal preferences [10, 33, 39]. Physiotherapists are key players in facilitating development of systems-wide approaches through their links between health, social care, leisure and public health [33]. Our model paves the way for physiotherapists to contribute to these larger systems by providing a dynamic, fine-grained evaluation of PA barriers faced by survivors.

Physiotherapists are key professionals for PA promotion after stroke. They therefore have responsibility to understand multi-layered barriers to physical activity facing survivors and how motivation and capability interact to influence survivors' PA. Applying the model to PA promotion after stroke, will better equip physiotherapists to understand why survivors choose to be active or not.

Implications for research, practice and policy

Future research should develop and test tools to assess interactions between motivation and capability to support physiotherapists to facilitate survivors' uptake of PA as part of stroke recovery following rehabilitation. Our model provides unique information for development of a new assessment tool. The tool will enable physiotherapists to explore with their patients the PA barriers that are explicitly explained within our model. Our model provides unique information for

development of a new assessment tool. The tool will enable physiotherapists to explore PA barriers with their patients in in-depth ways that physiotherapists have not previously had the skills to do. The tool will be linked to a shared decision-making algorithm to guide therapists and survivors towards, evidence-based solutions to PA participation, individualised to survivors' situation and context. Assessing and addressing survivors' motivation and capability thus will enhance physiotherapists' skills in behaviour change and facilitate development of new strategies to translate PA intentions into actions. Developing and testing new stroke specific behavioural interventions to integrate our model with existing behaviour change interventions, and within appropriate socio-ecological frameworks requires future research. Collaborative approaches with survivors, their families and physiotherapists to ensure fit with current practice and diverse health and social care contexts are required. Furthermore, policy makers must provide accessible environments, transport and appropriate facilities to address pragmatic barriers to activity faced by survivors.

Limitations and Strengths

We sought diverse survivor views through purposive sampling; however nurses may have introduced recruitment bias by selecting survivors they considered most appropriate. Our structured topic guides sought to elicit comprehensive data however, participant accounts may have been reframed by retrospective bias. Nonetheless, this study enhances previous PA barriers research by providing a conceptual and pragmatic framework for physiotherapists' facilitation of PA.

Conclusion

Promoting PA after stroke requires evaluation of nuanced synergies between motivation and capability and a conceptual and pragmatic shift towards interventions that achieve synergy between these concepts. Our model will support physiotherapists' assessment of barriers and facilitators to PA and inform development of person-centred interventions to promote survivors' sustained participation in PA for health and recovery after stroke.

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631 Figure 1.

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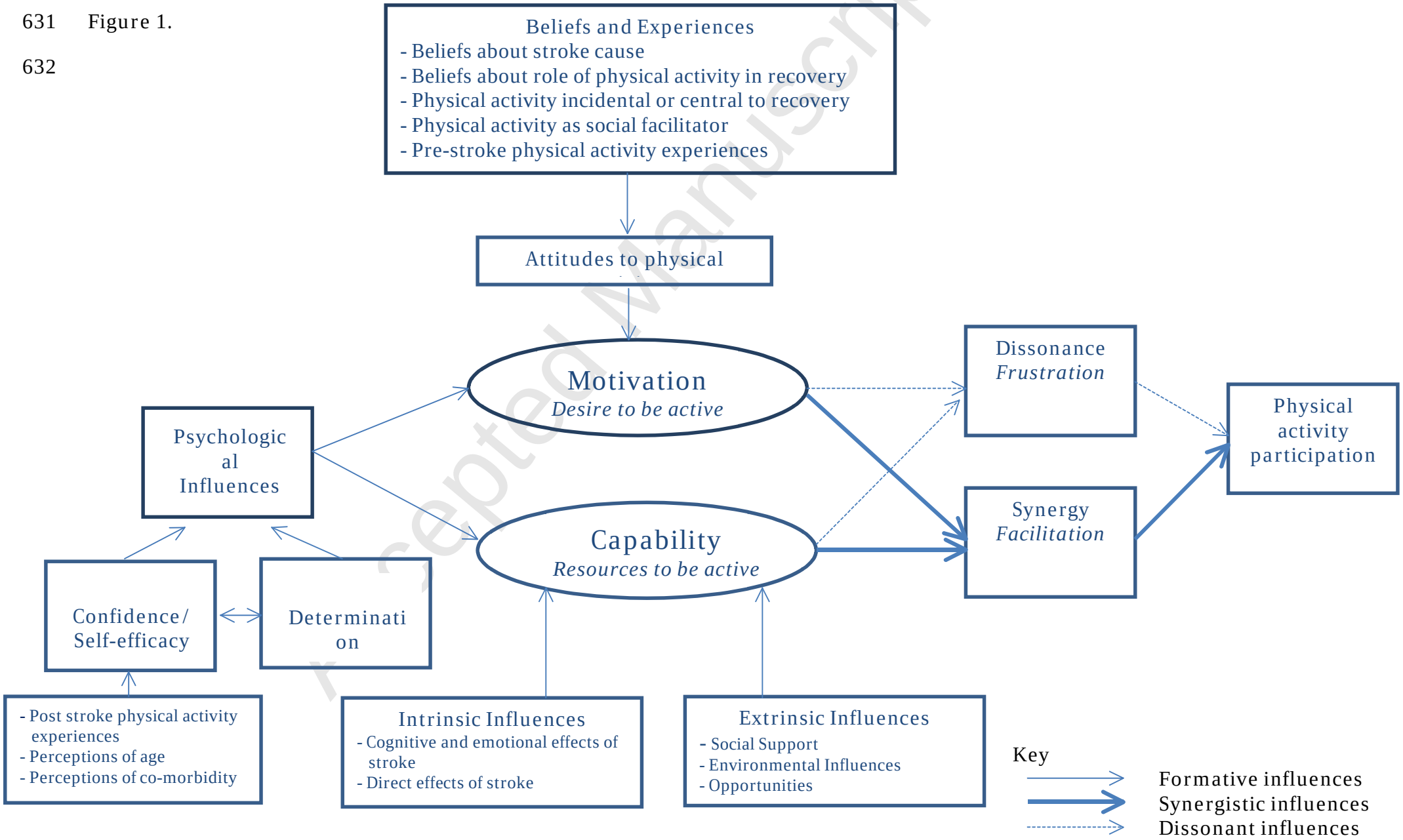

Figure 1. Conceptual framework of influences on physical activity participation after stroke

Table 1. Participant Characteristics: Stroke Survivors (n=38)

	Males (n)	Females (n)
Gender	19	19
Age (years)		
20-40	0	1
41-60	3	4
61-80	14	12
80+	2	2
Carstairs Deprivation Index		
Low SS (mean =0)	7	10
High SS (mean >0)	12	9
Barthel Index		
Low disability (Barthel index =100)	10	9
High disability (Barthel Index <100)	9	10
Time since stroke (months)		
6-12	9	5
13-24	2	7
24+	7	8
Activity level PASIPD score		
High	10	9
Low	9	10

Table 2. Quotes illustrating influences on motivation

Influences on PA motivation	Content	Exemplar Quotes
Beliefs, experiences and attitudes to PA and stroke recovery	Perceptions about mechanisms of recovery and associated activities	
PA incidental to recovery	Control of recovery low, motivation for structured PA low, type of activity limited to household tasks and personal care	*Quote a) It is because, you see, I don't know, when I had the stroke but I would say its just gradual isn't it....is it not one of these things that varies with each individual person....." (Female 73, high disability, low SS, low activity)* *Quote b) "Well, it could be anything, it might be writing, kneeling or your carpet, reaching up, kneeling down, cleaning your windows, dusting, doing the carpet" (Female survivor, 79, low disability, low SS, high activity)* *Quote c) When somebody's pushing you on, fine, but then I'm not going to be any quicker. By doing more exercise, I 'm not going into the shop three times quicker than I did yesterday or the day before...I'm sitting here saying to myself 'I should get up and do so and so' but in my mind I just can't do that (Male survivor 68) ".*
PA central to recovery	Control of recovery high, motivation high, PA organised and structured for physical benefits	*Quote d) All the things which I needed to improve, your diet, to lower your cholesterol, you know modify your drinking, you need to, to increase your exercise, all the things you can do and I really seriously took all those things on board when I, before I got out the (hospital name) and I gave myself a talking to about how I needed to change my life, which I really needed to do and it was just that, so I wouldn't have another stroke..." (Male survivor 65, low disability, high SS, high activity)*
PA as Social Facilitator	PA as a motivator for return to valued and enjoyable social and occupational activities	*Quote e) I'm lucky I've got children and they want a mum so you've just got to get on with it....I mean, that's what I did to start with was literally shuffle down the road.....Well, you can be so sore sometimes. You're in agony but you've just got to keep pushing on through it (Female survivor, 44, high disability, high SS, high activity)* *Quote f) Physical activity is playing golf or walking the dogs or sociable, no rules, no regulations, you just do it for enjoyment (Male survivor, 54, high disability, high SS, low activity)* *Quote g) Just something to do. There's nothing worse than sitting watching that television every day. I'd rather be out doing a bit of something round the garden or even go for a walk. (Male, survivor 74, low disability, low SS, low activity).*
Pre-stroke PA Behaviour	Role of PA in pre-stroke identity as motivator	*Quote h) I am highly motivated, I was fit anyway and so exercise wasn't an issue for me...I think that is the only reason I have made a full recovery is because of what I was before (Male, 65, low disability, high SS, high activity)* *Quote i) " I did curl a wee while ago...I wanted to try and see, but..., I couldn't shift the stone that way ...so I jumped back from playing third to playing fifth, which is a much lower level...but I was still frustrated by my lack of ability on the ice...I went down last Friday and I was inspired to go back again just meeting some of the guys again. (Male,70, low disability, low SS, high activity)* ***Quote j)*** *Well, I suppose I could go in for walks and things like that, but I've just never in my life done that. It's not one for that (Female, 68, low disability, low SS, low activity)*

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Intrinsic Influences on PA Capability	Content	Exemplar Quotes
Direct Effects of the stroke	Influence of physical effects of stroke	*Quote a) God I would love that. If you could take the tiredness away, I mean and my arm was not so heavy and my leg, I'd jump back at it in two minutes (Female survivor stroke survivor, 39 years, high disability, low socio-demographic status, low activity)*
Emotion	Affective factors that influence physical activity	
Mood	Negative emotional response to stroke that influences physical activity	*Quote b) I never really picked up right after the stroke, I was quite happy just shutting the blinds and pretending there was no one in…you think oh well okay then if I can't go out I can't go out, and then I think you just kind of get into a habit and you can't climb out of it you know." (Female survivor stroke survivor, 75 years, high disability, high socio-demographic status , high activity).*
Fear	Fear of negative consequences of PA	*Quote c) I think it makes you more cautious and a little bit scared. It's very easy for you to lose your balance, so to be able to go out for a walk, you think, 'I've got a walking stick, I can go,' but sometimes you lose your balance so there's a fear of that and there's a big fear of falling and you can't pick yourself up." (Female survivor, stroke survivor, 70, high disability, high socio-demographic status , high activity)*
		Quote *d) I think you have a fear. You have a fear of having another one and you don't really know what your body is capable of. You know that you've overdone it to get to this stage and I think it would be very easy to go back… So, I've now got a fear but I still think you need to have exercise. (Female survivor, 52, high socio-demographic status low disability, high activity)*
Embarrassment	Self-consciousness of effects of stroke on body when exercising	*Quote e) Embarrassed about going to the gym? I would at first and it's basically because there's a lot of mirrors in that specific gym and you're aware of seeing the difference, the way you walk, the way you move. People don't physically see the imperfections but you know they're there and it just make you more self-conscious. (Female survivor stroke survivor, 39 years, high disability, low socio-demographic status, low activity)*
Psychological Factors	Beliefs that influence PA behaviour	
Confidence	Perception that physical activity participation and goals can be successfully achieved	*Quote f) …I didn't feel confident with the personal trainer who specialised in strokes. She was just very abrupt…Telling me, 'Oh you'll get this back.' Yes, I know I'll get this back, 'Oh you'll be able to do this, you'll be able to do that.' She was giving me timelines and stuff like that and I thought, 'You're just pushing too hard too fast… so I kind of never went back.'" (Female survivor 43, high disability, high socio-demographic status , high activity)* *Quote g) I could incorporate a short walk there and short walk back, which is all good exercise as well for me and builds up your confidence, which is a must after a stroke. It's getting confident to do things. I find the first time you do it, you are a wee bit apprehensive, but then you've done it. You've achieved it and the feeling is brilliant, so you don't think twice about doing it again. It's just a case – it's like going up a ladder (Female survivor 72, high disability, high socio-demographic status , high activity)*
Determination	Resolve to overcome the effects of the stroke	*Quote h) That's difficult because it's all your own personal determination. You may not do it the same way as you used to do it, but as long as you get it done, that's all that matters. An awful lot is your own self-determination. (Female survivor survivor, low disability, low socio-demographic status, low activity)* *Quote i) I can't do the things I want to do, again age comes into it, I'm at an age that no matter what I want there's certain things I'm never going to do because of my age so the thing is to feel pleasant within yourself, relaxed in your muscles and that. (Male survivor, 78 years, high disability, low socio-demographic status , high activity)*

Table 3. Quotes illustrating intrinsic and extrinsic influences on PA

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Extrinsic Influences on PA Capability	Content	Exemplar Quotes
Social Support		
Role of Health Professionals	Physiotherapists or other health professionals who support survivors with PA	*Quote j) "I often wish I could do a bit better at some of the exercises I get from the physio, you know like stretching your arm up to put on a wall, but then frustration gets to you because your arm doesn't move the way you want it…I'm not complaining about the phyiso I've been given, but it's just been difficult doing it when you're just on your own." (Female survivor stroke survivor 43 years, high disability, high socio-demographic status, high activity)*
		Quote k) I go to physio……she said but you're going to the gym because she was only doing what the gym would be doing she said because of your balance….we can only give you exercise which was great, it helped a lot and I just kept on going." (Male stroke survivor, 61, low disability, high socio-demographic status high activity)
Role of Family Members	Members of survivors' families who were perceived to help or hinder PA participation	
Over-protective		*Quote l) She was wanting to come and do everything for me without me saying that I needed it. She would be here every day, she'd be doing hoovering, she'd be doing ironing. I felt as though she was infringing on my life." (Female survivor survivor, 68 years, low disability, high socio-demographic status, low activity)*
Directive		*Quote m) She's constantly saying "you've no been on that bike for ages … I says "well aye … ", I says "but I'll go back on it, I will" … so it keeps you, it does, ken what I mean?(Male stroke survivor, 72, high disability, high socio-demographic status , low activity*)
Facilitatory		*Quote n) Oh yes they're really good, they'll say go oh you can do it yourself you know they're like that, you can do it yourself, you don't need me to do it for you… that it's like they basically only just feed me and leave me, everything else I have to do myself …- (Female survivor stroke survivor, 45, high disability, high socio-demographic status , high activity)*
Role of other survivors	Other survivors as role models for recovery	*Quote o) it gives you an insight…I was maybe be four months into the stroke…and you were seeing people that was years into it and it gives you that knowledge of well hang on a minute we'll have to take less of a push on it, let's sit down and see what we're going to do…you saw the people struggling to do it and they'd had it for a while you know so I thought that was one of the things that really said to me look let's sort it out and take our time, you know I'll get there some time." (Male survivor 69 years, high disability, high socio-demographic status, high activity)*
		Quote p) No I don't think so, I've always been a loner, I've never been a communal person….I stay active on my own…because I don't like other people really(Male survivor 54 years, low disability, low socio-demographic status, high activity)
Environmental Influences	Factors in the physical environment that influenced PA participation	*Quote q) I can't do buses… because I can't balance on them. You have to have somebody with you, because otherwise you fall. I've tried it and unless the driver sees you, they don't wait on you and you just get shoved and it's no use for me. (Female survivor, 68, low disability, high socio-demographic status, low activity)*
		Quote r) I think that would be better if there was ones (classes) in the evening…there was that one on a Saturday and we thought would've been better …but that was his time…if there was more available I think I would probably do more you know. (Female survivor 52 years, low disability, high socio-demographic status , low activity)

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Extrinsic Influences on PA Capability (Continued)	Content	Exemplar Quotes
Synergy and Dissonance between motivation and capability		
Synergy	Synergy: matching between desire and capability, even where capability has changed	*Quote s) Obviously what I can and can't do has changed but I would say my attitude towards it has not changed, I think it's still important you know but I would say like it has physically changed obviously....I still try and do as much as I can like, you know"* (*Female survivor 44 years, high disability, high socio-demographic status , high activity)*
Dissonance	Dissonance; the mismatch between what survivors desired to achieve and what they actually could achieve	*Quote t) I've stopped going to Scottish Old time dancing because I can't do it properly and I used to be in a Scottish country dance team where I did it properly and it just frustrates me that I can't do it properly. The same with tap dancing....so I've stopped doing that." (Female survivor 69 years, low disability, low socio-demographic status, low activity)*
Frustration	The emotion experienced where dissonance between motivation and capability occurred	*Quote u) Frustration is your biggest problem to overcome and it really is, because everything you face seems to be a conflict of what I used to do and what I can't do. You can't make a happy medium, because you're so limited with what you can do.* (Male survivor 68, low disability, *low socio-demographic status high activity*) *Quote v) Well it maddens me really not being able to do things that I usually did but you've just got to get on with it. (Female survivor, 85 years, low disability, low socio-demographic status , low activity)* *Quote w) Because I want to get better and I think that's where the determination comes from, the fact that you want to get better so you do the things you're supposed to do in the hope that they will work, although it takes sheer bloody-mindedness at times. (Male, 78, high disability, high socio-demographic status, high activity)*

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