

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

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

3

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31

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36

37 Declarations

38

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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.

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67 Introduction

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

73

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

84

85 Previous qualitative studies and surveys highlight pragmatic and clinical barriers and  
86 facilitators to PA, including physical effects of stroke, social and instrumental  
87 support, transport availability, and costs [8-10], however beliefs and attitudes, which  
88 are important determinants of PA, have not been fully explored after stroke [10].

89 Existing evaluations of barriers to PA were conducted mainly with African American  
90 populations [11], with survivors within other studies [12], members of existing stroke

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

95

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

104

105 This study explored attitudes, beliefs, barriers and facilitators to PA of a purposefully  
106 selected sample of survivors, to seek to understand influences on PA participation.

107 Specific research questions were:

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

114

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

118

119 Methods

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

125

126 East of Scotland Research Ethics Service granted ethical approval (reference  
127 10/S1401/47).

128

129 Sampling and Recruitment

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

134

135 Community stroke liaison nurses from two Scottish health boards sent invitation  
136 letters to 260 potential participants. The study researcher contacted ninety  
137 respondents by telephone for screening, and preliminary match to sampling criteria.

138 The researcher (TO) was a female health psychologist experienced in qualitative



139 research in healthcare settings . Full screening for those matching sampling criteria  
140 was conducted at participants' homes before interview. Screening tools for sampling  
141 criteria [20-24] are described in Supplementary Information, Table A. Previous work  
142 [25] suggested we would reach the point at which no new ideas emerge with 30-40  
143 participants; therefore target recruitment was 36 participants.

144

145 Data Collection

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

151

152 Topic guide

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

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

166

167 Data Analysis

168 Framework Approach [29, 30] guided data analysis and NVIVO 9 software facilitated  
169 data organization. Framework was selected because it is particularly useful for  
170 conducting applied qualitative research and for analysis by teams of researchers.

171 TO read and coded transcripts according to a) initial research questions b)

172 explanatory theoretical concepts described above. She was also alert to emergent

173 issues. Two additional researchers [JM, TK] applied coding to nine transcripts each,

174 providing inter-coder verification and establishing agreement about the coding

175 framework. We opted to review the eighteen transcripts to ensure participants

176 across the sampling framework were represented, and that half the transcripts were

177 reviewed by two researchers. Researchers next aggregated codes into higher order

178 themes informed by research questions, apriori theoretical concepts and emerging

179 issues. The thematic framework was applied to all transcripts by TO. Themes were

180 agreed and added as they emerged from subsequent interviews until all transcripts

181 were indexed. Data were summarised and inserted into thematic charts organised by

182 case, major themes and sub-themes[29]. The final thematic framework was refined

183 by agreement between all researchers [JM, TO, TK, SJ, BW]. Constant comparison

184 across themes and between cases ensured systematic data comparison for mapping

185 and refinement of higher order concepts[29]. New relationships between concepts

186 were sought until our final conceptual model was defined. Where disagreements

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

192

193 Results

194

195 Participant Characteristics

196 We recruited 19 male and 19 female participants aged between 23 and 85 years, and  
197 8 months to 30 years post-stroke (Table 1). Twenty-one participants were  
198 categorised by Carstairs Index as having high socioeconomic status, and Barthel  
199 Index scores ranged from 60 to 100, denoting diverse physical disabilities.

200

201 Findings

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

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

213

#### 214 Influences on Physical Activity Motivation

215

216 Beliefs, experiences and attitudes to PA and stroke recovery

217

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

220

221 PA as incidental to recovery

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

228

229 Insert Table 2 about here

230

231 PA as central to recovery

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

235 medical conditions or lifestyle behaviours that could be ameliorated by PA.

236 Consequently, PA appeared important for recovery and future prevention, and

237 benefits were relevant to post-stroke life.

238

239 PA as a social facilitator

240 Some survivors, often younger, expressed social and occupational drivers for

241 recovery, including family, work, and social roles, representing desire for fulfilling

242 lives. PA was thus prioritised for its potential to facilitate participation in wider life

243 roles despite effort involved (Table 2, Quote e). Other survivors expressed more

244 direct social benefits of PA. These survivors enjoyed PA, viewing it as pleasurable

245 activity and were motivated by return to the social sense of self that it offered (Table

246 2, Quote f) or because it passed time (Table 2, Quote g).

247

248 Role of pre-stroke PA behaviour

249 These beliefs were frequent if survivors had undertaken pre-stroke PA, saw it as part

250 of their identity and expected physical benefits of PA to influence recovery, (Table 2,

251 Quote h). However, attempts to return to pre-stroke activities were sometimes

252 undermined by frustration resulting from lost skills. Failure to achieve expected

253 benefits sometimes led to loss of enthusiasm (Table 2, Quote i). Conversely,

254 survivors who had never been active did not see PA as part of their identity, making

255 purposeful engagement unlikely (Table 2, Quote j).

256

257 In summary, beliefs about stroke cause, recovery, enjoyment and expectations of

258 benefits influenced desire, or motivation to participate, beyond daily tasks.

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

261

### 262 Perception of Capability for Physical Activity

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

270

271 Insert Table 3

272

### 273 Intrinsic Influences on capability

274

275 Direct effects of stroke

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

282

283 Cognitive and emotional effects of stroke

284 Mood

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

293

294 Fear

295 Fear of negative consequences of PA also influenced perceived capability for PA and  
296 could prevent survivors from translating motivation into action. Fear often stemmed  
297 from perceptions of poor balance and possibility of falling (Table 3, quote 5c). For  
298 others, fear of another stroke caused by PA was weighed against concern of  
299 inactivity causing another stroke. This led to careful consideration before committing  
300 to PA. Development of coping strategies around fear was important (Table 3, quote  
301 5d).

302

303 Embarrassment

304 Embarrassment stemmed from survivors' self-consciousness about exercising in  
305 public places and how others might perceive them. The gym environment, with  
306 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.



331

332 Extrinsic influences on capability

333 Social Support

334 Role of Health Professionals

335 Participants viewed health professionals, particularly physiotherapists as facilitators

336 of PA. However therapy could be facilitatory or frustrating. It was time-limited, and

337 self-management advice was not always provided. Frustration was common when

338 physiotherapists did not tailor self-directed exercises to survivors' disabilities (Table

339 3, Quote j). Conversely, effective self-management support for PA enhanced

340 survivors' capability and confidence (Table 3, quote k).

341

342 Role of family members

343 Family often provided instrumental support to enable motivated survivors to be

344 active. However survivors valued this support in different ways. Over-protective

345 family appeared to undermine survivors' autonomy, which sometimes led to

346 resentment (Table 3, quote l). Some family members were directive, which whilst

347 resented by some, spurred others to activity because it reflected normal interactions

348 within relationships (Table 3, quote m). Survivors valued caring approaches that

349 supported their autonomy to be active in ways they desired (Table 3, quote n).

350

351 Role of other survivors

352 Opportunities for PA with other survivors were valued and enhanced perceived

353 capability to be active. Other survivors provided moral support and were viewed as

354 role models for what could be achieved. Seeing others recover, provided survivors

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

358

359 Environmental Influences

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

365

366 Synergy and Dissonance between Motivation and Capability

367

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

378

379

380 Discussion

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

387

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

397

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

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

407

408 Data also illustrated how confidence to overcome pragmatic, environmental barriers  
409 to PA, such as transport and negotiating leisure centres, appeared to influence  
410 perceived capability. Confidence to address barriers in turn enhanced motivation for  
411 activity, illustrating the synergistic relationships between motivation and capability.

412 As we predicted, the finding aligns with Bandura's social cognitive theory [28], which  
413 proposes self-efficacy, or confidence to successfully undertake activities, determines  
414 motivation and translation of motivation into behaviour. Physiotherapists are  
415 important facilitators of PA after stroke [16, 33]. Our data suggests exploring  
416 survivors' self-efficacy for PA and finding activities survivors can successfully  
417 undertake despite disabilities, will enhance physiotherapists' facilitation of  
418 behaviour change.

419

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

427 successful way to improve adherence to physiotherapy-led PA in other conditions  
428 [32]. Our findings endorse the importance to physiotherapists of understanding the  
429 role played by self-determination in PA after stroke, and suggest this theory should  
430 also inform physiotherapists' assessment of survivors' attitudes and beliefs about  
431 PA, and the development of new tailored interventions to support survivors' PA.

432

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

442

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

449

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

460

461 Physiotherapists are key professionals for PA promotion after stroke. They therefore  
462 have responsibility to understand multi-layered barriers to physical activity facing  
463 survivors and how motivation and capability interact to influence survivors' PA.

464 Applying the model to PA promotion after stroke, will better equip physiotherapists  
465 to understand why survivors choose to be active or not.

466

467 Implications for research, practice and policy

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

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

489

#### 490 Limitations and Strengths

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

497

498

499 Conclusion

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

506

507

508 The authors have no conflicts of interest to disclose.

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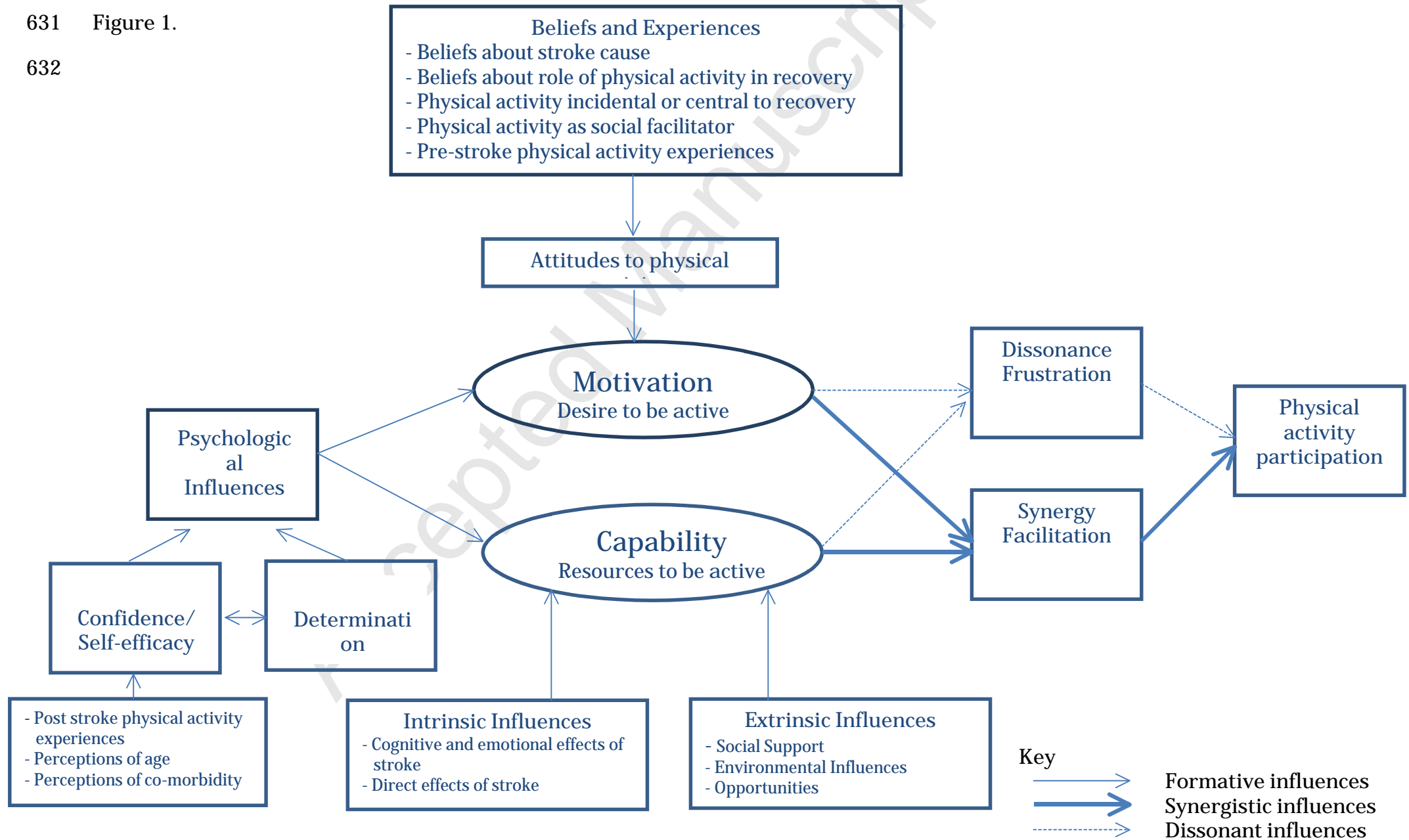
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631 Figure 1.

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

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637 Table 1. Participant Characteristics: Stroke Survivors (n=38)  
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	Males (n)	Females (n)	639
Gender	19	19	641
Age (years)			642
20-40	0	1	643
41-60	3	4	644
61-80	14	12	645
80+	2	2	646
Carstairs Deprivation Index			647
Low SS (mean =0)	7	10	648
High SS (mean >0)	12	9	649
Barthel Index			650
Low disability (Barthel index =100)	10	9	651 652
High disability (Barthel Index <100)	9	10	653 654
Time since stroke (months)			655
6-12	9	5	656
13-24	2	7	657
24+	7	8	658
Activity level PASIPD score			659
High	10	9	660
Low	9	10	661 662

Table 2. Quotes illustrating influences on motivation

Influences on PA motivation	Content	Exemplar Quotes
<u>Beliefs, experiences and attitudes to PA and stroke recovery</u>	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	<p>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)</p> <p>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)</p> <p>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) ".</p>
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	<p>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)</p> <p>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)</p> <p>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).</p>
Pre-stroke PA Behaviour	Role of PA in pre-stroke identity as motivator	<p>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)</p> <p>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)</p> <p>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. <del>33</del> not one for that (Female, 68, low disability, low SS, low activity)</p>

Intrinsic Influences on PA Capability	Content	Exemplar Quotes
<u>Direct Effects of the stroke</u>	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)
<u>Emotion</u>	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)
<u>Psychological Factors</u>	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
<u>Social Support</u>		
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 physio 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 hovering, 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)
<u>Environmental Influences</u>	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
<u>Synergy and Dissonance between motivation and capability</u>		
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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