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RESEARCH ARTICLE

A survey of physical activity (PA) across the stroke pathway of care: physiotherapists' routine practice and knowledge

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ABSTRACT

Background: Stroke research mainly focuses on ambulant participants attending supervised exercise interventions, delivered by physiotherapists, that are not informed by behaviour change theory or measured accurately. It is not clear whether the findings are reflected in clinical practice across the stroke pathway.

Objective: This survey investigated physiotherapists' practice, knowledge, training and understanding of PA interventions across the stroke pathway of care.

Design: An online self -administered 26-item survey was completed by physiotherapists working in the stroke population across the United Kingdom (UK) and Republic of Ireland (ROI).

Results: 77 valid responses were analysed. Tailored individual exercise (28% $n=21$) was the most common PA intervention description and Treadmill training, the least common. Walking ability (68%) and Berg balance scale (62%) were the most common outcome measures reported to measure PA. Lack of time ($n=50$) and services to signpost to ($n=48$) were the most reported barriers to providing PA interventions.

Conclusions: We showed that physiotherapists have good awareness of, but mixed knowledge on, the PA guidelines, and valid measures of daily PA. In terms of implementation, there continues to be a focus on tailored exercise, particularly in non-ambulant people with stroke. Common barriers to the implementation of PA interventions across the stroke pathway were lack of time, limited community services to signpost to, and low patient responsiveness. Future studies should explore knowledge gaps in more detail, and address the barriers to implementation of PA in people with stroke.

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Physical activity; stroke; exercise; physiotherapists; survey

Background

Stroke is a global health concern, affecting over 110 million people worldwide [1] Physical activity (PA) plays a crucial role in stroke prevention and reducing the risk of recurrent strokes [2]. Despite secondary prevention of stroke being important to stroke survivors [3], individuals with stroke tend to have low levels of PA, measured in steps per day, compared to healthy older adults [4]. This lack of PA can be attributed to various factors, including reduced mobility in stroke survivors [5]. In contrast, numerous studies have demonstrated positive outcomes of PA interventions, including PA promotion, on clinical endpoints such as mobility, function, and pain in the stroke population [6–11].

Physiotherapists working in stroke rehabilitation have a significant opportunity to contribute to the physical functional recovery of stroke survivors, given the importance of stroke rehabilitation, as well as promoting wellness through PA promotion. However, a recent scoping review has shed light on the complexities surrounding the terminology, type, and measurement of PA interventions in stroke rehabilitation research, as well as the characteristics of the participants involved [12]. The scoping review findings indicated that research on the stroke population primarily focuses on ambulant stroke survivors attending supervised exercise interventions delivered by physiotherapists. However, these interventions often lack the incorporation of behaviour change theory and accurate measurement [12]. It has been established that attending supervised exercise alone does not lead to sustained increases in subsequent PA unless there is a behavioural component [13,14]. "Behavioural components" refer to intervention strategies or elements aimed at promoting behaviour change in individuals, specifically in the context of PA interventions. Despite these findings, it remains uncertain whether the observations from the scoping review are reflected in clinical practice across the stroke pathway. Therefore, this survey aims to investigate physiotherapists' practice, knowledge, training, and understanding of PA interventions, including PA promotion, throughout the stroke pathway of care.

Research objectives

Objective 1: To determine physiotherapist knowledge of PA across the stroke pathway of care and identify if this knowledge is reflective of our scoping review.

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Objective 2. To explore physiotherapist current practice across the stroke pathway of care including barriers to implementation of PA interventions

Methods

Sample

This was a cross sectional online survey study of physiotherapists working in the United Kingdom (UK) and Republic of Ireland (ROI) who treat patients who have sustained a stroke. Physiotherapists who were not currently or had not previously worked with the stroke population in any setting in either the UK or ROI or who were not registered with The Health and Care Professions Council (HCPC) (UK), or Regulating Health and Social care Professionals (CORU) (ROI) were excluded from the study. The study protocol was reviewed and approved by Ulster University Ethics Filter committee [FCNUR-22-019].

Participants were recruited credibly and anonymously, by distributing the survey link via email lists of professional special interest group networks of the Chartered Society of Physiotherapists (CSP) e.g. Association of chartered physiotherapists working in Neurology (ACPIN), Irish Society of Chartered Physiotherapists (ISCP) and via social media advertisement.

Survey development

The survey consisted of seven sections with a total of 26 questions (supplementary material 1). All survey questions and most of the response choice development ($n = 22$ questions) were informed by a process of literature review (scoping review**)** and reflection [15] (Table 1). Qualtrics software, version June 2022 [16] was used to format the survey layout and to allow for automated raw data retrieval. We employed a mixture of open, closed, and vignette questions. To understand whether PA intervention approaches varied across the stroke pathway of care, we included vignette questions that used Likert scales across four categories: acute non-ambulant, acute ambulant, chronic non-ambulant, and chronic ambulant. The survey and item structure followed best practices [15] by starting with participant demographic questions (3 questions) and then addressing the remaining questions (22 questions) aligned with the research aim and objectives. To minimise the burden on physiotherapists, the survey was designed to be completed in less than 10 min on average. Participation was voluntary, and all survey responses were anonymous.

The draft questionnaire underwent a pilot test for clarity and understanding of the questions by four physiotherapists who represented the study population. Based on the pilot feedback, some formatting changes were made, including the addition of a signposting introduction to section six of the survey and the removal of randomised allocation of answers.

Data analysis

Demographic details were analysed for trends and patterns in responses. Analysis focused on descriptive statistics using

Table 1. Survey development outline.

Survey section/questions	Alignment to scoping review: Participant response options	Alignment to scoping review: Question content
Objective 1: To determine physiotherapist knowledge of physical activity across the stroke pathway of care and if this knowledge is reflective of the research arena		
		✓
Section 2 (Question 5): Description of the term 'physical activity intervention'	13 intervention options	✓
Section 3 (Question 6): Beliefs of exercise provision only, increasing physical activity		✓
Section 4 (Question 7): Choice of physical activity measurement	13 measurement options	✓
Section 5 (Question 22): Understanding of physical activity training/ education		✓
Objective 2: To explore physiotherapist current practice behaviours across the stroke pathway of care including barriers to implementation of physical activity interventions		
Section 6 (Questions 8–20): Choice of physical activity intervention based on four vignettes: acute ambulant, acute non-ambulant, chronic ambulant and chronic non-ambulant.	13 intervention options	✓
Section 7 (Question 21): Choice of implementation barriers to providing physical activity interventions for the stroke population	11 barrier options	✓

A seven-section table which aligns the survey objectives to the survey question content and participant response options.

Microsoft excel [17]. Descriptive statistics (counts, medians, percentages) were used to summarise the sample responses to each closed question. Open questions generated qualitative data; this was entered into the NVIVO software [18] to allow for analysis. This was analysed by coding responses and grouping them together to create themes, allowing for comparisons in participants' answers. All coding and themes were completed independently by the chief investigator and one other member of the research team (NK).

For question five, non-parametric statistics were used. A median rank and percentage as first rank were calculated for each response. A lower median rank (e.g. 1 or 2 out of 15) or high percentage as first rank indicated a high level of consensus among respondents. To explore the correlation pattern between first rank order and percentage first rank, Spearman's rank analysis was utilised to determine any association. The level of significance was set at $p < .05$. Statistical tests were carried out using Statistical Package for the Social Sciences for Windows, Version 28 [19]

Results

Survey activity

The survey remained open for a duration of 13 weeks, during which a total of 121 individuals completed the survey. Out of these responses, 77 were considered valid and included in the analysis. Valid responses were defined as those in which participants completed all questions, except for one or more demographic questions (questions 1–3). Specifically, 70 respondents completed 100% of the survey, providing comprehensive data for analysis. It is worth noting that a subset

of surveys was identified as invalid due to participants not progressing beyond the initial section, which consisted of participant demographic questions. The completion rate for each question can be found in Table 2, providing an overview of the response rates for the survey items.

Demographics of participants

The demographics of the participants revealed that most respondents (32%, *n* = 24) had between 6–10 years of experience working with the stroke population, followed by 0–5 years of experience (21.5%, *n* =16). In terms of the setting in which participants work, a majority of respondents were from England (61%, *n* = 45/74), followed by Northern Ireland (15%, *n* = 11) and the Republic of Ireland (13%, *n* = 10). Fewer respondents were from Scotland (7% *n* = 5) and Wales (3% *n* = 2), while one participant did not specify their location. Regarding healthcare settings, the respondents were evenly distributed across secondary care (34% *n* = 25/74) and community care (33% *n* = 24/74), with a smaller proportion working in primary care (20% *n* = 15/74). Private care and other settings had fewer respondents.

> Objective 1: To determine physiotherapist knowledge of PA across the stroke pathway of care and if this knowledge is reflective of the research arena

Physiotherapists' knowledge of the UK PA Guidelines was assessed. The results showed that a majority of respondents (92% *n* = 66/72) were aware of the guidelines. However, just over a third had not read them (35% *n* = 25/72) with a small number not aware of the UK guidelines (8% *n* = 6). Instead, some participants (7% *n* = 5) were familiar with other unspecified PA guidelines. When considering the components of the guidelines, most respondents (81% *n* = 57/70) knew that 150 min of moderate-intensity PA is recommended each week. However, less than half (39%, *n* = 27/70) were aware of the recommendation for 75 min of vigorous activity. Additionally, only one-third (37%, *n* = 26/70) of respondents knew about the requirement for muscle-strengthening activities.

Table 2. Completion rate of each survey question.

Survey Question	Completion rate	Survey Question	Completion rate
Demographics of participants		Section 6 Choice of physical activity intervention based on four vignettes: acute ambulant, acute non-ambulant, chronic ambulant and chronic non-ambulant (Questions 9–20)	
1: Approximately how many years of experience do you have working as a physiotherapist?	n= 70/77	9: This question relates to acute non-ambulant patients. Do you currently treat this population in your current caseload?	n= 75/77
2: Approximately how many years of experience do you have working as a physiotherapist with the stroke population?	n= 75/77	10: An acute (within 6 weeks) stroke patient is currently non-ambulant, medically fit and have no cognitive deficits. Considering your current routine practice, which of the following interventions would you most likely use?	n = 60/77
3: Which nation do you currently work?	n = 74/77	11: State any other interventions you use that are not listed	n = 5/77
4: Which health care setting do you mainly work in?	n = 74/77	12: This question relates to acute ambulant patients. Do you currently treat this population in your current caseload?	n = 73/77
Section 1 Knowledge of physical activity guidelines (Questions 23–26)		13: An acute (within 6 weeks) stroke patient is currently ambulant, medically fit and have no cognitive deficits. Considering your current routine practice, which of the following interventions would you most likely use?	n = 58/77
23: Are you aware of the UK Physical Activity Guidelines?	n = 72/77	14: State any other interventions you use that are not listed	n = 4/77
24: It is recommended that adults aged 18–64 years engage in how many minutes of moderate intensity physical activity every week?	n = 70/77	15: This question relates to chronic non-ambulant patients. Do you treat this population in your current caseload?	n = 73/77
25: As an alternative to moderate intensity, it is recommended that adults aged 18–64 years engage in how many minutes of vigorous intensity physical activity every week?	n = 70/77	16: A chronic (over 4 months) stroke patient is currently non-ambulant, medically fit and have no cognitive deficits. Considering your current routine practice, which of the following interventions would you	n = 56/77
26: In addition to moderate/ vigorous intensity, it is recommended that adults aged 18–64 years engage in how many minimum days per week of muscle-strengthening activities?	n = 70/77	17: State any other interventions you use that are not listed	n = 3/77
Section 2 Description of the term 'physical activity intervention' (Question 5)		18: This question relates to chronic ambulant patients. Do you currently treat this population in your current caseload?	n = 74/77
5: Please rank the answer choices in order of which most accurately describes what you understand by the term 'physical activity intervention', 1 (top) being the most accurate.	n= 75/77	19: A chronic (over 4 months) stroke patient is currently ambulant, medically fit and have no cognitive deficits. Considering your current routine practice, which of the following interventions would you likely initially consider.	n = 56/77
Section 3 Beliefs of exercise provision only, increasing physical activity (Question 6)		20: State any other interventions you use that are not listed	n = 4/77
6: Do you believe providing an exercise intervention only to people with stroke increases their physical activity?	n = 72/77	Section 7 Choice of implementation barriers to providing physical activity interventions for the stroke population (Question 21)	
Section 4 Choice of physical activity measurement (Question 7)		21: As part of current routine practice, do you experience any of the following barriers to providing physical activity interventions for the stroke population? Tick all that is relevant	n = 70/77
7: Do you use the following to measure physical activity?	n= 76/77	NB: Question 8 is a statement of reference and did not require a response: *'We are about to present 4 vignettes, based on the following: acute ambulant, acute non ambulant, chronic ambulant and chronic non ambulant.'*	
Section 5 Understanding of physical activity training/ education (Question 22)			
22. Consider any physical activity training/ education you have gained. Where did this training/ education mostly occur?	n= 76/77		

Two section table which indicates a fraction number of how many respondents answered each survey question, sectioned under seven subheadings.

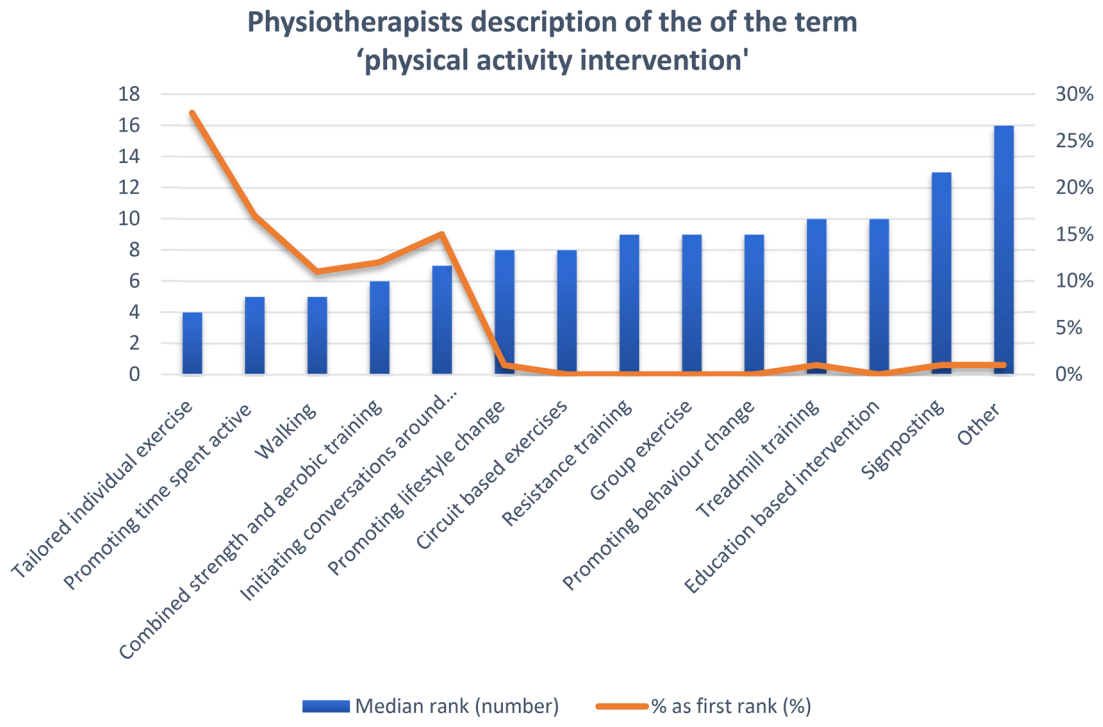

Figure 1. Median rank and percentage as first rank of physiotherapists' description of the term 'physical activity intervention'.
Stacked bar chart listing 13 descriptions of physical activity and the correlation of physiotherapists who chose each description in both median rank and first percentage. Tailored individual exercise gained the highest percentage of first rank answers and lowest median rank.

The study also explored how physiotherapists described the term "physical activity intervention" through ranking terms. A statistically significant correlation (Spearman's Rank negative −0.692, correlation $p < .011$) between median rank and percentage first rank indicates a pattern of a lower median rank score correlating to a higher percentage as first rank (Figure 1), suggesting a lack of consensus on what might constitute a 'physical activity intervention' amongst physiotherapists. The most common responses indicated that tailored individual exercise ($n=21/75$) and promoting time spent active ($n=13/75$) were the terms that best reflected their understanding. On the other hand, terms such as signposting ($n=19/75$) and cycle ergometry ($n=17/75$) were identified as least reflective of a PA intervention.

Moreover, the study investigated physiotherapists' beliefs regarding whether providing an exercise intervention alone increased PA for people with stroke. The majority of respondents (64% $n=46/72$) did not believe that exercise intervention alone increased day to day PA. Various reasons were provided to support their answers, including definitions, intervention variables, condition/patient-related variables, and alternative explanations (Table 3).

Measurement of PA in the stroke population was explored. The top three measurements most often used to measure PA were walking ability (68%), Berg balance scale (62%) and timed up and go (53%), all of which are defined as functional performance measures. The measures least likely to be used were device-based measures (4%), self-reported measures of PA (5%), behavioural mapping (5%) and Vo2 peak/max (Table 4). Thirty-two (42%) respondents indicated they often used 'other' measures to measure PA; the most common being functional performance measures ($n=18$) including the Modified Rivermead and the Postural Assessment Scale for Stroke (PASS).

Table 3. Summary of reasons for physiotherapists' answers to the question 'do you believe providing an exercise intervention only to people with stroke increases their physical activity?'.

Survey Question 6: Do you believe providing an exercise intervention only to people with stroke increases their physical activity?			
Answer	%	Count	Thematic overview of responses
Yes	21	15	1. Increases PA in the long term (n = 10), or short term only (n = 4) 2. Only if it is personalised (n = 4) or includes a shared experience (n = 3) 3. Improves Quality of Life (QOL) (n = 3)
No	64	46	1. Does not increase PA in the long term (n = 7) 2. Intervention needs to be meaningful and / holistic (n = 7), have a behaviour change component (n = 1), be personalised (n = 3), include support (n = 2) or be prescribed / dose (n = 1) 3. There are issues relating to capacity to move/ physical deficit (n = 4), engagement (n = 1), cognition (n = 1) or baseline level (n = 1)
Other	15	11	1. Intervention factors: Dependent upon intervention type (n = 3), supervision level (n = 1), inclusion of behaviour change components (n = 1), meaningful and /holistic (n = 2), personalised (n = 1), prescribed / dose (n = 2) and if there is the level of support needed (n = 1) 2. Patient factors: Dependent upon the patient motivation levels (n = 2), readiness to change (n = 1), exercise backgrounds(n = 1), individual factors(n = 4), cognition (n = 1) baseline level (n-1), ability/ deficit (n = 1)

Three section table outlining thematic responses for physiotherapists who answered 'yes', 'no' and 'other' to questions related to their beliefs on exercise increasing physical activity.

Participants' training and education in PA were assessed as well. Less than half (47%, $n=36/76$) of the respondents had received PA training as postgraduate education, and even

Table 4. Most and least used measures of physical activity.

Measurement outcomes	Often	Never
Walking ability	**68% (n= 52/76)**	3% (n = 2/76)
Berg Balance Scale	**62% (n = 47/76)**	5% (n = 4/76)
Timed up and go	**53% (n = 40/76)**	12% (n = 9/76)
10 Metre walk test (10MWT)	33% (n = 25/76)	26% (n = 20/76)
Other- please state	32% (n = 24/76)	53% (n = 40/76)
6 Metre walk test (6MWT)	20% (n = 15/76)	28% (n = 21/76)
Time spent active	16% (n = 12/76)	30% (n = 23/76)
Heart rate	14% (n = 11/76)	39% (n = 30/76)
Steps per day	9% (n = 7/76)	43% (n = 33/76)
Self-reported measures	5% (n= 4/76)	**64% (n = 49/76)**
Behavioural mapping	5% (n = 4/76)	**64% (n = 49/76)**
Device based measures	4% (n = 3/76)	**55% (n = 42/76)**
Vo2 Peak/Max	0% (n = 0/76)	**92% (n = 70/76)**

Three section table outlining the most and least used measures of physical activity. Walking ability, Berg Balance Scale and Timed up and go were most used.

fewer (35%, $n = 26/76$) had received training at an undergraduate level. Other forms of PA training mentioned included work-based learning and experience, as well as training based on personal interests focussing on a subset of PA such as the "Otago course", Pilates and CrossFit training.

Objective 2: To understand current practice of therapists working across clinical settings in PA intervention delivery for the stroke population

The study aimed to understand the current practice of therapists working across clinical settings in delivering PA interventions for the stroke population. Results indicated that the usage patterns of PA interventions varied depending on the ambulation status and chronicity of stroke patients. For non-ambulant patients at both acute and chronic timepoints, the most commonly used interventions were found to be 'tailored individual exercise,' 'promoting time spent active,' and 'education-based interventions.' These interventions consistently emerged as the top three choices for this patient population (see supplementary material 2). Similarly, for ambulant patients, the most frequently utilised interventions were comparable between chronic and acute timepoints. 'Promoting time spent active,' 'walking,' and 'tailored individual exercise' emerged as the top three interventions for ambulant patients, regardless of the chronicity of their condition. On the other hand, certain PA interventions were identified as being less likely to be used by physiotherapists across the stroke pathway of care. Responses from participants regarding specific survey vignette questions (8–20) revealed that for least likely used interventions, 'treadmill training' had an average rate of 62%, 'circuit class training' was 45%, and 'group exercises' was 34%. These interventions were consistently reported as being less commonly utilised, irrespective of ambulation status or whether the stroke was acute or chronic (see supplementary material 2).

In terms of barriers experienced by physiotherapists when providing PA interventions to the stroke population, responses ($n = 266$) indicated that physiotherapists experience more than one barrier. The most common barriers were identified as follows: lack of time (19%, $n = 50$), lack of community services to signpost to (18%, $n = 48$), and low responsiveness from patients (14%, $n = 38$); see Table 5. Four physiotherapists (1.5%) reported no experience of barriers.

Table 5. The percentage of physiotherapists experiencing barriers to providing physical activity interventions for the stroke population.

Answer	% (Count)
Lack of time	19% (n = 50)
Lack of community services to signpost/ refer to	18% (n= 48)
Low responsiveness from patients	14% (n = 38)
Low priority to patients	11% (n = 28)
Lack of organisational support	10% (n = 26)
Lack of knowledge of community services to signpost/ refer	9% (n = 23)
Lack of training	7% (n = 19)
Other- please state	6% (n = 16)
Low priority to therapists	5% (n = 13)
I do not experience barriers	2% (n = 4)
Not my job remit	0.4% (n = 1)

A two section table outlining the percentage of physiotherapists experiencing barriers to providing physical activity interventions for the stroke population. Lack of time, lack of community services to signpost/ refer to and low responsiveness from patients were the barriers experienced most frequently.

Discussion

Our survey aimed to determine physiotherapists' knowledge of PA across the stroke pathway of care and explore current practice including barriers to implementation of PA interventions. We showed that physiotherapists are very aware of the PA guidelines and have mixed levels of knowledge about the specifics of the guidelines ranging from good knowledge around the volume of moderate intensity PA per week, and less knowledge on the volume for higher intensity PA, or the strengthening recommendations. There was a lack of consensus on what constituted a physical activity intervention with tailored exercise being the most common response, with the majority recognising that this does not necessarily translate in changes in daily PA levels. We identified a knowledge gap concerning the measurement of PA, consistent with recent findings from a scoping review [12], as the majority opted for functional performance measures rather than valid measures of PA. Approximately 50 to 65% of respondents have not received formal training at postgraduate or undergraduate levels, respectively. In terms of current practice tailored exercise was common regardless of ambulation status but walking and advice to be active was only common in the former group, with no difference in PA interventions used in terms of time since stroke. Common barriers to implementation of PA were lack of time, limited community services to signpost to, and low patient responsiveness were the most common barriers identified.

Demographics and responses

The majority of respondents in this study were physiotherapists working in secondary or community care settings (67%, $n = 49/74$). This distribution reflects the proportion of participants typically involved in PA and stroke research studies [20]. Furthermore, previous research [21] has indicated that healthcare professionals working in hospital settings perceive more barriers to implementing PA interventions compared to their patients. This may explain why physiotherapists in this study may not consider PA interventions feasible in acute care settings. Additionally, the limited capacity of physiotherapists to provide post-discharge follow-up may contribute to

their lack of recognition regarding the feasibility of PA interventions in acute care. The high rate of partial completion of the survey, with only the initial demographic questions completed by many respondents ($n = 44/121$), may be attributed to the challenge of reflecting on and considering their understanding of PA. This finding supports the main outcomes of the study and underscores the need for training and education in this area. Existing literature provides further support for these observations. For instance, a study by Jones et al. [22] explored healthcare professionals' perspectives on PA promotion in the acute care setting and highlighted the various barriers they face, including time constraints and limited resources. Similarly, a systematic review by Harden et al. [23] examined factors influencing healthcare professionals' implementation of PA interventions and identified challenges related to knowledge, skills, and confidence. These studies reinforce the importance of addressing barriers and enhancing healthcare professionals' training and understanding of PA interventions, particularly in acute care settings.

Beliefs on exercise and PA

The impact of PA interventions, incorporating behaviour change components, on long-term adherence to PA for stroke survivors has been established [24,25]. However, in concurrence with previous literature [26,27], the majority of respondents in our study perceived PA interventions, for the ambulant stroke population, to be personalised exercise plans. Approaches such as 'promoting time spent active' were only identified for the non-ambulant population. Ambulatory status is therefore a significant factor influencing the choice of PA interventions in the stroke population, surpassing the influence of acute/chronic status. Day-to-day PA interventions, which should inherently include behaviour change components, were not a common selection for the non-ambulant population. It is uncertain whether this discrepancy is due to a lack of opportunity or knowledge regarding alternative PA interventions for this population.

Respondents were very aware of the UK PA guidelines and had mixed knowledge of the guidelines. Compared to previous studies undertaken with physiotherapists [28,29], General Practitioners [30], and medical students [31], it would seem some aspects of knowledge are improving, however some clear gaps in knowledge continue. We did not explore whether such knowledge gaps related to undergraduate or postgraduate education in our study, but it is likely to explain, in part, our findings. Such knowledge gaps should be addressed, a recommendation supported by other literature in the area [24,29,32] to support a more comprehensive and strategic integration of behaviour change strategies in PA interventions across the stroke pathway of care.

Measurement of PA

A final indicator to support the need for education in this area was the lack of outcome measures identified that measured day-to-day activity, despite respondents reporting using interventions to promote this. Instead, the most commonly reported outcome measures related to physical function and performance. These measures are well-suited to capture the effects of structured and planned exercise interventions, as defined by Caspersen [33] which aim to improve physical fitness through repetitive and purposeful activities. However, it is noteworthy that a limited proportion of physiotherapists (less than 10%) utilised measures that capture day-to-day PA, such as steps per day or device-based measurements, despite reporting they were using PA interventions. Employing device-based measures, such as accelerometers, to assess PA in stroke populations, has recently been recommended for this purpose, as these measures provide more reliable data compared to self-reported measures, particularly in evaluating long-term changes in day-to-day activity [34,35]. Moreover, studies conducted by other researchers [36,37] have indicated that physical function and performance measures are not considered direct indicators of day-to-day PA. Despite this knowledge, the integration of such measurement outcomes into routine practice remains limited; however, the incorporation of these measures into routine practice can enhance the assessment and monitoring of PA interventions, ultimately contributing to more effective stroke rehabilitation outcomes.

Training and education in PA

Although the survey responses suggest that some PA training is currently incorporated into both undergraduate and postgraduate education, the specific content and focus of this training remain unknown, revealing a potential gap in formal education and training in PA interventions for stroke patients. It is important to note that respondents who did indicate the content of their training mentioned specific activities such as Pilates, CrossFit, and Otago courses, which do not typically include a strong emphasis on behaviour change. This finding raises concerns about the lack of consensus and understanding regarding the components of PA training among healthcare professionals. Previous research supports the need for a comprehensive review of PA education and training in healthcare curricula. For instance, a systematic review and meta-analysis by Rethorn et al. [29] examined physiotherapists' knowledge, skills, beliefs, and the impact of organisations on PA promotion. The review highlighted the importance of behaviour change strategies and the integration of these strategies into training programs to enhance healthcare professionals' ability to promote PA effectively. Considering the variation in respondents' knowledge and understanding of PA in this survey, it is crucial to gain further insight into the content and detail of skills attainment at both undergraduate and postgraduate levels of education. This would enable the identification of areas that require improvement and the development of targeted educational interventions to enhance healthcare professionals' knowledge and skills in delivering effective PA interventions.

Barriers to providing PA interventions

The survey explored the barriers experienced by physiotherapists when providing PA interventions for stroke patients. Lack of time, limited community services to signpost to, and

low patient responsiveness were the most common barriers identified. These findings align with existing literature [28,38,39] highlighting the challenges faced by healthcare professionals in delivering effective PA interventions. Addressing these barriers would require organisational support, resource allocation, and patient engagement strategies.

Limitations

One limitation of this study is that the survey specifically targeted information related to PA interventions and measurements, rather than encompassing general physiotherapy interventions. While the authors acknowledge this distinction, there is a possibility that, due to the phrasing of certain questions, participants may not have clearly understood the intended focus. This potential misunderstanding could have impacted the clarity ambiguity of the results, particularly for questions 5, 7, and 21. Therefore, it is advisable to interpret the results of these questions with caution. Despite the piloting process not identifying this issue, it could be attributed to the overall disparity in understanding of PA interventions across the stroke pathway of care. Another limitation is the unknown survey response rate due to the survey's electronic distribution through multiple channels. While the ACPIN Membership (one of the distribution channels) exceeds 1000, previous surveys of physiotherapists working in stroke reported an average response rate of 14% [40–44]. Thus, it was anticipated that the response rate for this survey would be similar. To mitigate this limitation, email and social media reminders were employed to increase response efforts.

Conclusion

We showed that physiotherapists have good awareness of, but mixed knowledge on, the PA guidelines, and valid measures of daily PA. In terms of implementation, there continues to be a focus on tailored exercise, particularly in non-ambulant people with stroke. Common barriers to the implementation of PA interventions across the stroke pathway were lack of time, limited community services to signpost to, and low patient responsiveness. Future studies should explore knowledge gaps in more detail, and address the barriers to implementation of PA. These efforts may improve outcomes for survivors including reducing the recurrence of strokes and promoting overall health benefits associated with increased PA [45].

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