A summary of the body of knowledge on physical activity for people following stroke: a scoping review

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\textbf{ABSTRACT}

\textbf{Background:} There are challenges implementing physical activity interventions for people across the stroke pathway of care. There is a need to understand the intervention content in addition to the effects.

\textbf{Objective:} This scoping review maps out the existing systematic review evidence in relation to five objectives.

\textbf{Design:} Intervention data were extracted to identify and clarify definitions of physical activity as well as key emerging themes, gaps and recommendations for implementation approaches and consensus.

\textbf{Results:} 50 systematic reviews fulfilled the predefined inclusion criteria. Most reviews (n = 31) focused on a subset of physical activity rather than day to day physical activity (n = 19). In addition, a description of theories underpinning the interventions were lacking. Only 11 reviews used a definition of physical activity. Physical activity outcome measures were reported in 22 reviews.

\textbf{Conclusions:} Better reporting of physical activity interventions is required to improve implementation. Research should include physical activity outcome measures across the stroke pathway. Determining which physical activity modes and parameters of each intervention would be useful in determining the optimal intervention for stroke survivors with different physical activity capacity levels.

\textbf{Introduction}

The lifetime risk of stroke has increased to one in four people [1], with one-quarter of reported strokes reoccurring [2]. One of the risk factors associated with stroke reoccurrence is the lack of physical activity (PA) post stroke [3]. There is increasing interest in physical activity levels and implementation of physical activity interventions for people across the stroke pathway of care who have varying degrees of physical impairments and physical capacity levels [2]. Physical activity levels, measured in steps per day, remain low in people with stroke, much less than a healthy older adult [2]. The causes of low levels of physical activity post-stroke appear to be multifactorial. Stroke often leads to long term physical impairments such as limited mobility and movement. These impairments may result in difficulty engaging with physical activity [4] and consequently the inability to adhere to physical activity guidance [5].

Clinical guidelines are an essential bridge in translating advice on the effectiveness of a physical activity intervention into clinical practice. The United Kingdom (UK) stroke guidelines [6,7] encourage physical activity without referring specifically to changing physical activity behaviour in people with stroke. The most recent UK Stroke practice guidelines recommend that people with stroke should aim to be active every day and participate in physical activity unless there are contraindications [6,7]. The evidence underpinning the guidelines include primary studies only which focus on, strengthening interventions [8], circuit class therapy [9], cardiorespiratory fitness [10], and aerobic exercise [11]; all of which do not focus on physical activity promotion as a change in long term lifestyle.

The UK physical activity guidelines [12] do not use evidence from the stroke population to inform their guidelines. The 2019 guidelines suggest analogous health benefits for disabled adults engaging in physical activity as for the rest of the adult population. This statement is based on a review completed for the UK Chief Medical Officers’ (CMO) physical activity guidelines for disabled persons [13]. These 2018 guidelines do not provide specific guidance for...
persons following a stroke and do not capture the evidence relevant to the stroke population.

Since the first seminal paper in 1953 by Morris [14], which found an association between increased physical activity levels and reduced incidence of coronary events; the term physical activity has been used interchangeably with various other terms. Physical activity is defined as any movement produced by skeletal muscles resulting in energy expenditure [15], and includes all physical activity done as part of daily living such as social and domestic activities, commuting, recreational and leisure activities [16,17]. Physical activity may or may not include exercise: exercise is a subset of physical activity that is planned, structured or repetitive [16], with a purpose of improvement or maintenance of one or more components of physical fitness as an objective [15]. Currently, there are four dimensions of physical activity, which are widely accepted [18,19]. These include mode or type of activity, frequency of performing activity, duration of performing activity, and intensity of performing activity. In addition, early physical activity research was largely uninformed by behaviour theory [20]. Today, theories of behaviour change are essential to understand physical activity and provide an organizing framework underpinning effective physical activity interventions [20]. Despite the terms of dimensions being widely accepted, there continues to be variation in physical activity terminology used within the literature and clinical guidelines, with most published studies being carried out as a subset of physical activity; for a specific purpose such as improving strength or cardiovascular fitness [17] rather than physical activity promotion as a change in long term lifestyle.

There is an existing large body of work in the promotion of physical activity for the stroke population which demonstrates positive outcomes [9,21–26]. These studies focus on the effects on clinical endpoints such as mobility, function, and pain rather than changing physical activity behaviour as an outcome, of which there is less clarity. In addition, there remain complexities with regards to the reporting of evidence in the area. Poor reporting of heterogeneous and complex evidence as well as the absence of analysis using the latest implementation guidelines has made it difficult for evidence to be implemented into practice [27–29].

Implementation is defined as the promotion and uptake of research findings and identifies ‘how to’ implement evidence to change healthcare practice. Work by Proctor et al. [29] provides a set of guidelines by which the body of evidence would provide sufficient detail in order for it to be more easily implemented; these guidelines were used to guide the data extraction of the current scoping review; specifically naming, defining, and operationalizing strategies in terms of the following criteria: action (provider of intervention), the action (intervention including definitions), action targets (population demographics, stroke pathway of care) and dose (physical activity dimensions and domains).

The lack of implementation and variation in reporting of this evidence across the stroke pathway warrants further investigation into the content of physical activity interventions. Therefore, a scoping review of systematic reviews within the area of physical activity and stroke is timely to learn more about these interventions, the terminology and outcome measures used and the key emerging themes from all the reviews that need some consensus building.

Our specific objectives are to:

1. Describe the focus of the reviews (aims, objectives, research questions, physical activity terminology used and theoretical description of the intervention)
2. Identify the overall level of reporting
3. Describe the actor (provider of intervention)
4. Describe the action (intervention including definitions), action targets (population demographics) and dose (physical activity dimensions and domains) across the stroke pathway of care (setting)
5. Identify physical activity intervention outcome measures (how these interventions were evaluated)
6. Identify key emerging themes, gaps and recommendations informing future research and clinical implementation

Methods

A scoping review was conducted to identify and describe available systematic review evidence on physical activity in the adult stroke population. The scoping review was reported using the Preferred Reporting Items for Systematic Reviews and Meta-analyses protocols extension for Scoping reviews (PRISMA-ScR) [30]. The Scoping review methods followed the five steps outlined in the framework devised by Arksey and O’Malley [31] and further developed by Levac et al. [32] with additional reference to the recently updated Joanna Briggs Institute (JBI) scoping review guide [33]. The published scoping review protocol is accessible here: https://www.tandfonline.com/doi/abs/10.1080/10833196.2020.1846237 and registered with the Open Science Framework (https://osf.io/vjfp4).
Eligibility criteria

This scoping review’s search and inclusion criteria were based on the dimensions and domains of physical activity outlined by Strath et al. [19] (Tables 1 and 2).

Study design was limited to systematic reviews, however within those reviews there were no restrictions on primary study design. Included reviews had been determined to be within the field of physical activity and included adults 18 years or older with a diagnosis of stroke. Language was limited to English. Reviews were not excluded based on population demographics such as severity of stroke, physical or cognitive impairment level, gender, variation of time since onset of stroke and settings. Reviews were included as being physical activity related if the core intervention(s) explicitly included a dimension and/or domain of physical activity approach or concept defined in Tables 1 and 2. Reviews were included if they had primary or secondary physical activity related outcome measures. Reviews that had combined specific rehabilitation (e.g., Constrained Induced Movement Therapy, Dual task training) and physical activity interventions and outcome measures, were only included if over 50% of the interventions were focused on physical activity (determined by research team).

Information sources

Comprehensive literature searches were defined and conducted with support from a research librarian. We searched the following electronic databases from inception until 1st June 2021: MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), EMBASE, PsycInfo and Scopus. A set of keywords and Medical Subject Headings (MeSH) was used, related to physical activity and stroke, with search limits to systematic reviews or meta-analysis. The final search strategy for the MEDLINE database including limits is presented in Appendix 1. Additional search strategies are available from the corresponding author, upon request. Reference lists of all identified reviews were also hand searched for additional relevant reviews.

Selection of sources of evidence

Search results were imported into Covidence Systematics [34], an online systematic review software system. 5% of the results titles and abstracts were assessed independently by two the research team (CMcF, KP) to pilot the suitability and clarity of the eligibility criteria [33,35]. The final list of titles and abstracts were divided among the core research team (100% CMcF, 50% NK, 50% KP) for screening using eligibility criteria, followed by a screen of full texts using the eligibility criteria. All screening was performed independently by two of three team members (100% CMcF, 50% NK, 50% KP), and discrepancies were resolved by consensus or involvement of a fourth team member (SMcD). Data was extracted electronically using Microsoft Excel software [35] and supported by Covidence software [34].

Data charting process

The data extraction and charting framework (Appendix 2) aligned to the research objectives [32] were developed and subsequently piloted on a random sample of 10 included papers and modified as required based on feedback from the research team. Aligning with the research objectives, for each of the included reviews, the following data was extracted from the pooled reporting of the results:

1. Review details: title, citation, review aim and objective(s), review question(s), physical activity

Table 1. Physical activity dimensions: mode, frequency, duration, and intensity [19] (a four section table outlining the definitions according to Strath et al. (2013) used to present information on dimensions of physical activity).

| Dimension | Definition and context |
|-----------|------------------------|
| Mode      | Specific activity performed (e.g. walking, gardening, cycling). Mode can also be defined in the context of physiological and biomechanical demands/types (e.g. aerobic versus anaerobic activity, resistance or strength training, balance, and stability training). |
| Frequency | Number of sessions per day or per week. In the context of health-promoting physical activity, frequency is often qualified as number of sessions (bouts) ≥10 min in duration/length. |
| Duration  | Time (minutes or hours) of the activity bout during a specified time frame (e.g. day, week, year, past month). |
| Intensity | Rate of energy expenditure. Intensity is an indicator of the metabolic demand of an activity. It can be objectively quantified with physiological measures (e.g. oxygen consumption, heart rate, respiratory exchange ratio), subjectively assessed by perceptual characteristics (e.g. rating of perceived exertion, walk-and-talk test), or quantified by body movement (e.g. stepping rate, 3-dimensional body accelerations). |
terminology or other terms used and the theoretical description underpinning the intervention
2. Review methods: actual inclusion/exclusion criteria, multi component or single, types of studies, number of studies and sample size.
3. Intervention characteristics (description of intervention, dimensions and domains of intervention and provider of the intervention and whether there was behaviour change associated with the intervention).
4. Population demographics across the stroke pathway of care (gender, age, severity of stroke, physical or cognitive impairment level, classification; acute, subacute, chronic, variation of time since onset of stroke and setting).
5. Intervention outcome measures used.
6. Recommendations and key points of review (emerging themes, gaps, recommendations for implementation approaches and areas where a consensus is required).

Full data extraction of each included review was completed by two team members (100% CMcF, 50% NK, 50% KP) independently (using Covidence), and subsequent consensus gained. Discrepancies were resolved by consensus or involvement of a fourth team member (SMcD). Where investigators published several reviews based on data from a single study population, the most recent or most complete review was selected for data extraction. Methodological quality or risk of bias of the included reviews was not completed, which is consistent with guidance on scoping review conduct [33].

**Data items**

**Intervention evaluation (outcome measures)**
Evaluation of interventions; the outcome measures reported in the reviews were presented separately for the following: physical activity measures, sedentary behaviour and physical performance and physiological measures.

Outcome measures for physical activity levels (including sedentary behaviour) were identified, including subjective self-report (e.g. International Physical Activity Questionnaire, recall diary) and/or objective measurement using devices (e.g. pedometers, actigraphy, activity monitoring global positioning systems) [16]. Physical performance and physiological measures and outcomes indicate potential physical activity capacity; however, they are not considered a measure of physical activity [36]. Examples identified included walking capacity (6 m Walk Test MWT) and walking speed (10 m Walk Test MWT).

**Theoretical descriptions underpinning the intervention**
Theoretical descriptions underpinning the intervention were identified from the reporting/interpretation of the authors of each included review.

**Data retrieval**
Data were extracted directly from the results published from each review (e.g. the results pooled from the studies included in each systematic review). Primary study data was not analysed beyond what was reported within the systematic review. Basic descriptive values were collated in Microsoft excel to gain averages and ranges of values that were reported in the reviews (e.g. reporting of dimensions of physical activity, age of participants).

**Analysis of results**
The analysis of results included descriptive analysis of both quantitative and qualitative data. These descriptive results were then presented using a diagrammatic or tabular form and/or in a descriptive format that aligns with the objective(s) and scope of the review. Qualitative summary information was extracted directly from the discussion section of each included review. One of the research team (CMcF) synthesised and categorised this information under the following themes: gaps in the research and recommendations for implementation strategies. The research team discussed the themes and made group decisions on the categorisations.

| Domain          | Contextual Definition or Examples                                      |
|-----------------|------------------------------------------------------------------------|
| Occupational    | Work-related: involving manual labour tasks, walking, carrying, or lifting objects |
| Domestic        | Housework, yard work, childcare, chores, self-care, shopping, incidental |
| Transportation  | Purpose of going somewhere: walking, bicycling, climbing/descending stairs to public transportation, standing while riding transportation |
| Leisure time    | Discretionary or recreational activities: sports, hobbies, exercise, volunteer work |
Results

Results have been presented below based on the information included within the systematic reviews, which relate to this scoping review’s objectives. This is information extracted directly from each individual review which reflects the review authors interpretation of their included primary studies (i.e. the studies included in each original systematic review). Topic headings, clear explanations and level of reporting are provided aligned to each objective.

Results of the search

The electronic searches returned 11151 records. After removal of duplicates, 10488 titles and abstracts were screened against the inclusion criteria. In total, 130 records underwent full text review. 50 systematic reviews fulfilled the predefined inclusion criteria (Figure 1 PRISMA flowchart). The reviews were published between 2014 and 2021 except for one review published in 2006 [8]. Appendix 3 describes an overview of the 50 included systematic reviews.

Study designs

All 50 systematic reviews described whether study design was reported by their included primary studies \((n = 935, \text{mean } n = 19 \text{ and range per review 3 to 103})\). Of these, 546 were RCT’s \((58\%)\), 191 primary study designs were not reported \((21\%)\), 77 primary studies were cross sectional \((8\%)\) and 35 primary studies were qualitative \((4\%)\). The remaining 86 studies were made up of other reported \(n = 41 \text{ (5\%)}; \text{retrospective } n = 2, \text{ crossover } n = 16, \text{ cohort } n = 8, \text{ ...
longitudinal $n = 3$, mixed methods $n = 1$, pilot $n = 2$, non-randomised, repeated measures $n = 2$, pre/post interventional $n = 7$ and other not reported $n = 45$ (5%).

**Focus of the reviews**

The focus of all reviews ($n = 50$) was consistent with an aim to change physical activity or a subset of physical activity. There was a broad set of aims, objectives and interventions across the scoping review that included anything pertinent to physical activity and stroke including reviews that focused on physical activity as day to day physical activity ($n = 19$); and reviews that focused on a subset (e.g. exercise) of physical activity ($n = 31$); the latter were usually carried out as part of a rehabilitation programme; 16 such reviews did not refer to the term physical activity within their text.

**Physical activity terminology**

Of the 50 reviews, 11 reviews defined physical activity (22%). Seven of these reviews referenced the Casperson 1985 definition; “Physical activity is defined as any bodily movements produced by the contractions of the skeletal muscles, that increase energy expenditure, such as those executed during leisure activities, at work, at home, or while travelling” [15]. Three reviews did not reference their definition of physical activity, and within these there was little commonality. One additional review had an unreferenced definition specific to stroke [37].

**Theoretical description underpinning the intervention**

Data on theories underpinning interventions was not dominant across the included reviews. 26% of reviews ($n = 13$) described whether behaviour change theories were reported by their included primary studies. Of those, behaviour change theories were not reported by the primary studies in 4 reviews. Of the remaining nine reviews that reported, there were four theories used to underpin a total of seven primary study interventions (Transtheoretical $n = 4$, Health belief $n = 1$, Social Cognitive Theory $n = 1$ and Health action $n = 1$). In addition, there were several broadly defined individual constructs of these theories (e.g. goal setting, action planning) targeted by intervention components described across 30 primary studies (of a total of 935).

**Population demographics**

Participant sex was reported in 30% of reviews ($n = 15$). The average percentage ratio of male and female participants ratio was 58:42. Participant age was reported in 70% ($n = 35$), the range was 48–75 ($n = 21$) and mean was 63 years ($n = 20$).

**Time since onset of stroke**

64% of reviews ($n = 32$) described whether the participants time since onset (TSO) of Stroke was reported by their included primary studies. 26 of 32 reviews reported the range (2.9- 89.3 months), five of these reviews also reported an average TSO (22 months).

**Classification**

40% of reviews ($n = 20$) described whether classification of participants in terms of acute, sub-acute and chronic was reported by their included primary studies. Of these 20 reviews, there were reviews that included a mix of classifications $n = 11$ and reviews that reported only one classification $n = 7$ (acute $n = 1$, chronic $n = 6$). Of the 20 reviews, classifications were reported as follows: acute ($n = 10$), sub-acute ($n = 4$), chronic ($n = 16$).

**Severity**

28% of reviews ($n = 14$) described whether classification of participants in terms of stroke severity at baseline was reported by their included primary studies. How severity was measured also varied; the Barthel index ($n = 6$) as a measure of impairment to indicate severity, was the most reported (see Table 3).

**Ambulatory status of participants**

72% of reviews ($n = 36$) reported or implied ambulatory status. 92% of these reviews ($n = 33$) were based on ambulant participants. 22 reviews reported participants were ambulant, with 11 additional reviews implying the participants were of ambulant status. This implication was based on the requirements to undertake the intervention, i.e. walking intervention. Three reviews focused on non-ambulant participants specifically and five reviews stipulated a mix of all ambulatory statuses.

**Table 3.** Frequency of measures of impairment severity used by included systematic reviews (a two section table presenting descriptions of measurement of impairment and the numerical number of reviews aligned to each. Most instances occur for the Barthel index measurement).
Cognitive impairment

49 of 50 reviews did not report on cognitive impairment level. One review reported participants were ‘able to communicate with investigators and follow a two-stage command’. One further review reported participants were ‘across the spectrum’ of cognitive impairment. Neither used a validated cognitive assessment. No review stipulated cognitive status within their inclusion/exclusion criteria.

Setting

A similar number of reviews reported the setting \((n = 23)\) as did not report it \((n = 27)\). Of the 23 reviews that reported, a total of 211 primary studies were within those reviews (23% of overall primary studies). The most prevalent setting was in a home or community setting \((n = 98\) primary studies) rather than in a healthcare setting (see Figure 2).

Intervention delivery

See Figure 3 for the number of occurrences across 18 reviews (36%) that reported the provider of interventions. Most instances occur for physiotherapists

Intervention characteristics

Physical activity dimensions: Mode, frequency, duration, and intensity (Strath et al. 2013)

There were 27 modes of physical activity interventions described across the 50 included systematic reviews (see Figure 4). Mode(s) were described in every review. The most prevalent included cycle ergometry \((n = 11)\) and treadmill training \((n = 10)\) (see Figure 3). For reviews that included general physical activity \((n = 6)\), this was described as; time spent in activity and inactivity, multimodal lifestyle interventions including any type of exercise (aerobic, strengthening, progressive, tailored, group), or any type of activity aimed at improving a skill or ability.

Frequency was the most reported dimension of physical activity (see Figure 3) in 84% of reviews \((n = 42)\). Time/duration was reported in 74% of reviews \((n = 37)\). The intensity was the least reported dimension of physical activity in 30% of reviews \((n = 15)\).

Physical activity domains

The domains in which physical activity occurred (i.e. occupational; work-related; domestic; housework, transportation; the purpose of going somewhere and leisure time; recreational activities) were not explicitly reported in any review. However, many could have been defined as leisure time as they consisted of an exercise or some other form of class.

Intervention evaluation (outcome measures)

Results of outcome measures used are presented separately for the following: physical activity measures, sedentary behaviour and physical performance and physiological measures.

Physical activity measures

Physical activity measures were reported in 44% of reviews \((n = 22)\). Of those, there was a total of 36 types of outcomes measuring physical activity. There were 30 types of self-report measures reported including validated tools (see Figure 6 for most prevalent). Self-reported measures occurred 62 times across the 22 reviews that measured physical activity.

Objective measures of physical activity occurred 47 times across the 22 reviews that measured physical activity. There were six types of objective measures of physical activity reported e.g. accelerometers
Eight reviews reported physical activity measured as steps per day, although the device or method to measure was not reported. Behavioural mapping was reported in three reviews, therapist recording (\(n = 1\)) and video recording (\(n = 1\)); all of which

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(n = 16 \text{ reviews}) \quad \text{and pedometers} \quad (n = 5 \text{ reviews}).
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Figure 3. Professions of the provider of physical activity interventions (A column chart plotting the number of occurrences across 18 reviews that reported the provider of interventions. Most instances occur for physiotherapists).

Figure 4. Modes of physical activity interventions (A column chart plotting the description of the mode of physical activity and the number of reviews that reported for each mode. There is a wide range of modes presented with marginally most instances occurring in cycle ergometry).

Figure 5. Reporting of frequency, duration and intensity of physical activity interventions (A bar chart plotting three dimensions of physical activity and the number of reviews that reported each dimension data. Significantly less instances occur for the dimension intensity).
were completed in inpatient settings. Various dimensions of physical activity were reported e.g. time spent in light intensity \( (n = 3) \); time spent in moderate -vigorous intensity \( (n = 4) \); change in number engaging in regular physical activity \( (n = 4) \); number meeting minimum requirements of physically activity for 30 mins/5 days a week \( (n = 2) \) and change from passive to active stage of physical activity \( (n = 2) \) (see Figure 7).

**Sedentary behaviour**

Three (6%) reviews \([2,38,39]\) defined sedentary behaviour as activities expending \(<1.5\) metabolic equivalents (METs) and measured it via behavioural mapping, wearable devices, and questionnaires.

**Physical performance and physiological measures**

There was a total of 57 types of Physical Performance and Physiological outcome measures reported across the scoping review \( (n = 50) \). The most prevalent of these were 6MWT \( (n = 28) \), VO2 Peak/Max \( (n = 22) \), 10MWT \( (n = 21) \), BBS \( (n = 17) \), Timed Up and Go \( (n = 12) \), Heart rate \( (n = 6) \) and walking ability measured using the Holden functional ambulation category scale \( (n = 4) \).

**Key emerging themes; gaps in the research and recommendations for implementation strategies**

Each theme was explored with supporting text provided in Tables 4 and 5.

**Summary of key findings**

**Discussion**

We conducted a comprehensive scoping review that included a total of 935 primary studies within 50 systematic reviews. 58% of these primary studies
were RCTs indicating a vastly growing evidence base in this area. In response to the low level of physical activity occurring in the stroke population, coupled with the large volume of research completed in this area, this scoping review mapped out the existing systematic review evidence to better understand the heterogeneity in reporting of research in this area, as well as the intervention
content indicating emerging gaps and themes embedded throughout this discussion.

We used Proctor et al. [29] implementation reporting guidelines like TIDieR (Template for Intervention Description and Replication) [45] in terms of intervention detail but extracted additional implementation detail such as implementation outcomes affected. This reporting guideline was used to collate what is known and not known from the systematic review evidence. This included the focus, terminology, characteristics, and outcome measures used in the physical activity and post stroke body of knowledge. Our review has been successful in outlining where there are inconsistencies and gaps in the current research knowledge. Given there were no published reviews that focused on implementation of existing evidence, our findings in terms of implementation are more limited.

**Focus of the reviews**

Many reviews focused on a subset of physical activity (n=31) rather than day to day physical activity (n=19). In addition, a description of theories underpinning the interventions was lacking. There is extensive evidence that the most effective physical activity interventions are based on behaviour change that supports people to incorporate physical activity into their daily routines [46]. From our scoping review there is emerging evidence that this applies also to people with stroke. Moore et al. (2018) [42] outlined six trials that showed an increase in physical activity behaviour (very or quite promising). These interventions were explicitly designed to increase physical activity in daily living such as counselling-based physical activity promotion. Most reviews in this scoping review, however, are focused on a subset of physical activity intervention that do not include behaviour change. The reason for this remains unclear.

Future physical activity interventions and programmes should move away from repeating what is already known and from adopting strategies that are less likely to lead to sustainable behaviour change across the stroke pathway of care [47].

Across the scoping review, only 11 reviews used a definition of physical activity: seven of those reviews referenced the well renowned Casperson 1985

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**Table 5. A summary of the key findings of this review (a seven section table presenting descriptive summary information on the key findings from the results).**

| Proctor | Key finding |
|---------|-------------|
| Focus of reviews/ Name | 19 reviews focused on physical activity as day-to-day physical activity and 31 reviews focused on a subset (e.g. physical fitness, aerobic exercise) of physical activity. |
| The action (intervention including definitions), | Of the 50 reviews, only 11 reviews defined physical activity (22%). Three reviews did not reference their definition of physical activity, and within these there was little commonality. Only one review had an unreferenced definition of physical activity specific to the stroke population [37]. |
| Action targets (population demographics, stroke pathway of care) | Data on population demographics was not well reported across the scoping review; except for time since onset of stroke (64% of reviews reporting) and age (70%). This review indicated gender (30% of reviews reporting), cognitive impairment (2%), severity of stroke (28%) and stroke classification (40%) were underreported. The average participant was 64 years old, marginally male (ratio 58:42), approximately 22 months post stroke, without cognitive impairment and more likely to be classified as chronic in the stroke pathway of care. Due to insufficient information, average severity levels were not available. |
| Outcome measures | Physical activity outcome measures were reported in 22 reviews. Self-reported measures of physical activity occurred more often than device based and varied greatly with 30 types described. The most used self-reported measure was the PASE (n=9). There were six types of device based physical activity outcomes with accelerometers most common, used in 16 reviews. Physical Performance and Physiological outcome measures were reported to be used in every review (n=50), with a total of 57 types described. |
| Actor (provider of intervention) | 18 reviews (36%) reported who delivered the intervention. Physiotherapists were most common with a range of other combinations of professions also reported (see Figure 5). |
| Mode of PA interventions | A wide range of modes of physical activity (n=27) was described within reviews. The most prevalent was cycle ergometry (n=11) |
| Dose (physical activity dimensions and domains) | Frequency was the most reported dimension of physical activity (see Figure 3) in 84% of reviews (n=42). Time/ duration was reported in 74% of reviews (n=37). The intensity was the least reported dimension of physical activity in 30% of reviews (n=15). A similar number of reviews reported the setting (n=23) as did not report it (n=27). The most prevalent setting was in a home or community setting (n=98 primary studies) rather than in a healthcare setting (see Figure 4). Data on behaviour change was not reported across the scoping review. |
definition [15] and one review outlined a specific definition appropriate for those on the stroke pathway of care who were non-ambulant [37] called ‘Adapted Physical activity (APA)’; “APA is a form of non-medical movement activity especially designed for individuals with specific health status alterations or chronic diseases. It is aimed to prevent disabilities mainly caused by immobility and to maintain residual motor skills (muscular tropism, joint flexibility, cardio-respiratory function, balance, ambulation, bone mass), bringing lifestyle changes”. Morris (2012) [40] reported a variation in physical activity definitions across studies, however did not determine a definition within the review text. These results highlight the use of a physical activity definition is not prevalent in research for this population. This may be linked to the lack of reporting and clarity in defining physical activity intervention dimensions and domains across all of the stroke pathway (including varying levels of physical capacities) and population demographics. Future research should focus on which physical activity measures (i.e. self-reported, device-based measures) are most appropriately aligned to the various physical capacity levels of the stroke population.

Population demographics

There is an overall lack of reporting of key demographics, such as gender (30% reported); age (41% reported); classification (41% reported); severity (27% reported) and cognitive impairment (2% reported). As a result, we are unable to decide what works well and for whom, particularly for those with cognitive impairments which make up a pooled prevalence of 53.4% (16% with a major impairment) of the stoke population yet only considered in one review [43,48].

The 32 reviews that reported the participants time since onset of stroke indicated that although research is being conducted across the whole stroke pathway (range 2.9–89.3 months), the average participant was 22 months post stroke. Whilst most reviews were based on the ambulant population (n = 33), some research has been conducted with non-ambulant participants specifically (n = 3), again indicating the wide scope of research overall, however with a clear majority of ambulant participants.

The main provider of physical activity interventions is Physiotherapists and given that the context of these reviews is generating evidence rather than implementation, there is a need to review what is happening in clinical practice. The qualitative review summaries frequently highlight the need for increased support for stroke survivors to engage with physical activity, such as peer and professional support. In addition, the roles of non-therapy staff in physical activity promotion, and collaboration with other exercise providers in providing physical activity interventions has been explored. The resulting conclusion is that physical activity promotion, as part of an intervention, should be a generic skill across health care and does not belong to one profession. Positively, many studies reported research being conducted in a home or community setting enhancing the likelihood of their findings being implementable.

Intervention characteristics and intervention evaluation (outcome measures)

27 modes of physical activity interventions were described across the scoping review, indicating a range of domains that could be implemented with this population. The most used mode (cycle ergometry) which in terms of current physical activity definition, is not considered a day-to-day activity. The most prevalent mode that people can fit into daily activities was walking (n = 11) and is therefore not implementable for the 20% of the stroke population who are non-ambulant [49,50].

There has been a predominance of studies measuring physical function and physical capacity (n = 31) without also then measuring how these translate into day to day increases in physical activity. This would suggest that those delivering the interventions (mainly physiotherapists), may have challenges implementing physical activity interventions and/or measuring their outcomes across the stroke pathway of care. There is a current gap in knowing what these challenges are in current practice. However, this trend is starting to change with more recent reviews also including self-report and device-based measures of physical activity which can inform both on the domains in which physical activity takes places and its dimensions. Physical activity dimensions such as intensity in relation to physical capacity levels need to be defined, measured, and clearly reported to determine the optimum dose (and guidelines) for specific stroke capacity levels. Additionally, a consensus is required to determine terminology when describing physical capacity levels i.e. ambulation, severity, classification, weakness.

Limitations of the review

There are some limitations of this review. All non-English studies were excluded from the search strategy which may have led to incomplete synthesis of data in this area. Heterogeneity in reporting of reviews also made the interpretation of results
challenging. Due the nature of this review, the authors did not go to the original papers for raw data if it was not reported within the systematic review. As the aim of this review was to look at a wide breadth of literature, reviews were included regardless of quality. Although the search strategy did not include implementation as a key term, a subsequent use of a more comprehensive framework such as the Consolidated Framework for Implementation Research (CFIR) [51] may have extracted more implementation detail. Given the volume and value of the information retrieved within this review, there is an opportunity for future research to follow on from this and include such implementation detail.

**Conclusion**

Better reporting of physical activity interventions is required to allow implementation and a clear focus for future research. In addition, future research should include physical activity outcome measures to measure the effects of different physical activity interventions across the stroke pathway. Determining which physical activity modes of interventions and establishing the physical activity parameters of each intervention would be useful in determining the optimal intervention for stroke survivors with different physical activity capacity levels and at each stage of the stroke pathway. Defining physical activity, specific to the stroke population, is uncommon and therefore an appropriate definition should be determined which aligns to the various physical activity levels of the stroke population. Research into clinician knowledge and routine practice of physical activity promotion and its outcomes should be completed in the first instance as a starting point of implementation.

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### Appendix 1. MEDLINE search strategy (a twenty-five-point list of the search strategy terms used, for the database MEDLINE)

| Step | Search | Retrieval |
|------|--------|-----------|
| 1    | exp Exercise | 210086 |
| 2    | (Physical	extsuperscript{5} or activ	extsuperscript{5} or Physical	extsuperscript{5} fitness or Physical exercise or physical exertion or physical endurance).mp. | 231378 |
| 3    | (Exercise	extsuperscript{5} or Fit	extsuperscript{5} or Activ	extsuperscript{5} or Sedentary or sport	extsuperscript{5} or walk	extsuperscript{5} or running or jogging or pilates or yoga)).mp. | 4637198 |
| 4    | (cycle or cycling) adj5 (school	extsuperscript{10} or work or workplace or commute	extsuperscript{4} or travel	extsuperscript{4} or equipment or facility	extsuperscript{4} or rack	extsuperscript{4} or store	extsuperscript{4} or storing or park	extsuperscript{6} or friendly or infrastructure)).mp. | 4876 |
| 5    | (bicycl	extsuperscript{5} or bike	extsuperscript{4} or biking or swim	extsuperscript{1} or swimming or exertion	extsuperscript{1} or strength training or resistance training or travel mode	extsuperscript{5}).mp. | 171731 |
| 6    | (exercis	extsuperscript{5} or exercise	extsuperscript{5} or aerobic	extsuperscript{4}).mp. | 14114 |
| 7    | (active adj (travel	extsuperscript{4} or transport	extsuperscript{4} or commute	extsuperscript{4})).mp. | 20976 |
| 8    | (active adj (travel	extsuperscript{4} or transport	extsuperscript{4} or commute	extsuperscript{4})).mp. | 20976 |
| 9    | (multimodal transportation or alternative transport	extsuperscript{4} or alternative travel	extsuperscript{4} or recreation	extsuperscript{4}).mp. | 34675 |
| 10   | ("use" adj3 stair	extsuperscript{4}).mp. | 248 |
| 11   | (pedestrian	extsuperscript{4} or rehabilitat	extsuperscript{4} or ambulat	extsuperscript{5}).mp. | 510110 |
| 12   | (graded adj2 activit	extsuperscript{3}).mp. | 480 |
| 13   | (exercise	extsuperscript{4} or leisure activity	extsuperscript{4} or "activities adj2 daily living" or adl or physiotherap	extsuperscript{4} or physical therap	extsuperscript{4}).mp. | 423112 |
| 14   | (Cardiorespiratory train	extsuperscript{6} or circuit train	extsuperscript{7} or hit train	extsuperscript{6} or aerobic train	extsuperscript{6}).mp. | 3085 |
| 15   | 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 | 5313279 |
| 16   | exp Stroke/ | 144198 |
| 17   | (stroke or brain infarction or cerebrovasc	extsuperscript{5} or brain vasc	extsuperscript{5} or cerebral vasc	extsuperscript{5} or cva5 or apoplex	extsuperscript{5} or SAH or post/stroke).mp. | 441386 |
| 18   | (brain	extsuperscript{5} or cerebel	extsuperscript{5} or cerebell	extsuperscript{5} or intracran	extsuperscript{5} or intracerebral) adj5 (ischemi	extsuperscript{5} or infarc	extsuperscript{5} or thrombo	extsuperscript{5} or emboli	extsuperscript{5} or occlu	extsuperscript{5}).mp. | 165190 |
| 19   | (brain	extsuperscript{5} or cerebel	extsuperscript{5} or cerebell	extsuperscript{5} or intracranial or subarachnoid) adj5 (hemorrhage	extsuperscript{5} or hemorrhag	extsuperscript{5} or haemorrhage	extsuperscript{5} or hematoma	extsuperscript{5} or hematom	extsuperscript{5} or bleed	extsuperscript{5}).mp. | 97414 |
| 20   | (hemipleg	extsuperscript{5} or hemipar	extsuperscript{5} or pareis or paretic).mp. | 31883 |
| 21   | 16 or 17 or 18 or 19 or 20 | 587021 |
| 22   | 15 and 21 | 112660 |
| 23   | limit 22 to english language | 102624 |
| 24   | (systematic review or SR or meta-analysis or meta-synthesis).mp. | 376903 |
| 25   | 23 and 24 | 3249 |
## Appendix 2. Data extraction framework (a seven section colour table outlining details of the framework used and content extracted for each systematic review)

| Section | Question | Further Questions | Further Questions | Instructions | Answer |
|---------|----------|-------------------|-------------------|--------------|--------|
| **Systematic Review Details** | Review title: | Enter Description or NR | Enter Narrative / reference to physical activity/ relationship to physical activity | | |
| | Review aims/ objectives: | Enter Description or NR | Enter Narrative / reference to physical activity/ relationship to physical activity | | |
| | Review Physical activity focus |  |  |  |  |
| | Review Physical activity focus |  |  |  |  |
| | Review questions: | Enter Description or NR | Enter Narrative / reference to physical activity/ relationship to physical activity | | |
| | Study citation details: | Enter Description or NR | Enter Narrative / reference to physical activity/ relationship to physical activity | | |
| | Links to physical activity | Enter Description or NR | Enter Narrative / reference to physical activity/ relationship to physical activity | | |
| | Is there a theory underpinning the intervention? | No? Type No | Yes? Describe the intervention and the Theoretical underpinning i.e. BCT Taxonomy v1 (Michie et al. 2013) | | |
| **Methods** | Actual Inclusion/ exclusion criteria | Is the review on one intervention or multi? Number | Is the review on one intervention or multi? Number | | |
| | Multi-component/single |  |  |  |  |
| | Number of studies in review | Sum number of participants across studies if reported (list the studies both in methods and results) | Description/ Not reported (Insert NR) | (Actual studies included) Not reported (Insert NR) | |
| | Total sample size |  |  |  |  |
| | Types of Study | Types of Study | Methods/ desired studies | Description/ Not reported (Insert NR) | |
| | Methods/ desired studies |  |  |  |  |
| | Results |  |  |  |  |
| | RCT | enter number | enter number | enter number | enter number |
| | Cohort | enter number | enter number | enter number | enter number |
| | Qual | enter number | enter number | enter number | enter number |
| | Mixed | enter number | enter number | enter number | enter number |
| | Other | enter number | enter number | enter number | enter number |
| **Definition of Physical Activity** | Is the term physical activity used? | Yes (Enter Y)/ No (Enter N) / Can’t answer (Enter CA) / Other term used (OT) for specific domain of physical activity | Yes (Enter Y)/ No (Enter N) / Can’t answer (Enter CA) / Other term used (OT) for specific domain of physical activity | | |
| | Is there a definition of the term physical activity? | Yes (Enter Y)/ No (Enter N) / Can’t answer (Enter CA) / Other term used (OT) for specific domain of physical activity | Yes (Enter Y)/ No (Enter N) / Can’t answer (Enter CA) / Other term used (OT) for specific domain of physical activity | | |
| | If Yes | Physical Activity definition Details and/or reference used | Enter definition /description | | |
| | If No, Other Term Used |  |  |  |  |
| | |  |  |  |  |
| **Intervention characteristics** | Intervention delivery | Name of intervention | This is the intervention name (or list of intervention names) and will capture the description of the interventions i.e. behaviour change, Tai chi, progressive exercises interventions will be described and included here. | | |

(continued)
| Section | Question | Further Questions | Further Questions | Instructions | Answer |
|---------|----------|-------------------|-------------------|--------------|--------|
| Provider | Who delivered the Physical Activity related intervention e.g. physio, exercise professional, community leader | | | | |
| Execution of delivery | Group (face to face) Individual (face to face) | Group (online) Individual (online) Self directed by service user | Other | | |
| Dimension | Mode | Execution of delivery Tick box if applicable – use ‘other’ to type description such as telehealth/ text service/ combination etc | | | |
| Dimension Domain | Frequency | Specific activity performed (e.g. walking, gardening, cycling) OR context of physiological and biomechanical demands/ types (e.g. aerobic versus anaerobic activity, resistance or strength training, balance and stability training). | | | |
| | Intensity | Number of sessions per day or per week | | | |
| | Duration | Rate of energy expenditure | | | |
| | Duration | Time (minutes or hours) of the activity bout during a specified time frame (e.g. day, week, year, past month). | | | |
| | Occupational | | | | |
| Domain Demographics | Domestic | Work-related: involving manual labour tasks, walking, carrying or lifting objects | | | |
| | Transportation | Housework, yard work, childcare, chores, self-care, shopping, incidental | | | |
| | Leisure Time | Purpose of going somewhere: walking, bicycling, climbing/ descending stairs to public transportation, standing while riding transportation | | | |
| Physical or Cognitive Impairment Level | | Discretionary or recreational activities: sports, hobbies, exercise, volunteer work | | | |
| Population demographics across the stroke population | Demographics | Severity | Description if summarised, ‘NR’ if not reported | | |
| | Classification (Acute/ sub-acute/ chronic) | Description if summarised, ‘NR’ if not reported | | | |
| | Variation of time since onset | Description if summarised, ‘NR’ if not reported | | | |
| | Gender | Description if summarised, ‘NR’ if not reported | | | |
| | Age | Description if summarised | | | |
| | Setting | N/%, ‘NR’ if not reported | | | |
| Settings | Setting Was Physical activity measured? | Yes (Y) No (N) | Number of reviews from summary | | |
| | Healthcare | | | | |
| | Community | Number of reviews from summary | | | |
| | Lab | Number of reviews from summary | | | |
| | Care homes / Nursing homes/ assisted living | Number of reviews from summary | | | |
| | Not Reported | Enter ‘NR’ | | | |

(continued)
### Intervention Outcomes

| Section       | Question                                                                 | Further Questions                  | Instructions                                                                 |
|---------------|--------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------|
|               | If Yes                                                                   | Physical Activity outcome measure used | OM 1                                                                          |
|               |                                                                          |                                    |                                                                               |
|               |                                                                          | Physical Activity outcome measure used | OM 2 … Enter each outcome used as listed                                     |
|               | If No                                                                    | Physical Activity related outcome measure used | OM 1                                                                          |
|               |                                                                          |                                    |                                                                               |
|               |                                                                          | Physical Activity related outcome measure used | OM 2 … Enter each outcome used as listed                                     |
|               |                                                                          | Emerging Themes                    | **Brief description/ Summary**                                                |

### Review Recommendations

| Section       | Question                                                                 | Further Questions                  | Instructions                                                                 |
|---------------|--------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------|
|               | Research Gaps                                                             | Brief description/ summary         |                                                                               |
|               | Recommendations for implementation approaches                             | Brief description/ summary         |                                                                               |
|               | Recommended areas where consensus is required                             | Brief description/ summary         |                                                                               |
|               | Any other significant detail/ Recommendations from review                 | Brief description/ summary         |                                                                               |
Appendix 3. An overview of included systematic reviews (a seven section table with a descriptive summary outlining details of each of the 50 included systematic reviews.)

| Study citation details | Title                                                                 | Year of publication | Review aims/objectives/questions                                                                 | Number of primary studies in review | No of participants | Intervention                                           |
|------------------------|----------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------|------------------------------------|--------------------|--------------------------------------------------------|
| Ada L, Dorsch S,       | Strengthening interventions                                            | 2006                | This systematic review examines not only whether strength training after stroke                   | 21                                 | 476                | Strengthening interventions                            |
| Canning CG.            |                                                                                                                                  |                     | is effective (i.e. does it increase strength), but whether it is harmful (i.e. does it increase  |                      |                    |                                                        |
|                        |                                                                                                                                  |                     | spasticity) and whether it is worthwhile (i.e. does it improve activity)                        |                      |                    |                                                        |
| Ammann BC, Knols RH,   | Application of principles of exercise training in sub-acute and chronic stroke survivors: a systematic review.                  | 2014                | Objectives of this systematic review were (1) to investigate whether training                      | 37                                 | 2135               | The employed interventions were varied including      |
| Baschung P, de Bie RA, |                                                                                                                                  |                     | principles for physical exercise interventions are reported in RCTs for sub-acute and chronic     |                      |                    | aerobic exercise; treadmill training                    |
| de Bruin ED.           |                                                                                                                                  |                     | stroke survivors, (2) to evaluate whether the RCTs reported                                      |                      |                    | with or without body weight support; resistance        |
|                        |                                                                                                                                  |                     | the prescription of the FITT components of the exercise                                          |                      |                    | training; circuit classes with                         |
|                        |                                                                                                                                  |                     | interventions as well as (3) patients’ adherence to this prescription, and (4) to assess the     |                      |                    | progressive strength training and combined             |
|                        |                                                                                                                                  |                     | risk of bias of the included studies.                                                           |                      |                    | interventions of aerobic and resistive strength        |
|                        |                                                                                                                                  |                     |                                                                                                 |                      |                    | exercise                                               |
| Belfiore P, Miele A,   | Adapted physical activity and stroke: a systematic review. J Sports Med Phys Fitness 2018;58:1867-75.                        | 2018                | The purpose of this systematic review was to explore the role of adapted physical activity and     | 14                                 | 645                | Adapted physical activity and exercise                 |
| Galli F, Liguori G.    |                                                                                                                                  |                     | exercise in the post-stroke period by referring not only to the rehabilitation stage but also     |                      |                    |                                                        |
|                        |                                                                                                                                  |                     | to the post rehabilitation one, in order to address future care policies                          |                      |                    |                                                        |
| Bonini-Rocha AC, de    | Effectiveness of Circuit-Based Exercises on Gait Speed, Balance, and Functional Mobility in People Affected by Stroke: A Meta- | 2018                | To examine the effectiveness of circuit-based exercise in the treatment of people affected by    | 11                                 | 750                | Task-oriented circuit class training defined as       |
| Andrade ALS,           | Analysis.                                                               | Apr;10(4):398-409.  | stroke                                                                                          |                      |                    | therapy provided to more than 2 participants          |
| Moraes AM, Gomide      |                                                                                                                                  |                     |                                                                                                 |                      |                    | simultaneously, which involved a series of             |
| Matheus LB, Diniz LR,  |                                                                                                                                  |                     |                                                                                                 |                      |                    | workstations focusing on gait practice and             |
| Martins WR.            |                                                                                                                                  |                     |                                                                                                 |                      |                    | functional gait-related tasks.                        |
|                        |                                                                                                                                  |                     |                                                                                                 |                      |                    |                                                        |
| Boyne P, Welge J,      | Factors Influencing the efficacy of Aerobic Exercise for Improving Fitness and Walking Capacity After Stroke: A Meta-        | 2017                | To assess the influence of dosing parameters and patient characteristics on the efficacy of      | 20                                 | 1747               | Aerobic exercise (AEX)                                |
| Kissela B, Dunning K.  | Analysis With Meta-Regression.                                           | Apr;10(4):398-409.  | aerobic exercise (AEX) post stroke.                                                              |                      |                    |                                                        |
| Study citation details | Title | Year of publication | Review aims/objectives/questions | Number of primary studies in review | No of participants | Intervention |
|------------------------|-------|---------------------|----------------------------------|------------------------------------|--------------------|--------------|
| Church G, Parker J, Powell L, Mawson S. | The effectiveness of group exercise for improving activity and participation in adult stroke survivors: a systematic review. Physiotherapy. 2019;105(4):399-411. | 2019 | Therefore, the aim of this systematic review was to examine how group exercise interventions improves the ICF domain of function and participation in adult stroke survivors. The secondary aim was to explore if and how the mechanism of progressive intensity has been measured for group exercise interventions. | 14 | 1039 | Group exercise including water based, aquatic, tai chi, circuit, exercise, education, Resistance training, balance exercise, fitness and mobility exercises, stretching, weight lifting. |
| Da Campo L, Hauck M, Marcolino MAZ, Pinheiro D, Plentz RDM, Cechetti F. | Effects of aerobic exercise using cycle ergometry on balance and functional capacity in post-stroke patients: a systematic review and meta-analysis of randomised clinical trials. Disabil Rehabil. 2019 Oct 2:1-7. | 2019 | The objective of this systematic review and meta-analysis are to evaluate evidence about the effects of aerobic exercise with cycle ergometer on the balance of post-stroke patients, evaluated by the Berg Balance Scale (BBS), and functional capacity, evaluated by the maximal oxygen intake and six-minute walk test (6MWT). This study aims to systematically review randomised clinical trials (RCT) which applied aerobic exercise with cycle ergometer alone, compared to conventional therapy or other interventions on balance and functional capacity outcomes in post-stroke patients. | 5 | 258 | Cycle ergometry |
| Dorsch S, Ada L, Alloggia D. | Progressive resistance training increases strength after stroke but this may not carry over to activity: a systematic review. J Physiother. 2018 Apr;64(2):84-90. | 2018 | Objectives are: 1. What is the effect of progressive resistance training on strength after stroke? 2. Does any increase in strength carry over to activity? | 11 | 314 | Progressive resistance strength training |
| Dorstyn D, Roberts R, Kreiboeve I, Kennedy P, Liesu C. | Systematic review of leisure therapy and its effectiveness in managing functional outcomes in stroke rehabilitation. Top Stroke Rehabil. 2014 Jan-Feb;21(1):40-51. | 2014 | The aim of this study was to perform a systematic review on the exercise trials post stroke. | 15 | 722 | Aerobic training 60% of studies used cycle ergometer, 33.3% used a treadmill and 6.7% a combination of the two |
| English C, Hillier SL, Lynch EA. | Circuit class therapy for improving mobility after stroke. Cochrane Database Syst Rev. 2017 Jun 26(6) | 2017 | To examine the effectiveness and safety of CCT on mobility in adults with stroke | 17 | 1297 | Circuit Class training |
| English C, Manns PJ, Tucak C, Bernhardt J. | Physical activity and sedentary behaviors in people with stroke living in | 2014 | This systematic review aimed to update current knowledge of physical activity and sedentary behaviors among people | 26 | 983 | Description of the time spent active |
| Study citation details | Title | Year of publication | Review aims/objectives/questions | Number of primary studies in review | No of participants | Intervention |
|------------------------|-------|---------------------|----------------------------------|-------------------------------------|-------------------|--------------|
| with stroke living in the community: a systematic review. Phys Ther. 2014 Feb;94(2):185-96. | How Physically Active Are People Following Stroke? Systematic Review and Quantitative Synthesis. Phys Ther. 2017 Jul 1;97(7):707-717. | 2018 | The aim of this study is to evaluate the effectiveness of tai chi on rehabilitation in stroke patients, in order to help clinicians to make evidence-based decisions on the use of tai chi in stroke patients | 5 | 346 | Tai chi comprises slow, graceful and precise movements, performed with a low centre of gravity |
| Fini NA, Holland AE, Keating J, Simek J, Bernhardt J. How Physically Active Are People Following Stroke? Systematic Review and Quantitative Synthesis. Phys Ther. 2017 Jul 1;97(7):707-717. | Effects of Tai Chi on Balance and Gait in Stroke Survivors: a Systematic Meta-Analysis of Randomized Controlled Trials | 2018 | The aim of this study is to evaluate the effectiveness of tai chi on rehabilitation in stroke patients, in order to help clinicians to make evidence-based decisions on the use of tai chi in stroke patients | 103 | 5306 | Devices/behaviour map |
| Francia JV, Bigongiari A, Mochizuki L, Miranda ML, Rodrigues B. Aerobic program in persons with stroke: a systematic review. Acta Med Port. 2014 Jan-Feb;27(1):108-15. | General lifestyle interventions on their own seem insufficient to improve the level of physical activity after stroke or TIA: a systematic review | 2020 | What is the effect of lifestyle interventions on the level of physical activity performed by people with stroke or TIA? | 11 | 2403 | General lifestyle/physical activity interventions |
| Galloway M, Marsden DL, Callister R, Erickson KJ, Nilsson M, English C. What Is the Dose-Response Relationship Between Exercise and Cardiorespiratory Fitness After Stroke? A Systematic Review. Phys Ther. 2019 Jul 1;99(7):821-832. | Exercise Interventions on Mobility among Stroke Patients | 2016 | The objective of this systematic review was to assess the impact of these aerobic exercise interventions on mobility outcomes among long-term stroke survivors. | 9 | 529 | The aerobic intervention groups comprised walking, which was done either indoors or outdoors on a track or treadmill. |
| Hendrickx, W, Vlietstra, L, Valkenet, K. et al. General lifestyle interventions on their own seem insufficient to improve the level of physical activity after stroke or TIA: a systematic review. BMC Neurol 20, 168 (2020). | Effect of Aerobic Exercise Interventions on Mobility among Stroke Patients: A Systematic Review. Am J Phys Med Rehabil. 2016 Mar;95(3):214-24. | 2020 | The purpose of this study was to systematically review and quantify the effects of aerobic exercise training on cardiorespiratory fitness, muscle strength, and walking capacity after stroke | 19 | 602 | Structured exercise intervention based on combined Aerobic Training and Resistance Training |
| Kendall BJ, Gothe NP. Effect of Aerobic Exercise Interventions on Mobility among Stroke Patients: A Systematic Review. Am J Phys Med Rehabil. 2016 Mar;95(3):214-24. | Combined Aerobic and Resistance Training for Cardiorespiratory Fitness, Muscle Strength, and Walking Capacity after Stroke: A Systematic Review and Meta-Analysis | 2020 | The purpose of this study was to systematically review and quantify the effects of aerobic exercise training on cardiorespiratory fitness, muscle strength, and walking capacity after stroke | 19 | 602 | Structured exercise intervention based on combined Aerobic Training and Resistance Training |
| Kringel, E. A., Barone Gibbs, B, Campbellbell, G., McCue, M, Terhorst, L., Kersey, J., & Skidmore, E. R. (2020). Influence of Interventions on Daily Physical Activity and Sedentary Behavior | Physical fitness interventions for non-ambulatory stroke survivors: A mixed-methods systematic review and meta-analysis. | 2018 | The aim of this mixed-methods systematic review and meta-analysis was to synthesize published literature on physical fitness interventions for non-ambulatory stroke survivors and evaluate the evidence for their effects on fitness, function, activity and participation, quality of life. | 33 | 910 | Most studies were characterised as assisted walking training (using electromechanical and other devices), 5 studies used cycle ergometer 3 studies had other training (dance, pilates, |
| Study citation details | Title | Year of publication | Review aims/objectives/questions | Number of primary studies in review | No of participants | Intervention |
|------------------------|-------|---------------------|---------------------------------|-------------------------------------|--------------------|--------------|
| after Stroke: A Systematic Review. Pm&r, 12(2), 186-201. | Larissa Tavares Aguiar, Sylvie Nadeau, J A Ila Caetano Martins, Luci FuscaldiTeixeira-Salmela, Raquel Rodrigues Britto & Christina Danielli Coelho de Morais Faria (2020) Efficacy of interventions aimed at improving physical activity in individuals with stroke: a systematic review, Disability and Rehabilitation, 42:7, 902-917. | 2020 | Efficacy of interventions aimed at improving physical activity in individuals with stroke: a systematic review. | 18 | 1314 | mixed walking/ cycling and health education; none of these were RCTs. The employed interventions were varied including aerobic training; lower-limb resistance training ; and functional task training. |
| Lawrence M, Kerr S, McVey MC, Godwin J. A systematic review of the effectiveness of secondary prevention lifestyle interventions designed to change lifestyle behaviour following stroke. JBI Libr Syst Rev. 2011;9(43):1782-1827. | Stroke survivors and family members perspectives of multimodal lifestyle interventions for secondary prevention of stroke and transient ischemic attack: a qualitative review and meta-aggregation | 2016 | This review and meta-aggregation aimed to improve understanding of stroke survivor and family member perspectives of secondary prevention interventions. | 5 | 84 | The employed interventions were varied including cardiac rehab programme; community-based exercise; self-management programme and exercise and education group. |
| Lawrence M, Pringle J, Kerr S, Booth J. Stroke survivors' and family members' perspectives of multimodal lifestyle interventions for secondary prevention of stroke and transient ischemic attack: a qualitative review and meta-aggregation. Disabil Rehabil. 2016;38(1):1-21. | Lifestyle interventions for secondary disease prevention in stroke and transient ischemic attack: a systematic review. | 2014 | This systematic review and meta-analysis examine the totality of evidence in relation to the impact of lifestyle changes specifically on the secondary prevention of vascular events post stroke or TIA. | 15 | 2534 | The employed interventions were varied including aerobic exercise and healthy lifestyle advice modelled on cardiac rehabilitation; aerobic interventions; education, advice and/or counselling. |
| Lennon O, Galvin R, Smith K, Doody C, Blake C. Lifestyle interventions for secondary disease prevention in stroke and transient ischaemic attack: a systematic review. Eur J Prev Cardiol. 2014 Aug;21(8):1026-39. | A systematic review of exercise trials post stroke | 2003 | To perform a systematic review of exercise trials post stroke. | 3 | 75 | One to one supervised exercise/ cycle ergometer/ class exercises including ROM and strength. |
| Lee J, Stone AJ. Combined Aerobic and Resistance Training for Cardiorespiratory Fitness, Muscle and | Influence of Interventions on Daily Physical Activity and Sedentary Behavior after | 2020 | To describe the effects of interventions on levels of daily physical activity and sedentary behavior among people with stroke. | 31 | NR | Nonpharmacological rehabilitation interventions on daily activity levels. Intervention components were |
| Study citation details                  | Title                                                                 | Year of publication | Review aims/objectives/questions                                                                 | Number of primary studies in review | No of participants | Intervention                                                                 |
|----------------------------------------|-----------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------|-------------------------------------|--------------------|------------------------------------------------------------------------------|
| Strength, and Walking Capacity after Stroke: A Systematic Review and Meta-Analysis. J Stroke Cerebrovasc Dis. 2020 Jan;29(1):104498. | Stroke: A Systematic Review                                           | 2019                | The primary aim of this systematic review was to determine the effect of different doses of exercise on cardiorespiratory fitness in people after stroke. | 9                     | 279                | classified as exercise, behavior change techniques, and education            |
| Li CY, Wang W, Liu GL, Zhang Y. Effects of Tai Chi on balance and gait in stroke survivors: A systematic meta-analysis of randomized controlled trials. J Rehabil Med. 2018 Jul 17;50(7):582-588. | What is the dose-response relationship between exercise and cardiorespiratory fitness after stroke? A systematic review | 2019                | This systematic review aimed to establish whether lifestyle interventions designed to help prevent recurrent stroke are effective in terms of effecting positive changes to lifestyle risk factor behaviour. | 3                     | 581                | Walking for Exercise                                                         |
| Lloyd M, Skelton DA, Mead GE, Williams B, van Wijk F. Physical fitness interventions for nonambulatory stroke survivors: A mixed-methods systematic review and meta-analysis. Brain Behav. 2018 Jul;8(7) | A review of the effectiveness of secondary prevention lifestyle interventions designed to change lifestyle behaviour following stroke. | 2011                | This review therefore aims to: a. identifies studies of fatigue after stroke that are linked to physical activity and physical fitness; b. determine how fatigue after stroke is measured; c. explore whether there is a relationship between poststroke fatigue and reduced physical activity and physical fitness efficiency; and d. establish the impact of fatigue poststroke on physical activity and physical fitness. | 19                    | 2072               | The employed interventions were varied including Physical fitness, ADL interventions, Mobility/ Activity or Not described |
| Loureiro, A. P. C., Guarita-Souza, L. C., Lerdal, A., & Langhammer, B. (2014). A review of the relationship between poststroke fatigue and physical activity. Topics in Geriatric Rehabilitation, 30(4), 296-306. | A Review of the Relationship Between Poststroke Fatigue and Physical Activity | 2014                | Effect of high-intensity exercise on cardiorespiratory fitness in stroke survivors: A systematic review and meta-analysis. | 17                    | 707                | An exercise intervention with high intensity includes high-intensity training (HIT) and high-intensity interval training (HIIT), HIT refers to a high intensity exercise |
| Luo L, Meng H, Wang Z, Zhu S, Yuan S, Wang Y, Wang Q. Effect of high-intensity exercise on cardiorespiratory fitness in stroke survivors: A systematic review and meta-analysis. Ann Phys Rehabil Med. 2020 Jan;63(1):59-68.. | Effect of high-intensity exercise on cardiorespiratory fitness in stroke survivors: A systematic review and meta-analysis. | 2020                | Effect of high-intensity exercise on cardiorespiratory fitness in stroke survivors: A systematic review and meta-analysis. | 17                    | 707                | Most of high intensity interventions included treadmill (n = 13) and cycle ergometer (n = 8) |
| Luo L, Zhu S, Shi L, Wang P, Li M, Yuan S. High Intensity Exercise for Walking Competency in Individuals with Stroke: A Systematic Review and Meta-Analysis. J Stroke Cerebrovasc Dis. 2019 Dec 28;28(12):104414. | High Intensity Exercise for Walking Competency in Individuals with Stroke: A Systematic Review and Meta-Analysis | 2019                | To evaluate the evidence and safety of high intensity interventions related to improving walking functional outcomes after stroke. | 22                    | 952                | Activity monitors for increasing                                             |
| Lynch EA, Jones TM, Simpson DB, Fini | Activity monitors for increasing                                       | 2018                | To summarise the available evidence regarding the                                             | 15                    | 245                | An activity monitor to be any wearable or                                       |
| Study citation details | Title | Year of publication | Review aims/objectives/questions | Number of primary studies in review | No of participants | Intervention |
|------------------------|-------|---------------------|---------------------------------|-------------------------------------|--------------------|--------------|
| NA, Kuys SS, Borschmann K, Kramer S, Johnson L, Callisaya ML, Mahendran N, Janssen H, English C; ACTIONs Collaboration. Activity monitors for increasing physical activity in adult stroke survivors. Cochrane Database Syst Rev. 2018 Jul 27;7(7). | Physical activity in adult stroke survivors | Effectiveness of commercially available, wearable activity monitors and smartphone applications for increasing physical activity levels in people with stroke. | 1 | 35 | 1293 | Portable electronic device that provided feedback (in either real time, or on a regular basis, e.g. Daily or weekly) on physical activity. |
| Lyu D, Lyu X, Zhang Y, Ren Y, Yang F, Zhou L, Zou Y and Li Z (2018) | Tai Chi for stroke rehabilitation: A systematic review and meta-analysis of randomized controlled trials. | Activity monitors for increasing physical activity in adult stroke survivors. | 2018 | 35 | 1293 | Tai Chi |
| Marsden DL, Dunn A, Callister R, Levi CR, Spratt NJ. Characteristics of exercise training interventions to improve cardiorespiratory fitness after stroke: a systematic review with meta-analysis. Neurorehabil Neural Repair. 2013 Nov-Dec;27(9):775-88. | Resistance training for gait speed and total distance walked during the chronic stage of stroke: A meta-analysis. | The objective of this study was to determine whether resistance training is an effective solution in increasing gait endurance and speed 6 months post stroke. | 2012 | 10 | 406 | The employed interventions were varied including: Progressive resistance training; Max concentric isokinetic strength training; Body weight supported treadmill training; Task orientated progressive resistance strength training; Sham aerobic exs and progressive resistance training and Strengthening exs for LL and functional task 10 walking related tasks 12 circuit exercise sessions. |
| Meek C, Pollock A, Potter J, Langhorne P. A systematic review of exercise trials post stroke. Clin Rehabil. 2003 Feb;17(1):6-13. | Effect of high-intensity exercise on cardiorespiratory fitness in stroke survivors: A systematic review and meta-analysis. | This systematic review will provide specific information on high-intensity exercise programs and their efficacy in improving CRF in individuals with stroke. | 2020 | 17 | 707 | An exercise intervention with high intensity includes high-intensity training (HIT) and high-intensity interval training (HIIT). HIT refers to a high intensity exercise program performed continuously, HIIT is characterized by maximum exercise intensity by short bursts of concentrated effort alternating with low activity or rest. |
| Mehta S, Pereira S, Vorwa R, Mays R, McIntyre A, Janzen S, Teasell RW. Resistance training Cardiovascular | Conditioning for Comfortable Gait Speed and Total Distance Walked | To determine whether cardiorespiratory exercise interventions initiated 6 months or more post stroke are effective in | 2012 | 7 | 254 | The employed interventions were varied including Water based leg exercises; Body |
| Study citation details                                                                 | Title                                                                 | Year of publication | Review aims/objectives/questions                                                                 | Number of primary studies in review | No of participants | Intervention                                                                                                                                 |
|---------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------|------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| for gait speed and total distance walked during the chronic stage of stroke: a meta-analysis. Top Stroke Rehabil. 2012 Nov-Dec;19(6):471-8. | During the Chronic Stage of Stroke: A Meta-Analysis                  |                     | Improving gait speed and total distance walked (as measured by the 6-minute walk test [6MWT]) |                      |                   |                                                                                                                                             |
| Mehta S, Pereira S, Janzen S, Mays R, Viona R, Lobo L, Teasell RW. Cardiovascular conditioning for comfortable gait speed and total distance walked during the chronic stage of stroke: a meta-analysis. Top Stroke Rehabil. 2012 Nov-Dec;19(6):463-70. | A systematic review of perceived barriers and motivators to physical activity after stroke | 2013                | The aim of the present study was to systematically review the literature to identify all studies examining perceived barriers and motivators to physical activity after stroke, with the specific objectives to (i) identify the most commonly reported barriers and motivators to physical activity after stroke and (ii) identify any tools/questionnaires specifically designed to explore perceived barriers and motivators to physical activity after stroke. | 6                                  | 174                | Interviews and focus groups                                                                                                                                 |
| Moore SA, Hrisos N, Flynn D, Errington L, Price C, Avery L. How should long-term free-living physical activity be targeted after stroke? A systematic review and narrative synthesis. Int J Behav Nutr Phys Act. 2018 Oct 17;15(1):100. | Interventions to promote long-term participation in physical activity after stroke: A systematic review of the literature | 2014                | To investigate the effects of interventions to promote long-term participation in PA on measures of frequency, duration, and intensity of PA at 3 months or longer in community-dwelling stroke survivor. | 11                                 | 1704               | The employed interventions were varied including: Tailored counselling; Mapping/setting/monitoring of PA goals; motivational interviewing/counseling; goal setting and reviewing techniques or follow-up visits/phone calls to promote adherence. Tailored exercises with activity advice (n = 5) The exercise interventions focused on walking, falls prevention. |
| Morris JH, Macgillivray S, McFarlane S. Interventions to promote long-term participation in physical activity after stroke: a systematic review of the literature. Arch Phys Med Rehabil. 2014 May;95(5):956-67. | The Importance of Psychological and Social Factors in Influencing the Uptake and Maintenance of Physical Activity after Stroke: A Structured Review of the Empirical Literature | 2012                | Objectives: (1) What is the role of psychological factors in influencing the uptake and/or maintenance of PA after stroke? (2) What is the role of social factors in influencing the uptake and/or maintenance of PA after stroke? (3) Within the literature that explores the role of psychosocial factors in the uptake and/or maintenance of PA after stroke, which health behaviour models have been investigated | 20                                 | NR                 | Any type of PA aimed at improving a particular skill or ability                                                                                                                                 |
| Morris J, Oliver T, Kroll T, Macgillivray S. The importance of psychological and social factors in influencing the uptake and maintenance of physical activity after stroke: a | Characteristics of Exercise Training Interventions to Improve Cardiorespiratory Fitness After Stroke: A Systematic Review With Meta-analysis | 2013                | To determine the effectiveness of exercise interventions to improve cardiorespiratory fitness after stroke. | 30                                 | NR                 | The employed interventions were varied including Aerobic training (n = 16) [treadmill, n = 8; cycle, n = 6; deep-water exercise, n = 1; cycle and recumbent stepper, n = 1], 11 used a |
| Study citation details | Title | Year of publication | Review aims/objectives/questions | Number of primary studies in review | No of participants | Intervention |
|------------------------|-------|---------------------|----------------------------------|-------------------------------------|-------------------|-------------|
| Nicholson S, Sniehotta FF, van Wijck F, Greig CA, Johnston H, McMurdo ME, Dennis M, Mead GE. A systematic review of perceived barriers and motivators to physical activity after stroke. Int J Stroke. 2013 Jul;8(5):357-64. | Effectiveness of walking training on balance, motor functions, activity, participation and quality of life in people with chronic stroke: a systematic review with meta-analysis and meta-regression of recent randomized controlled trials. | 2021 | The purpose of the present systematic review, meta-analysis and meta-regression was to review and quantify the effects of various walking training protocols versus other physical exercises for the improvement of balance, motor functions, walking endurance, walking speed, participation, and quality of life in people with chronic stroke. | 15 | 653 | Walking training is any activity/exercise that involves walking including recreational or free-living walking within the community, walking for fitness, and competitive race-walking as well as rehabilitative walking training (e.g. walking with expensive robotics, body weight supported training, aquatic pool floor walking). |
| Peurala SH, Karttunen AH, Sjőgren T, Paltamaa J, Heinonen A. Evidence for the effectiveness of walking training on walking and self-care after stroke: a systematic review and meta-analysis of randomized controlled trials. 2014. J Rehabil Med. May;46(5):387-99. | Evidence for the effectiveness of walking training on walking and self-care after stroke: a systematic review and meta-analysis of randomized controlled trials. | 2014 | To examine the effect of randomized controlled trials of walking training on walking and self-care in patients with stroke. | 44 | NR |Walking training-Traditional walking training includes walking with essential walking aids/orthosis combined with verbal and manual guidance. |
| Pogrebovy D, Dennett A. Exercise Programs Delivered According to Guidelines Improve Mobility in People With Stroke: A Systematic Review and Meta-analysis. Arch Phys Med Rehabil. 2020 Jan;101(1):154-165. | Exercise Programs Delivered According to Guidelines Improve Mobility in People With Stroke: A Systematic Review and Meta-analysis. | 2020 | To determine if prescribing a combined aerobic and resistance training exercise program in accordance with American Stroke Association physical activity guidelines improves mobility and physical activity levels of people after stroke. The primary aim of this systematic review was to determine the effectiveness of combined aerobic and resistance training exercise programs, prescribed according to guidelines, for improving mobility and physical activity levels of people with stroke. | 8 | 499 | The employed interventions were varied including Cardic Walking: Exercise bike; treadmill; steps ; Resistance; functional strengthening, resistance bands and lower limb strengthening machines. the aerobic training component included walking, exercise bike, treadmill, and steps. Interventions for the resistance training component included functional strengthening, resistance bands, or lower limb strengthening. |
| Study citation details | Title                                                                 | Year of publication | Review aims/objectives/questions                                                                 | Number of primary studies in review | No of participants | Intervention |
|------------------------|----------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------|-------------------------------------|-------------------|--------------|
| Saltychev M, Sjögren T,BArvärd E, Laimi K, Paltamaa J. Do aerobic exercises really improve aerobic capacity of stroke survivors? A systematic review and meta-analysis. Eur J Phys Rehabil Med. 2016 Apr;52(2):233-43. | Do aerobic exercises really improve aerobic capacity of stroke survivors? A systematic review and meta-analysis | 2016 | The purpose of our study was to investigate: 1) if there is evidence that aerobic capacity of stroke survivors, measured by maximal oxygen consumption (Vo2max), can be improved by aerobic training and, if so; 2) what is the evidence on clinically significant magnitude of this effect? | 13 | 689 | strengthening machines Comparison interventions included unsystematic physical activity, 17home exercise programs22or seated upper extremity programs, 26relaxation, 27and unstructured usual care19, 23Two trials24, 25 compares a combined program with an aerobic-only training program |
| Saunders DH, Sanderson M, Hayes S, Johnson L, Kramer S, Carter DD, Jarvis H, Brazzelli M, Mead GE. Physical fitness training for stroke patients. Cochrane Database of Systematic Reviews 2020, Issue 3. Art. No.: | Physical fitness training for stroke patients | 2020 | The primary objectives of this updated review were to determine whether fitness training after stroke reduces death, death or dependence, and disability. The secondary objectives were to determine the effects of training on adverse events, risk factors, physical fitness, mobility, physical function, health status and quality of life, mood, and cognitive function. | 75 | 3617 | Physical fitness training |
| Stoller, O., de Bruin, E.D., Knols, R.H. et al. Effects of cardiovascular exercise early after stroke: systematic review and meta-analysis. 2012. BMC Neurol 12, 45 | Effects of cardiovascular exercise early after stroke: systematic review and meta-analysis. | 2012 | The aim is to provide an overview of the evidence for the use of CV training in the early stages post stroke. | 11 | 423 | Body weight supported treadmill training; strength, balance, cycle ergometry; Treadmill training; Leg cycle ergometry; Task orientated circuit class training and Handbike |
| Stretton CM, Mudge S, Kayes NM, McPherson KM. Interventions to improve real-world walking after stroke: a systematic review and meta-analysis. Clin Rehabil. 2017 Mar;31(3):310-318. | Interventions to improve real-world walking after stroke: A systematic review and meta-analysis | 2017 | This study aimed to determine the effectiveness of current interventions to improve real-world walking for people with stroke and specifically whether benefits are sustained. | 10 | NR | Interventions were grouped as either (a) primarily consisting of progressive exercise or (b) explicitly including at least one or more of the 40 behaviour change techniques as outlined by the CALO-RE taxonomy for use in interventions to improve physical activity. |

(continued)
| Study citation details | Title                                                                 | Year of publication | Review aims/objectives/questions                                                                 | Number of primary studies in review | No of participants | Intervention |
|------------------------|----------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------|-------------------------------------|--------------------|---------------|
| Thilarajah S, Mentiplay BF, Bower KJ, Tan D, Pua YH, Williams G, Koh G, Clark RA. | Factors Associated With Post-Stroke Physical Activity: A Systematic Review and Meta-Analysis | 2018                | To investigate factors associated with PR among community dwelling stroke survivors          | 26                    | NR                | NR           |
| Veldema J, Jansen P. | Ergometer Training in Stroke Rehabilitation: Systematic Review and Meta-analysis | 2020                | To summarise controlled studies investigating the potential of ergometer training for stroke recovery and evaluate their findings. | 28                    | 1115               | Ergometer training versus no intervention; Ergometer training versus another intervention; Ergometer training versus another ergometer training | HITT A training protocol commonly referred to as high-intensity interval training (HIT) consists of intermittent bursts of effort separated by periods of recovery |
| Wiener, J., McIntyre, A., Janssen, S., Chow, J.T., Batay, C. and Teassell, R. (2019), Effectiveness of High Intensity Interval Training for Fitness and Mobility Post Stroke: A Systematic Review. Journal of Injury, Function and Rehabilitation, 11: 868-878. doi:10.1002/pmrj.12154 | Effectiveness of High-Intensity Interval Training for Fitness and Mobility Post Stroke: A Systematic Review. | 2019                | To evaluate the evidence on the effectiveness of high-intensity interval training (HIIT) in improving fitness and mobility post stroke | 6                     | 146               | Physical activity |
| West T and Bernhardt J. | Physical Activity in Hospitalised Stroke Patients Stroke Research and Treatment. Volume 2012 (2012), Article ID 813765, 13 | 2012                | The purpose of this paper was to examine common methods of monitoring activity in hospitalised stroke patients and summarise the amount and type of physical activity undertaken by stroke patients managed in a range of hospital settings. | 24                    | NR                | Physical activity |
| Wevers L, van de Port I, Vermue M, Mead G, Kwakkel G. | Effects of task-oriented circuit class training on walking competency after stroke: A systematic review | 2009                | Our aim was to systematically review randomized, controlled trials of task-oriented circuit class training on gait and gait-related activities in patients with stroke | 6                     | 307               | Task orientated circuit class training |
| Wu S, Chen J, Wang S, Jiang M, Wang X, Wen Y. | Effect of Tai Chi Exercise on Balance Function of Stroke Patients: A Meta-Analysis. Med Sci Monit Basic Res. 2018 Dec 3;24:210-215. | 2018                | Evaluate the effectiveness of Tai chi for stroke rehab to help clinicians make evidence based decisions. | 6                     | 347               | Tai Chi |
| Young RE, Broom D, Sage K, Crossland K, Smith C. | Experiences of venue-based exercise interventions for people with | 2019                | The aim of this review of qualitative data is to provide a systematic search and synthesis of evidence about the experiences and | 7                     | 76                | The employed interventions were varied including Circuits; resistance training; flexibility; | (continued) |
| Study citation details | Title | Year of publication | Review aims/objectives/questions | Number of primary studies in review | No of participants | Intervention |
|------------------------|-------|---------------------|---------------------------------|-----------------------------------|-------------------|--------------|
| exercise interventions for people with stroke in the UK: a systematic review and thematic synthesis of qualitative research. Physiotherapy. 2019 Jun 14;50031-9406(19)30075-6. | Stroke in the UK: a systematic review and thematic synthesis of qualitative research. | reported impact of participation in venue based exercise following stroke in the UK | | | | CV circuit; ARNI; Gym based exercise group; Stroke specific exercise group and Exercise on prescription scheme |