

Protocol for scoping review

Title: Maintaining physical activity through the use of digital tools for people with a long-term condition/s (LTCs): A scoping review.

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We will conduct a scoping review to map the available evidence in relation to the maintenance of physical activity through the use of digital interventions for people with a long-term condition/s.

Background and Purpose

Physical activity is defined as “any bodily movement produced by skeletal muscles that requires energy expenditure” (World Health Organization 2019) and is recognised as being beneficial for both the prevention and management of long-term conditions (LTCs) (Public Health England 2016). Indeed, up to 10% of some chronic conditions are caused by physical inactivity (Lee et al., 2012). A chronic or LTC has been described as “a condition that cannot at present be cured but can be controlled with medication or therapies” (UK Department of Health (DH) 2012, p3). Such conditions are also considered to last more than a year, with an associated impact on the person’s life (NICE 2015). Physical activity has been shown to improve the health and wellbeing of those living with a variety of LTCs. For example, Holm et al., (2015) identified improvements in both physical ability and overall health following physical activity for those with long-term musculoskeletal conditions. Marley et al., (2017) and O’Connor et al., (2014) also identified improvements in pain and self-reported function for those with musculoskeletal pain. Furthermore, recent recommendations suggest that physical activity is a necessary part of managing long-term degenerative and inflammatory arthritis (Rausch Osthoff et al., 2018). Physical activity has been found to improve

ambulation and ability to exercise following stroke (Saunders et al., 2016), and balance, mood and quality of life for people with asthma (Carson et al., 2013). Physical activity also plays an important role in the prevention of complications, recurrence and the worsening of some LTCs (Reiner et al., 2013). However, reported levels of physical activity are often lower in people with a LTC and diminish further for those with multimorbidities (Sport England 2019, Saunders et al., 2020, Moseng et al., 2014). This has been reported to lead to a decline in functional ability, symptomatic control and overall wellbeing (Hagen et al., 2012).

Although guidelines exist to support the implementation of physical activity for people with LTCs (WHO 2019, DH 2019, NICE 2018), undertaking such activity is not always straightforward. Indeed, the symptoms that may be improved through physical activity are paradoxically often identified as barriers to participation (Mulligan et al., 2012). Issues surrounding safety, the environment and available information have also been found to be important for encouraging engagement with physical activity (Bethancourt et al., 2014, Brazeau et al., 2008, Mulligan et al., 2012).

Interventions to promote physical activity for people with LTCs include community led initiatives (Stroke Association 2019, Baker et al., 2015), healthcare referral schemes (Onerup et al., 2019, Rowley et al., 2018), and increasingly a variety of digital options (Murray et al., 2017). Many digital tools use the internet due to its potential for reaching a large number of people, including those who are traditionally hard to reach (Parsons and Adams 2018). A recent systematic review by Jahangiry et al., (2017) reported that web-based tools can be effective for promoting physical activity, although their findings were limited to people without a LTC. Similarly, Muller et al., (2016) undertook a systematic review of digital tools to promote physical activity, including web-based tools, smartphone apps and wearables. Their findings indicate that such tools can be effective to enhance activity levels for healthy populations in developing countries. Existing systematic reviews focusing on LTCs have found that digital tools can promote physical activity in the short-term, but lack longer term outcome data, for those with osteoarthritis (Berry et al., 2018), cancer (Roberts et al., 2017) and diabetes (Connelly et al., 2013).

Definitions for the longer-term maintenance of physical activity vary, from one to twelve months post-intervention in existing research (Muller and Khoo 2014). They are also, typically, based on the frequency and intensity of the behaviour, such as regular physical activity lasting more than six months (Dunn et al., 1999). Others have used a definition of a statistically significant change in behaviour at least three months post-intervention (Fjeldsoe et al., 2011). A recent systematic review looking at the maintenance of physical activity behaviours in cancer survivors also used a 3-month definition (Grimmett et al., 2019).

Longer term usage of digital behaviour change tools is interlinked with the concept of engagement (Danaher et al., 2006, McClure et al., 2013). Exploring the factors associated with engagement is considered to be important for understanding and achieving maintenance behaviours (Donkin et al., 2011). Perski and colleagues (2017) undertook a systematic review to conceptualise engagement in relation to digital behaviour change interventions, defining engagement jointly as both usage of the tool and the subjective experience of users. Furthermore, their work highlights that engagement is associated with the tool itself, the wider setting of delivery and those using it. It is therefore important for

the present review to include objectively measured maintenance of physical activity data, qualitative experiences of users and observed barriers and facilitators to the use of such tools.

A small-scale preliminary search of the literature was conducted using the terms (and synonyms of terms) 'maintenance', 'physical activity', 'digital' and 'review'; between 2009 – 2019. This search identified a series of systematic and narrative reviews, but no scoping review in this area. Three of the systematic reviews included studies focusing on long-term conditions, however only a small number of these included digital tools for delivery of the intervention (Grimmett et al., 2019, Samdal et al., 2017, Stellefson et al., 2013). Of the studies that focused on digital tools, only one study reported effective maintenance at >3 months for cancer survivors (Grimmett et al., 2019), while one study from the Samdal et al., (2017) review reported lower deterioration in physical activity levels for people with diabetes. Three further reviews reported maintenance of physical activity using digital tools, but did not include people with a LTC (Jonkman et al., 2018, Maher et al., 2014, Hobbs et al., 2013).

Given the small number of quantitative studies with a focus on digital maintenance of physical activity, we concluded that it was more appropriate to broaden our approach to this review. While a systematic review seeks to answer a more defined question about effectiveness of the best available evidence (Chandler et al., 2019), a scoping review takes a broader approach (Tricco et al., 2018a). Indeed, many scoping reviews aim to identify and map the range of literature in a topic area (Tricco et al., 2016) in order to refine a future research question or to provide a wider perspective than would be possible with a systematic review (Levac et al., 2010). Given the lack of scoping review in this area, we aim to:

- Identify the range and variety of digital tools and their associated theoretical foundations for supporting people with a LTC/s to maintain physical activity.
- Uncover the components considered to be necessary for engagement with digital tools to support maintenance of physical activity

This review ultimately aims to inform the development of future interventions for supporting maintenance of physical activity and other health behaviours.

Review objectives:

1. What is the “extent (size), range (variety) and nature (characteristics) of the evidence” (Tricco et al., 2018b) on digital tools to support the maintenance of physical activity for people with a LTC/s?
2. What theoretical underpinnings are used in digital tools to promote the maintenance of physical activity?
3. What are the experiences of people using digital tools to maintain physical activity?

4. What are the barriers and facilitators to maintaining physical activity for people with a LTC/s using digital tools?

Methods

We will conduct this scoping review in accordance with the PRISMA-ScR guidance <http://www.prisma-statement.org/Extensions/ScopingReviews> (Tricco et al., 2018b) and use the framework devised by Arksey and O'Malley (2005) and further developed by Levac et al., (2010). We will aim to publish and register the protocol on the Open Science Framework (<https://osf.io/>).

Search strategy

Our search strategy will be conducted in three parts in accordance with guidance from Peters et al (2017).

1. A preliminary search in CINAHL and Medline will be undertaken by PC to review titles, abstracts and index terms of identified articles to establish appropriate search terms for our comprehensive search of the literature. Medline was chosen due to its focus on behavioural science and public health (US National Library of Medicine 2019), while CINAHL was chosen due to its focus on health sciences and qualitative methods (Wright et al., 2015). This search will use the following search terms 'Digital', 'Physical activity', 'Maintenance' and synonyms of these terms.
2. A list of comprehensive search terms and strategy will be developed and reviewed by the scoping review team and by an academic librarian. Once this is agreed, a search of the following databases will be undertaken: CINAHL, Medline, OVID EMBASE, IEEE Xplore, PsycINFO, Scopus and Google Scholar (to capture grey literature). We will also search clinical trial registries (PROSPERO, ISRCTN, ICTRP (WHO), EU clinical trials register, Clinicaltrials.gov (USA) to ensure that ongoing and recently completed studies are not missed.
3. Search for additional studies in reference lists of the studies included in the review.

Study selection

To ensure a broad overview of the available evidence, we will include quantitative, qualitative and mixed methods studies in this review. This will incorporate all research designs (primary and secondary sources), while also including opinion-based articles, conference proceedings and abstracts. The inclusion of both published and unpublished sources will ensure the potential for effectively answering each research question.

The process for study selection is shown in Figure 1. Once the comprehensive search (search strategy - step 2) has been undertaken, 5% of the results will be independently assessed by two researchers (PC, SMcD) to explore whether the eligibility criteria are suitable or if refinements are necessary (Levac et al., 2010, Colquhoun 2019). A process of reviewing

titles and abstracts from the final list of results will be divided amongst the team for screening against the eligibility criteria using the Covidence review software (Veritas Health Innovation, Melbourne, Australia). Each reference will be reviewed by two independent researchers, with any conflicts highlighted through the software and decided by a verifier.

Full-text reports will be obtained and divided between the team for review and charting. In accordance with guidance from Arksey and O'Malley (2005) and Peters et al., (2017), a quality appraisal of the identified studies will not be undertaken.

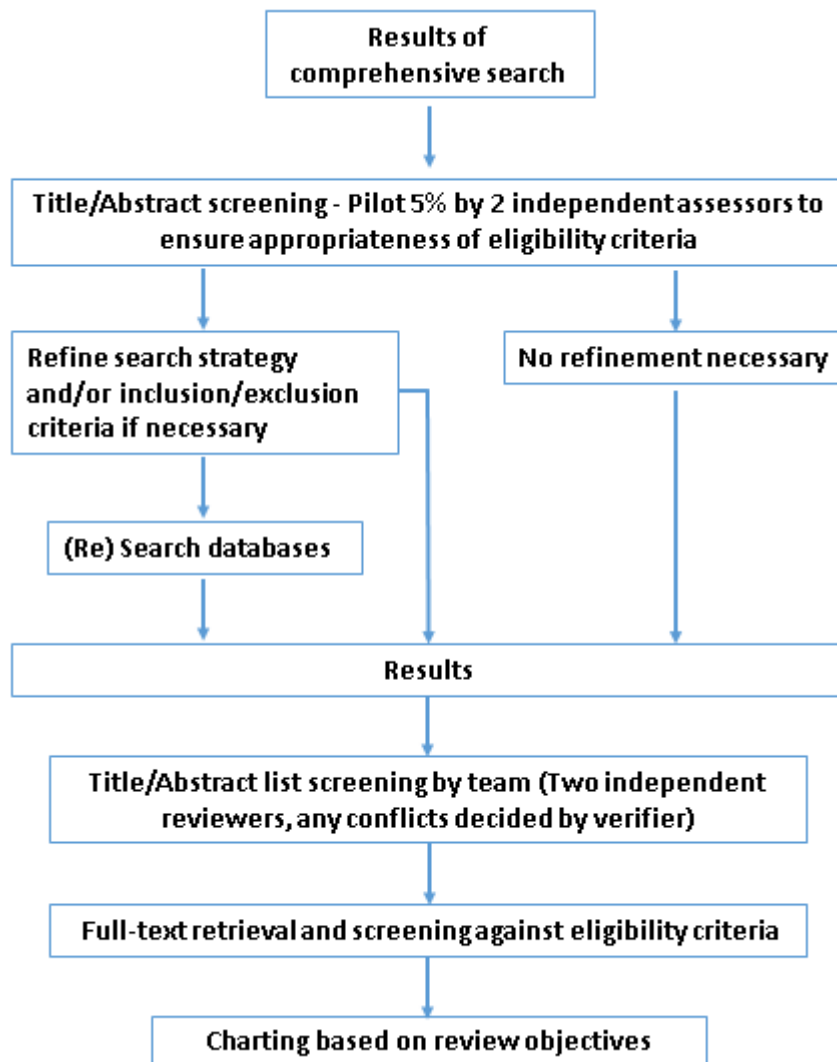


Figure 1: Process for study selection

Eligibility criteria

Long-term conditions

Adults with at least one LTC defined as “a condition that cannot at present be cured, but can be controlled with medication or therapies”, while also being considered to last more than a year and have an associated impact on the person’s life (DH 2012, NICE 2015). The LTCs to

be included in the review are based on The Quality and Outcomes Framework (QOF) from 2017/18 (NHS Digital 2018) and the National Institute for Health and Care Excellence (NICE) physical activity pathways (NICE 2019). These include the following conditions and synonyms of these conditions:

- Cardiovascular disease, including AF, HTN, Heart failure, Peripheral arterial disease, secondary prevention of coronary heart disease
- Myocardial infarction: secondary prevention
- Stroke/TIA
- Asthma
- COPD
- Chronic kidney disease
- Diabetes mellitus
- Dementia
- Epilepsy
- Mental Health
- Depression
- Osteoporosis
- Rheumatoid arthritis
- Osteoarthritis
- Obesity

We will also include studies that have used broader terms such as chronic, long-term condition and multimorbidity as long as one or more of the specific conditions highlighted above is included. Following a small-scale pilot of literature in this area we identified that some studies will include one of these conditions as a subset of the overall population. Where possible, results will only be extracted in relation to this relevant condition/s, although if the results are not reported by population, the overall results will still be charted.

Cancer and low back pain will be excluded due to recent published reviews in the area (Grimmett et al., 2019, Roberts et al., 2017, Garg et al., 2016, Goode et al., 2015).

Physical activity intensity

Studies will include adults who are not currently maintaining the >150 minutes of moderate to vigorous activity (MVPA) per week (Ottenbacher et al., 2012) or stated equivalent, such as duration and intensity using UK physical activity guidelines (Department of Health and Social Care 2019). Studies that report only a reduction in sedentary time will be excluded.

Maintenance definition

Maintenance will be defined as at least 3 months post the end of the intervention in accordance with previous reviews that have explored maintenance of physical activity (Grimmett et al., 2019, Fjeldsoe et al., 2011). However, we recognise that given the range of conditions and types of digital intervention included, it is likely that limiting our inclusion criteria to only those studies that report no-contact with participants post-intervention will

be too restrictive. We will instead ensure that this information (if reported) is charted to be able to map the literature in this area, in accordance with a scoping review methodology (Levac et al., 2010). Where possible, results will be charted to reflect the impact of the digital tool on maintenance of physical activity, although if this is not possible, the overall results will still be charted.

Digital tools

Digital tools are defined using the World Health Organisation classification of digital health interventions v 1.0 (WHO 2018). The categories used in this classification and associated digital health tool examples are shown in Table 1. Combinations of digital tools and multifactorial interventions where digital is part of the intervention will also be included.

Table 1: Digital tools for inclusion in review

WHO category for digital health interventions for clients (WHO 2018)	Example of digital tool
Targeted client communication	Email or other messaging intervention Web-based intervention
Untargeted client communication	Web-based or software-based interventions, including video
Client to client communication	Digital peer support group
Personal health tracking	Smart watch or other activity tracker with a visual display Telemedicine systems with visual display for user
Citizen-based reporting	
On-demand information services to clients	Digital sources of information
Client financial transactions	Digital incentive management
Other	Exergaming, gamification

We will exclude studies that have used pedometers and accelerometers alone, without a connection to another digital device.

Type of studies

- Studies published between 2009 and 2019 (Fjeldsoe et al's 2011 review reports up to 2009 and found only one study relating to internet-based delivery). However, as it is likely that abstracts will ultimately be published as full-text papers, to avoid duplication, we will only include abstracts from the last three years (2017 – 2019).
- All quantitative studies including controlled, validation, evaluation, observational studies, conference proceedings, abstracts
- All qualitative studies including case studies, ethnographies, grounded theory, phenomenological
- Secondary sources including literature reviews

- Mixed methods studies
- Opinion-based articles

Data extraction (charting)

The results of the identified studies will be extracted into a template, which is based on the research objectives. The format of the template has been informed by charting forms developed by Peters et al., (2017), Grimmett et al., (2019) and Burke et al., (2017) (Appendix A). Our charting form will be further refined by the research team after initial use including early pilot work with a range of relevant studies. The scope and type of data to be extracted will be determined by the review objectives (highlighted above) and through discussion with the team. This will be facilitated through an online portal, allowing the team to both see each other's contribution to the charting process and discuss any uncertainties.

Studies will be reviewed using the 'descriptive analytical method' described by Arksey and O'Malley (2005). This approach requires reviewers to identify and record the theoretical underpinnings of the research. Although quality appraisal will not be undertaken, this approach requires that the data be synthesised (Levac et al., 2010, Arksey and O'Malley (2005). The full list of data to be charted from the identified studies is shown in Appendix A. Identifying the effectiveness of identified interventions is not a specific objective of this scoping review but is included in the charting form to inform the development of future review objectives. This approach is consistent with the broader aims of scoping reviews reported by Levac et al., (2010) and Arksey and O'Malley (2005).

Data analysis (collating and summarising)

Quantitative data will be described descriptively in accordance with guidance from Arksey and O'Malley (2005). Qualitative data will be analysed using a thematic analysis approach (Braun and Clarke 2006), utilising an inductive approach to develop codes and themes based on the data charted (Braun and Clarke 2012). This will encompass the six-stage approach defined by Braun and Clarke (2006), including:

1. Familiarisation with the data
2. Initial coding
3. Identifying themes
4. Reviewing themes
5. Defining and naming themes
6. Reporting

The research team will be divided based on their experience with qualitative and quantitative research to undertake the data analysis.

Reporting the results

We will present the results of this scoping review in the most appropriate manner based on the results identified. This may include the use of summary tables to highlight the key findings of the review and/or pictorial/flowcharts.

Timescales

November 2019 – January 2020

- Conduct preliminary searches, develop comprehensive search strategy with team and librarian
- Pilot charting form
- Undertake full searches

January – May 2020

- Pilot 5% of results by two independent screeners, update search strategy if necessary
- Allocation of full list of Title/Abstracts for review against eligibility criteria
- Resolving conflicts
- Full-text retrieval and allocation for full-text review
- Charting

June – August 2020

- Charting
- Collating and summarising (Data analysis)
- Allocation (based on results and expertise)

August – October 2020

- Drafting of publication

Appendix A: Adapted charting form headings based on Peters et al (2017), Grimmatt et al (2019), Burke et al (2017). Full charting form includes example extraction.

Study citation (e.g. author/s, date, title, journal, volume, issue, pages)	
Study design	
Country and number of sites	
Setting	
Study focus, inclusion/exclusion criteria, intervention description Please indicate if digital was only part of the intervention and if so to what extent was it used?	
N (Control, Intervention group) (If there is a control and intervention group, please provide demographics for both groups in the appropriate field)	
Age (Mean/SD) (Control, Intervention group) (If there is a control and intervention group, please provide demographics for both groups in the appropriate field)	
Gender (N/%) (Control, Intervention group) (If there is a control and intervention group, please provide demographics for both groups in the appropriate field)	
Long-term condition (Select the primary condition from list)	
Comorbidities (Please indicate number and condition/s)	
Theoretical underpinning Was the BCT Taxonomy v1 (Michie et al 2013) used?	
Theoretical underpinning Was another theoretical underpinning used? (Select from pre-defined list only)	
Other reported theoretical underpinning (If more than two, please type in)	
Follow-up period Length of follow up Did participants have access to intervention during follow-up?	
Effectiveness of the intervention in relation to physical activity (How was effectiveness reported?) Subjective = patient-reported outcomes,	

Objective = Use of a measure/s that have evidence of reliability	
Effectiveness of the intervention (If subjective or objective, which methods were used and what were the results?)	
Author reported limitations	
Reference list check (Please add citations that have been referred to in discussion and appear relevant to inclusion criteria)	
Experiences of intervention use for maintenance of physical activity (Please record the themes identified and relevant participant quotes)	
Barriers to maintaining physical activity (Please record the themes identified and relevant participant quotes)	
Facilitators to maintaining physical activity (Please record the themes identified and relevant participant quotes)	

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