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Use of technology in supporting goal setting in rehabilitation for adults: a scoping review

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ABSTRACT

Objective To map the extant literature evaluating the use of technology for goal setting in adult rehabilitation and the impact of technology for patient outcomes.

Design Scoping review.

Methods MEDLINE (via Ovid), CINAHL (via EBSCO), AMED and Scopus were searched for articles describing observational or interventional studies. ProQuest Dissertations and Theses database were searched for grey literature. Two review authors independently screened all titles and abstracts for potentially relevant articles. We included articles describing studies that had evaluated the development or application of technology to facilitate goal setting in rehabilitation for adults. Articles were excluded if the technology described did not include features to facilitate goal setting or were not in English. Narrative reviews, opinion pieces and editorials were also excluded.

Results After screening 1640 publications of potential interest, we identified 27 studies for inclusion. These 27 articles described studies involving a total of 16 different technologies including, seven mobile apps, three websites, two mobile apps/website hybrids, two apps and two websites connected to a pedometer. We found that most technologies described were designed to facilitate self-management with goal setting as a feature and that only five included a shared decision moment around goal setting. Only six of the 16 technologies had research providing evidence of effectiveness in terms of improved patient outcomes, with the best evidence of beneficial effects associated with technologies that linked goal setting to pedometer use.

Conclusions The identified technologies for use in adult rehabilitation that included goal setting as a feature were largely accepted and valued by patients and health professionals. The limited data suggest that there is a need for further research; specific foci may include the impact of incorporation of a shared decision-making moment and evaluation of effectiveness on patient outcomes.

Strengths and limitations of this study

- ► This scoping review synthesises research evidence in a relatively new research area and identifies areas for further research.
- ► Knowing that digital technologies rapidly change, the reported findings may need to be reappraised in the near future.
- ► The nature of the scoping review did not allow the grading of the evidence since a quality evaluation of the included studies has not been conducted.

INTRODUCTION

Goal setting is an essential component of any rehabilitation programme. This concept has increasingly dominated discourse as the formal process whereby a rehabilitation professional or a multidisciplinary team, together with the patient and/or their family, negotiate goals. Goal setting has been described as a desired future state that has to be actively selected, intentionally created, have purpose and is shared[1] and is an essential feature of any rehabilitation programme.[2 3]

Goal setting in rehabilitation ensures explicit identification of the reasons for any clinical activity. In rehabilitation, setting goals may: increase patient motivation and drive; allow the rehabilitation process to be better monitored and so to stop ineffective interventions; enhance the effectiveness of therapy and enhance shared decision making and thus the person-centredness of rehabilitation service delivery.[4 5] Locke and Latham stated that goals have an energising function whereby participation in the goal-setting process increases performance, and persistence to achieve specific goals.[6] As well, Wade affirmed the identification and setting of appropriate collaborative goals should be one of the skills that characterises professionals involved in rehabilitation.[7]

Despite the importance attributed to goal setting, health professionals can struggle to involve patients in the goal selection process to the extent that is desirable.[8–11] This lack of involvement may be due to: (a) patients being hesitant to promote their own ideas as they rely on the health professional to direct rehabilitation planning[12]; (b) health professionals being overwhelmed by the task of collaborating in goal setting and with goal setting

interactions with other professionals, patients and families being perceived as complex, difficult and requiring effort[13]; (c) lack of clinician education on how to engage patients in goal setting or (d) lack of patient interest in participating.[14]

The use of technologies such as websites, smartphones and apps that generate, store or process data has been suggested as increasing engagement of patients in goal-setting.[14–16] In particular, mobile apps and websites may enable health professionals to more adequately engage patients and their families in goal setting. Technologies could enable goal setting by: (a) providing the shared space where patients can offer their ideas and opinions about their goals; (b) providing a structure for collaboration in goal setting, while also reducing or managing complexity in goal setting; (c) overcoming the lack of clinician education by intentional design to engage patients in goal setting or (d) increasing patient interest in goal setting through appealing design and easy-to-use features. A recent study evaluating a mobile app designed to target impairments and improve quality of life for people with schizophrenia found participants actively engaged with the mobile app each time they logged in. Moreover, participant's satisfaction levels were high, particularly regarding the features associated with setting personalise goals.[17] Another study assessing a web-based intervention designed to enhance self-efficacy to self-manage cancer-related fatigue after primary cancer treatment, showed that participants engaged well with the goal-setting sections of the website.[18 19] Despite these findings, most studies exploring technology for goal setting have highlighted the need to gain further knowledge and empirical data regarding impact, and that refinements to health technologies are required.[20–22] This study aimed to map the extant literature that evaluates the use of technology for goal setting in adult rehabilitation and the impacts of technology for patient outcomes.

METHODS

Research design

The purpose of a scoping review is to comprehensively synthesise evidence to map a broad, complex or emerging field of study and to identify gaps with the intent to inform practice, policy and future research.[23] We chose to use the scoping review methodology to broadly explore and summarise the literature about the use of technology around goal setting in rehabilitation. We used the framework recommended by Arksey and O'Malley,[23] further developed by Levac *et al*[24] and finally enhanced by the work of Peters *et al*.[25] This five-step process comprised: (a) identifying the research question, (b) identifying relevant studies, (c) selecting studies, (d) charting data and (e) collating, summarising and reporting results. The protocol for this review was prepublished online.[26] This review was reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Extension for scoping reviews (PRISMA-ScR).[27] The completed PRISMA-ScR checklist is provided in online supplemental appendix 1.

Identification of the research objectives

The research objectives were identified from a preliminary scan of the literature and from the expertise of the research team. The research team includes a physiotherapist (CS), an academic physiotherapist (WMML) with expertise in goal setting, an academic physician with interests in technology (RG), and two academic occupational therapists (KTakahashi, KTomori). Moreover, given the iterative nature of the scoping review that allows the researcher to reproduce, manipulate and re-analyse data to add to the results to support the interpretation of the study, we adapted and reframed the objectives of the study with the data extraction process. Rationale for the questions arose from the lack of studies in the academic literature on the use of the digital technologies in the goal setting process in rehabilitation settings.

The primary objective of this scoping review was to identify and summarise the research that has examined the application of technology for goal setting in rehabilitation. A secondary objective was to gather and synthesise research on the effectiveness of technology for goal setting in rehabilitation to improve patient outcomes.

Identification of relevant articles, inclusion and exclusion criteria

Types of studies

We included studies published at any time in English that explored the development or application of information and communication technology (internet-based technology and mobile apps) to facilitate goal setting in rehabilitation. Methodological quality of the published articles was not a criterion for exclusion/inclusion, so that a breadth of knowledge pertaining to the research objectives could be included, as is consistent with scoping review practices.[23 24 28] Review publications, experimental trials (eg, randomised controlled trials (RCTs)), observational studies (eg, cohort studies), case studies and qualitative studies were included. We excluded narrative reviews, opinion pieces and editorials.

Type of participants

Studies involving participants aged 18 years or over, with any health conditions, as defined by the International Classification of Disease[5] who were receiving rehabilitation were included. We used the conceptual description provided by Meyer *et al*[29] to determine what 'rehabilitation' was:

> Rehabilitation is a health strategy which, based on the World Health Organization's integrative model of functioning, disability, and health, applies and integrates [assessments and therapeutic interventions]… in partnership between person and provider… to enable persons with health conditions experiencing or likely to experience disability to achieve and maintain optimal functioning (p768).[29]

Types of technology

We included studies that described or evaluated goal setting technology that had been designed specifically for rehabilitation services as well as goal setting technology designed for general use but applied to rehabilitation services. This included computer programmes, websites and mobile apps (eg, apps for smartphones and tablets) designed to help people set rehabilitation goals. We included technology that was used to: (a) facilitate the selection of a topic for goals to be set around, including negotiation of this topic between patients, family and health professionals; (b) help select a specific target (ie, level of performance) to be achieved by a patient at a point in the future; (c) facilitate the translation of a topic and specific target for a goal into an explicit goal statement (ie, writing and recording the goal statement); and (d) renegotiate the topic or targeted level of performance for a goal.

We excluded studies that investigated the development or application of technology primarily designed to aid communication (eg, augmented and alternative communication or telemedicine technology), without being specifically designed for goal setting. We also excluded studies that investigated the development or application of technology that was only used for: (a) collecting assessment (ie, baseline) data; (b) providing information to patients (eg, about health conditions or the rehabilitation process); (c) reporting or measuring performance data, even if this was against stated goals (eg, pedometers to measure step count against a goal related to walking where walking was a general activity rather than a specific rehabilitation goal were excluded) and/or (d) sending motivational messages or reminders to patients, without the technology also being used to aid the setting of goals.

Search strategy

A search strategy for Medline (via Ovid), CINAHL (via EBSCO), AMED, Scopus and ProQuest were developed in collaboration with a reference librarian. Searching was last executed the 20 May 2020. The search strategy for all databases is in online supplemental appendix 2. Reference lists and forward citation searches of included studies (using Scopus and Google scholar) were also searched and any potentially relevant studies included.

Data screening

We imported identified articles into the reference manager Endnote (V.X9, Clarivate Analytics), then uploaded them to Rayyan QCRI web application,[30] where the titles and abstracts were reviewed to eliminate duplicates. Two authors (CS, WMML) separately screened all article titles and abstracts for inclusion against eligibility criteria. The full text of all eligible articles then underwent independent review by two authors (CS, WMML) to confirm if inclusion criteria were met. At each stage, any discrepancies were discussed until consensus was reached, with third author (KTo) adjudication as needed. The discrepancies found were about the goal setting features of the technology, the population, and the design of the study as well as the authors' inaccuracy in reading the title and abstract. Two authors (CS, WMML) reached consensus by reviewing the full-text article, downloading and using the app/website to check if was designed for goal setting and consulting a third author. All discrepancies were easily resolved and did not require further action. Twenty-three discrepancies were found, and only two resulted in consulting a third author (KTo). One record was eliminated because was a protocol and the second because the goal setting component of the technology was not clearly stated. Where articles included study authors who were also on the review team, those authors were excluded from decisions about or data extraction from that article.

Charting, summarising and reporting the results of the review

A descriptive-analytical narrative method was used to extract and chart the data.[23 24 28] The first author (CS) drafted the data extraction template, which was further refined after feedback from all authors. Five articles were used to pilot the data extraction tool. Two authors independently extracted the data for each article. The primary author (CS) then extracted data from all articles, with the other authors each extracting data from a quarter of the included articles. All discrepancies were reviewed in discussion between the authors (CS and WMML for all, with RG, KTakahashi or KTomori) and agreed by consensus. The final version of the data extraction form is in the online supplemental appendix 3. We extracted the data on characteristics of each included article and the key study findings. For key study findings, we collected quantitative and qualitative data on intervention effectiveness and user perceptions of the technology. Given the heterogeneity of the included studies, no secondary analysis of published data (eg, meta-analysis or meta-synthesis) was undertaken. The primary author (CS) used an Excel spreadsheet to collate and analyse extracted data. A risk of bias assessment of the included studies was not performed as this is outside of the objectives of a scoping review.[27]

Patient and public involvement

No patients or members of the public were involved.

RESULTS

Search strategy

Our search identified 1071 unique records, after removal of duplicates. We excluded 1013 records on screening titles and abstract, and a further 36 on full-text screening, leaving 22 articles for data charting from the database searches (see figure 1). Reasons for excluding the 1031 records at titles and abstracts included: absence of the word 'goal setting' in the abstract; technology not used in a rehabilitation context; non-adult population and narrative reviews, editorials and opinion pieces. Reasons for excluding the 58 articles at full-text screening included: insufficient information about the goal setting process

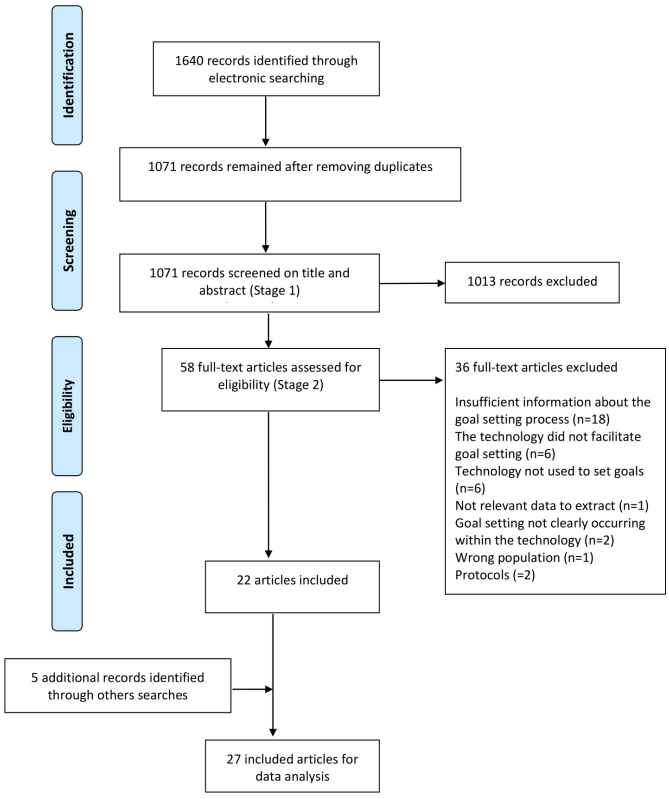

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Extension for scoping reviews flow diagram for article selection.

(n=18); technology did not facilitate goal setting process (n=6); technology was not used to set goals (n=6); lack of relevant data to extract (n=1); goal setting did not clearly occur within the technology (n=2); wrong population (n=1); and the article was a study protocol (n=2). Five more articles were identified through checking reference lists and forward citation searching, giving a total of 27 articles for data extraction.

Characteristics of included studies

Most of the articles (22/27, 81.5%) were published in the last 5 years. The studies were from the USA (10/27, 37.1%), UK (5/27, 18.5%), Canada (3/27, 11.1%), Japan (3/27, 11.1%), an international partnership between Finland, Sweden, Texas and India (1/27, 3.7 %), an international partnership between New Zealand, Australia, UK and USA (1/27, 3.7 %) a European partnership between Belgium, Greece, UK, Switzerland and Netherlands (1/27, 3.7 %), Korea (1/27, 3.7 %), New Zealand (1/27, 3.7%) and Portugal (1/27, 3.7%). Common study designs were RCTs in which the technologies were evaluated (8/27, 29.6%) and observational studies (7/27, 25.9%), with smaller numbers of qualitative studies exploring the stakeholders views about the technologies for goal settings (5/27, 18.5%), mixed-methods studies (4/27, 14.8%), descriptive studies eliciting opinions concerning digital technologies around goal settings (2/27, 7.5%) and a pilot study (1/27, 3.7%).

Characteristics of included technologies

Among the 27 articles, there were 16 different programmes/software described, which were 7 mobile apps, 3 websites, 2 mobile app/website hybrids (the mobile app was connected with a corresponding website) and technologies (2 mobile apps and 2 websites) connected to a pedometer. Most of the 16 technologies were disease-specific (12/16, 75%) designed for a named condition: heart conditions (n=3), neurological disorders (n=2), diabetes (n=2), chronic obstructive pulmonary disease (COPD) (n=2), schizophrenia (n=2) and cancer-related fatigue (n=1). The remaining technologies (4/16, 25%) were for adults with any chronic condition or multiple chronic conditions. Almost half of the included technologies (7/16, 43.8%) were, at the time of the data charting, available in the market for public purchase from the Google Play store, Apple's app store, Microsoft's app store or from a website. The remainder (9/16, 56.3%) were not accessible: four were under development, three were associated with a private health service, one had a region/location restriction and one for no identifiable reason. By downloading the app or accessing the website, reading the app store description and scanning the information in the article, we found that the majority of technologies described (10/16, 62.5%) were designed for self-management use and that the remaining six (6/16, 37.5%) were also for self-management, but with the possibility of having feedback or evaluation from a health professional.

Characteristics of approaches to goal setting

For most of the technologies (9/16, 56.3%), goal selection was undertaken by the patient. The remaining technologies included: two that involved automated goal setting with no direct human control, setting treatment objectives from a predetermined list (2/16, 12.5%), and five that allowed a shared decision moment, in which client and health professional could meet in person or online to decide on the common objectives (5/16, 31.3%). Most of the technologies (11/16, 68.8%) facilitated the evaluation of goal achievement and provided a report of each client's goal progress, represented by bar graphs, illustrations or figures. For 9 of the 16 technologies (56.3%), there was no identified psychological theory underpinning the approach to goal setting. For the remaining 7 of the 16 technologies (43.7%) the psychological theories used included: Bandura's Social Learning Theory,[18 19 31 32] Self-Determination Theory,[14 17 33] Behavioural Change Theory[34–37] and Problem Solving Theory.[38]

Evidence of the user experience

Overall patients reported positive experiences of the technologies included, especially how easy to use or pleasing the technology was. The technology needed to be straightforward and easy to operate, with clear and simple instructions and good accessibility, including for those with lower levels of digital literacy.[31 39] One study showed that people less familiar with the internet would

need support, and that individuals with a preference for written media were more likely to drop out of studies.[19] Another study indicated that older individuals had more difficulties using these technologies.[37] Users wanted their technology to be able to track goals, physical activity and other health measures, such as heart rate, weight and diet,[37 40] as well as have more specific and individualised relevant goals and personalised feedback from health professionals.[31 41] Devi *et al* conducted semistructured interviews with 16 participants to explore patient experiences of using a web-based cardiac rehabilitation programme. These participants increased physical activity, improved psychological well-being and demonstrated greater empowerment when managing angina symptoms; the programme also instilled confidence related to exercise.[34] One study showed that most of the participants were able to identify beneficial outcomes from taking part on the study, and that the technology helped them to gain a better understanding of their disease and its management. Participants liked interactive technology and video links to patient stories, which were perceived to be more engaging than paper-based information.[31]

Evidence regarding the health effects of the included technologies

Among the included articles, eight were RCTs assessing the effectiveness of six different technologies. These studies evaluated technologies including websites only (n=2),[18 32] websites synchronised to a pedometer (n=4),[35 42–44] a mobile app (n=1)[17], and a mobile app linked to a pedometer (n=1).[45] Primary outcome measures for the studies included daily step count (n=5 studies with technology linked to pedometer) and usage and adherence to the technology (n=3). Of note, goal setting was only one feature of many in all these technologies, so any benefits could not be attributed with the goal setting components alone. The studies with technology linked to a pedometer reported increases in daily step count in the intervention group compared to the control group, mostly in the first 4 months of use.[35 42–45] However, in most of these studies there were no statistically significant between-group differences in any primary or secondary outcomes at any time points. Demeyer *et al*[45] investigated the effectiveness of a 12-week semiautomated telecoaching intervention on physical activity in patients with COPD in a multicentre RCT. They showed that the app resulted in statistically significant improvements in step count and small changes in time doing moderate physical activity, but that the other outcomes including the overall health status and breathlessness, did not differ. Moy *et al*[42 43] tested the efficacy of an internet-mediated, pedometer-based exercise intervention, again with a component of goal setting, in a population of US veterans with COPD. Differences in daily step counts in the intervention group compared with controls were statistically significant at 4 months, but not at 8 months.

Devi *et al*[35] examined the effectiveness of a web-based cardiac rehabilitation programme for people with angina. They randomised 95 people to either an intervention group using the website connected to an accelerometer, with goal setting around step count or a control group, who continued treatment as usual. The results showed that people in the intervention group obtained a statistically significant improvement in their goal of daily step count weight, and self-efficacy and a reduction in their duration of sedentary behaviour and angina frequency, both at 6 weeks and at 6 months follow-up.

The remaining studies showed that participants demonstrated large variability in website/app usage, especially for the first few months. Two of these studies reported no statistically significant between-group differences in any of the measured outcomes. Foster *et al*[19] conducted an RCT where 85 people were allocated to either an intervention group, given access to a website that provided a goal-direct programme for self-management of cancer-related fatigue, or to a control group, provided only with written information on fatigue management. The authors reported that there were no statistically significant differences in any of the scores at any time point. Similarly, Glasgow *et al*[32] conducted an RCT (n=270) to test the effectiveness of a website-based self-management intervention for people with type 2 diabetes mellitus, which involved a component of goal setting, in comparison to usual care. Participants demonstrated a large variability in website usage over the 4 month period decreasing over time and no significant differences between-groups on most of the engagement variables.

Only one small study, evaluating the efficacy of a mobile-based digital health intervention designed to improve motivation and quality of life in a 12-week RCT, demonstrated a significant increase in all outcomes measured. Compared with a group receiving usual care, the people in the intervention group had significantly greater improvements in self-reported depression, defeatist beliefs, self-efficacy and a trend towards motivation/pleasure negative symptoms post-trial, and these improvements were maintained 3 months after the end of trial.[33] See online supplemental appendix 4 for more details.

DISCUSSION

This scoping review identified and summarised the literature that examines technology for goal setting in rehabilitation and the effectiveness of these technologies for improving patient outcomes. Our study showed that the 27 articles included 16 different technologies with the majority of those being mobile apps and the rest websites. Four of the technologies were linked to pedometers providing numeric feedback on progress towards goals. The purpose of goal setting in this context was to enhance physical activity by empowering participants to increase their walking as part of the rehabilitation process.[42–45] Several studies have used step counters to provide real-time feedback on physical activity with goal setting, and coaching programmes, with the aim of increasing physical activity, have been associated with larger improvements

in amount of physical activity compared with only rehabilitation.[46]

An interesting finding was that the majority of the technologies identified were meant to aid self-management strategies, with the patients independently selecting their own goals. Fewer technologies allowed healthcare professionals or coaches, to have insight into patient adherence to a self-management programme or allow for additional intervention if patients were having difficulty with progressing towards a particular goal. For example, some technologies provided automated prompts to the patient to conduct self-management activities and allowed them to send information, including photographs, to clinicians to alert them of medical issues.[14 40 45] Others technologies allowed the contact with therapists in crisis situations.[37] This finding aligned with evidence in the literature that technology-based interventions can help people manage physical symptoms[47] and that interventions designed to increase self-efficacy to manage physical symptoms are effective in chronic-disease populations.[48]

Only a few of the included technologies were created with the intent of aiding therapists and patients to jointly set rehabilitation goals.[18 36 39 49 50] These technologies were developed following the recommendation that sharing decisions about goals can have a positive impact on the patient's health and mental well-being.[51] Furthermore while a rich and sophisticated body of theory about goal setting in rehabilitation—with a sound empirical base—already exists[52] less than half of the technologies examined were not based on any stated theoretical framework. Our data synthesis suggest that future goal setting technologies should be underpinned by best-practice principles of rehabilitation and evidence about goal setting.

The extent to which the scope or focus of goal setting was restricted in the technologies examined is also notable. Some technologies only permitted goals to be set on a limited set of topics, for example selecting from a menu of predetermined goals. Others only allowed goals to be set around level of performance in just one area of functioning, for example, step count goals. Only five technologies clearly allowed for an open-ended process of setting goals, thus enabling shared decision making and supporting person-centred approach to rehabilitation.[14 31 36 41 53]

Evidence shows that a move towards a person-centred, caring and strengths-based approach can promote engagement in rehabilitation.[54] This process has been shown to facilitate disabled persons' voices to be heard, and their expertise and competence to be acknowledged, which may increase patient motivation and drive, achieving the first objective of goal setting. Therefore, person-centredness during technology development may lead to the improvement in intervention effectiveness/efficiency.[55] Future technologies developed for goal setting in rehabilitation should also consider how the technology may specifically enhance the effectiveness of therapies and/or be useful for monitoring rehabilitation. These objectives may require a wider focus on which types of goals can be included.

The eight RCTs that gave information about the effectiveness of the digital technologies for patient outcomes have shown that technologies that addressed the requirements of patients with complex care needs. Such patients tend to be high users of the healthcare system and may benefit from rehabilitation,[56] and were identified as those who might benefit from a device that allows to set rehabilitation goals in the various aspects of their daily life. Results from these studies also showed that people enjoyed and positively accepted digital technologies as part or in place of their daily rehabilitation procedure. Several studies reported decreases in use after three or 4 months which may indicate familiarity with the technology and reduced novelty impact with ongoing engagement. Therefore, future research should investigate how to help people maintain engagement in goal-setting technologies over longer periods of time (eg, 6–12 months) or concentrate on benefits that may be valuable to achieve in short time periods.

Limitations

While this scoping review was planned, conducted and reported according to relevant guidelines[27] various limitations need to be considered. One possible limitation of our study is the change in the research objectives from that stated in our archived protocol. Consistent with the iterative nature of the scoping review methodology, we adapted the objectives of the study in the initial stages of the data extraction process. Five articles we inlcuded were used to pilot the data extraction tool, with the tool then adapted to enable accurate data extraction from the other included studies (online supplemental appendix 3). After we clearly understood the types of studies described in the included articles, we adapted our research objectives; these steps are appropriate in a scoping review.[25] Although this may be considered a limitation, the overall purpose of our scoping review remains unchanged, that is to comprehensively synthesise evidence and map the literature about the use of technology around goal setting in rehabilitation. A second limitation is about the quality assessment. Since scoping review methods do not require a quality assessment of included research papers, the study quality is likely to be variable. However, articles included were published in peer-reviewed journals, we excluded narrative reviews, opinion pieces and editorials and not all grey literature was included. Unpublished yet related information on the most current trends in this field may have been missed. Knowing that digital technologies rapidly change, the reported findings may need to be reappraised in the near future. This scoping review addressed a broad area of content and contexts, that is, different technologies, developers, features, goals and implementation contexts; multiple applications; different users, communities and countries and different multiple chronic conditions and single conditions. However, this may limit transferability of the results to a specific context

and present as prime areas for future systematic and realist reviews.

CONCLUSION AND IMPLICATION

These results demonstrated that the web-based and mobile-based interventions were largely accepted and valued by the participants. We have also shown that there is the need for further research to develop technologies that sustain engagement and use over short periods and improve patient outcomes over the medium- to long-term. Researchers and developers of healthcare digital technologies may find benefits accrue when a theoretical framework is used to guide their cyclical, iterative process of design, implementation and evaluation. Clinical research could focus on developing more digital tools that are better integrated into clinical care in order to improve user acceptance, sustained engagement and ultimately, clinical value and behaviour change. These results have given an overall idea about how few technologies exists that specifically support a goal setting process that is collaborative, actively selected, patient-centred, shared and engaged in within the context of an interdisciplinary rehabilitation. Most of the technologies examined by this review were designed for very specific patient populations, and the goal setting components supported by a specific type of intervention. Many of the technologies placed significant restrictions on the type of goals that could be set and the topic. However, this review has also shown that there are in the market, even if still a minority, technologies that identify and facilitate shared discussion and prioritisation of meaningful, individualised goals, presenting patients with a wide variety of possible activities and social roles to provide an indication of the breadth of goals they could consider. The key to successful goal setting is supporting patients to become active partners in their health care. This should be accomplished by encouraging dialogue and questions, exploring values and stressors and celebrating successes.[57] Effective goal setting requires active listening by providers as well as new approaches to patient counselling, and digital technologies can certainly support that. Additional research is critical in order to maximise the potential for digital health care, while advancing the triple aim of healthcare to improve patient's access, increase patient's satisfaction and, if possible, lower overall costs.

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Contributors CS conducted the study conception and design, and the analysis and interpretation of data, drafted the manuscript and revised content based on feedback. WMML and RG assisted with study conception and design, interpretation of data, and provided critical revision of drafts. KTa and KTo assisted with interpretation of data and provided critical revision of drafts. All authors approved the final version of the manuscript. CS is responsible for the integrity of this work as a whole.

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Supplementary file_ **Appendix 1_ Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist**

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	2
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	3
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	3 and 4
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Appendix 2_List of citations
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	4 and 5
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	5
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	5

Supplementary file_ **Appendix 1_ Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist**

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	5
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	5 and 6
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	6 and 7
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	6 and 7 & Appendix 4_RCTs data analysis
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	8
Limitations	20	Discuss the limitations of the scoping review process.	9
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	10
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	10

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.
* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.
† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).
‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.
§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Supplementary File_ **Appendix 2: Databases and preliminary search results**

1) MEDLINE

	Search	**Results**
1	((app or apps or application* or technolog*) adj2 (mobile* or device or tablet or tablets or phone* or cellphone* or smartphone* or smart-phone* or handheld* or hand-held* or digital or communication)).tw,kw.	20332
2	((social adj1 (app* or media* or networking)) or website* or web-site* or internet-based or webpage* or web-page or web-based).tw,kw.	74245
3	mobile applications/	4237
4	Cell Phone/	7848
5	computers, handheld/ or smartphone/ or internet/ or web browser/ or social media/	79919
6	(mhealth or m-health or app or apps).tw,kw.	26898
7	or/1-6	170841
8	exp rehabilitation/	288576
9	exp rehabilitation centers/	13979
10	recovery of function/	47951
11	exp physical therapy modalities/	144294
12	(physiotherap* or physical therap* or occupational therap* or neurorehab* or rehab* or recover*).tw.	802634
13	or/8-12	1046754
14	((goal* or target*) adj3 (behavio* or set* or plan* or agree* or negotiat* or discuss* or propos* or prescrib* or develop* or formulat* or elaborat* or establish* or identif* or write or written or state* or specif* or construct* or manag* or direct* or orient* or attain* or achiev* or evaluat* or cent?red)).tw.	293336
15	Goals/	15831
16	14 or 15	303481
17	7 and 13 and 16	387
18	limit 17 to english language	**382**

Supplementary File_ **Appendix 2: Databases and preliminary search results**

2) AMED

	Searches	**Results**
1	exp computers/ or internet/	2799
2	(internet* or web-based or website* or web-site* or webpage* or web-page* or cellphone* or "cell* phone*" or smartphone* or smart-phone* or "mobile device*" or mhealth or m-health or app or apps or "mobile phone*" or "digital technolog*" or handheld* or hand-held* or tablet or tablets).mp.	3196
3	1 or 2	4739
4	(goal* or target*).mp.	11101
5	goals/	537
6	4 or 5	11101
7	3 and 6	254
8	nursing/ or rehabilitation/ or "therapeutic use"/ or therapy/	102163
9	(rehab* or physiotherap* or therap* or exercis* or recover* or neurorehab*).mp.	183240
10	8 or 9	185566
11	7 and 10	181
12	limit 11 to english	**170**

Supplementary File_ **Appendix 2: Databases and preliminary search results**

3) Scopus

423 document results

((TITLE-ABS-KEY (((app OR apps OR application* OR technolog*) W/2 (mobile* OR device OR tablet OR tablets OR phone* OR cellphone* OR smartphone* OR smart-phone* OR handheld* OR hand-held* OR digital OR communication))) OR TITLE-ABS-KEY (((social W/1 (app* OR media* OR networking)) OR website* OR web-site* OR internet-based OR webpage* OR web-page OR webbased)) OR TITLE-ABS-KEY ((mhealth OR m-health OR app OR apps)))) AND ((TITLE-ABS-KEY (physiotherap* OR "physical therap*" OR "occupational therap*" OR neurorehab* OR rehab* OR recover* OR "exercis* therap*" OR "activities of daily living") AND TITLE-ABS-KEY (((goal* OR target OR targets) W/3 (behavio* OR set* OR plan* OR agree* OR negotiat* OR discuss* OR propos* OR prescrib* OR develop* OR formulat* OR elaborat* OR establish* OR identif* OR write OR written OR state* OR specif* OR construct* OR manag* OR direct* OR orient* OR attain* OR achiev* OR evaluat* OR centred OR centered)))))) AND (LIMIT-TO (LANGUAGE,"English"))

Supplementary File_ **Appendix 2: Databases and preliminary search results**

4) CINAHL

S16	S12 AND S15	(242) (**236**) with English limit
S15	S13 OR S14	(76,908)
S14	TI ((goal* OR target*) N3 (behavio* OR set* OR plan* OR agree* OR negotiat* OR discuss* OR propos* OR prescrib* OR develop* OR formulat* OR elaborat* OR establish* OR identif* OR write OR written OR state* OR specif* OR construct* OR manag* OR direct* OR orient* OR attain* OR achiev* OR evaluat* OR centred OR centered)) OR AB ((goal* OR target*) N3 (behavio* OR set* OR plan* OR agree* OR negotiat* OR discuss* OR propos* OR prescrib* OR develop* OR formulat* OR elaborat* OR establish* OR ident ...	(68,724)
S13	(MH "Goals and Objectives") OR (MH "Goal-Setting") OR (MH "Goal Attainment")	(16,845)
S12	S7 AND S11	(6,229)
S11	S8 OR S9 OR S10	(445,114)
S10	TI ((physiotherap* or physical therap* or occupational therap* or neurorehab* or rehab* or recover* OR "exercis* therap*" OR "activities of daily living")) OR AB ((physiotherap* or physical therap* or occupational therap* or neurorehab* or rehab* or recover* OR "exercis* therap*" OR "activities of daily living")) OR SU ((physiotherap* or physical therap* or occupational therap* or neurorehab* or rehab* or recover* OR "exercis* therap*" OR "activities of daily living"))	(340 ,610)
S9	(MM "Rehabilitation Centers")	(2,226)
S8	(MH "Rehabilitation+")	(251,562)

Supplementary File_ **Appendix 2: Databases and preliminary search results**

S7	S1 OR S2 OR S3 OR S4 OR S5 OR S6	(104,812)
S6	TI (((social N1 (app* OR media* OR networking)) OR website* OR web-site* OR internet-based OR webpage* OR web-page OR web-based))) OR AB (((social N1 (app* OR media* OR networking)) OR website* OR web-site* OR internet-based OR webpage* OR web-page OR web-based))) OR SU (((social N1 (app* OR media* OR networking)) OR website* OR web-site* OR internetbased OR webpage* OR web-page OR web-based)))	(56,365)
S5	TI ((mhealth OR m-health OR app OR apps)) OR AB ((mhealth OR m-health OR app OR apps)) OR SU ((mhealth OR m-health OR app OR apps))	(7,581)
S4	TI ((app OR apps OR application* OR technolog*) N2 (mobile* OR device OR tablet OR tablets OR phone* OR cellphone* OR smartphone* OR smart-phone* OR handheld* OR hand-held* OR digital OR communication)) OR AB ((app OR	(14,725)
	apps OR application* OR technolog*) N2 (mobile* OR device OR tablet OR tablets OR phone* OR cellphone* OR smartphone* OR smart-phone* OR handheld* OR hand-held* OR digital OR communication)) OR SU ((app OR apps OR application* OR technolog*) N2 (mobile* OR device OR tablet OR ...	
S3	(MM "Internet") OR (MH "Social Media+") OR (MM "World Wide Web") OR (MM "World Wide Web Applications") OR (MH "Internet of Things")	(48,958)
S2	(MH "Smartphone") OR (MH "Cellular Phone") OR (MH "Computers, Hand-Held") OR (MH "Computers, Portable")	(8,478)
S1	(MH "Mobile Applications") OR (MH "Web Browsers")	(5,872)

Supplementary File_ **Appendix 2: Databases and preliminary search results**

5) Proquest Dissertations and Theses database

429 results

((ti(((app OR apps OR application* OR technolog*) NEAR/2 (mobile* OR device OR tablet OR tablets OR phone* OR cellphone* OR smartphone* OR smart-phone* OR handheld* OR hand-held* OR digital OR communication))) OR ab(((app OR apps OR application* OR technolog*) NEAR/2 (mobile* OR device OR tablet OR tablets OR phone* OR cellphone* OR smartphone* OR smart-phone* OR handheld* OR hand-held* OR digital OR communication))) OR su(((app OR apps OR application* OR technolog*) NEAR/2 (mobile* OR device OR tablet OR tablets OR phone* OR cellphone* OR smartphone* OR smart-phone* OR handheld* OR hand-held* OR digital OR communication))) OR ti(mhealth OR m-health OR app OR apps) OR ab(mhealth OR m-health OR app OR apps) OR su(mhealth OR m-health OR app OR apps) OR ti(((social NEAR/1 (app* OR media* OR networking)) OR website* OR web-site* OR internet-based OR webpage* OR web-page OR web-based)) OR ab(((social NEAR/1 (app* OR media* OR networking)) OR website* OR web-site* OR internet-based OR webpage* OR web-page OR web-based)) OR su(((social NEAR/1 (app* OR media* OR networking)) OR website* OR web-site* OR internet-based OR webpage* OR web-page OR webbased))) AND (ti(physiotherap* OR "physical therap*" OR "occupational therap*" OR neurorehab* OR rehab* OR recover* OR "exercis* therap*" OR "activities of daily living") OR ab(physiotherap* OR "physical therap*" OR "occupational therap*" OR neurorehab* OR rehab* OR recover* OR "exercis* therap*" OR "activities of daily living") OR su(physiotherap* OR "physical therap*" OR "occupational therap*" OR neurorehab* OR rehab* OR recover* OR "exercis* therap*" OR "activities of daily living"))) AND noft((goal* OR target*) NEAR/3 (behavio* OR set* OR plan* OR agree* OR negotiat* OR discuss* OR propos* OR prescrib* OR develop* OR formulat* OR elaborat* OR establish* OR identif* OR write OR written OR state* OR specif* OR construct* OR manag* OR direct* OR orient* OR attain* OR achiev* OR evaluat* OR centred OR centered))

Supplementary File_ **Appendix 2: Databases and preliminary search results**

Applied filters
Scholarly Journals OR Dissertations & Theses OR Conference Papers & Proceedings OR Other Sources OR Books OR Working Papers
English

Supplementary File_**Appendix 3: Data extraction form template**

Scoping review_data extraction form

Reviewer: CS ☐ WL ☐ RG ☐ KOH ☐ KAYO ☐

Reference	Title	
	Author(s)	
	Year of publication	
	Journal	
	Origin/Country of origin (where the study was published or conducted)	
	Study design type (RCT, scoping review, other)	

Participants	Setting (Hospital, rehabilitation centre etc.)	
	Study population and sample size (Intervention population sample and control population sample) if applicable	
	Health conditions of the population	
	Duration of the study	

	Type of technology (app, website etc.)	
		☐ Yes

Technology/ App	Is the technology available in the market?	☐ Write, if possible, under which name and where: No Write, if possible, the reasons:

Supplementary File_**Appendix 3: Data extraction form template**

	Characteristics of goal setting function	
	Who is technology for? (patient group, service …)	
	For which category of disability is the technology for? (generic, specific pathological condition such as diabetes)	
	Is the technology for selfmanagement or does it require a therapist?	
	Theoretical foundation: Theory about how the goal setting process is meant to work If any. (ex. social cognitive theory, Locke and Latham's theory)	

Outcomes	Main outcomes measures (if applicable):	Primary outcomes:
		Secondary outcomes:

Results:	

Additional notes if any:	

Supplementary File_ **Appendix 4: RCTs data analysis**

Author & year of publication	Country	Type of study	Population	Intervention	Type of technology	What is the tech for?	Who the technology is for?	Characteristics of goal setting	Primary outcome	Secondary outcome	Results
(Demeyer et al., 2017)	Europe	RCT	N= 343 people with COPD were randomized. N=171 Intervention group – Fitbug app and pedometer; N=172 Control group – treatment as usual	During the 12 weeks intervention, patients in the intervention group received usual care plus the tele coaching intervention. This included an exercise booklet and a step counter providing goals and feedback directly and via the Fitbug app. Patients' targets were automatically revised once per week, based on performance in the preceding week. The clinician could control the goal selection process as they could 'alter` or 'lock' the goals if needed, based on interaction with the patient. The patient received text messages and occasional telephone contacts with investigators. Control group participants continues with usual medical treatment.	Fitbug smartphone app and Fitbug air step counter.	It is specifically designed for tele-coaching physical activity.	The app is for People with COPD across the whole disease spectrum, partly for selfmanagement, but it requires a therapist to monitor.	The smartphone app provides "automated coaching" by displaying an activity goal (number of steps) and feedback daily. The feedback included a graphical representation of the day's performance and an educational tip. This smartphone app provides an individualised daily activity goal (steps) revised weekly and a text message as well as occasional contact with the therapist. Goals can automatically get harder if the user improves the step count.	Number of steps per day over 3 months.	Time in at least moderate intense Physical Activity, measured by accelerometer; walking time; movement intensity during walking; post bronchodilator spirometry; 6 minute walk test; isometric quadriceps force; health status, measured by the CAT, COPD Assessment Test; Clinical COPD Questionnaire (CCQ); and breathlessness, measured by the modified Medical Research Council questionnaire.	The app resulted in improvements in step count (MD 1469 steps/day; 95% CI 971 to 1965); min/day in moderate physical activity (MD 10.4 mins; 95% CI 6.1 to 14.7); and the 6 min walk test (MD 13.4 m; 95% CI 3.4 to 23.5m). Other health status outcome did not differ.
(Devi, Powell, & Singh, 2014)	UK	RCT	N= 95 people with angina were randomized. N= 48 intervention group – Activate Your Hearth. N= 47 control group- treatment as usual.	The intervention group participants wore the monitor on the right upper arm for 2 weekdays (12 hours per day) at baseline and at the 6-week and 6month follow-ups. They were told to log in to the program daily to record their daily physical activity. Control participants in the control group continued with treatment as usual from their GP and received no further contact from the researcher until the 6-week follow-up.	Secure and passwordprotected website "ActivateYour Heart" connected to accelerometer - Sensewear Pro 3 accelerometer technology.	It aims to improve health behaviours.	It is designed for people with CHD (coronary heart disease) for self-management to use at home.	Baseline information are used to set individualized tailored goals focused on exercise (e.g. being physically active for 30 minutes 5 times a week), diet (e.g., eating more fruit/vegetables and reducing salt intake), emotions (e.g., managing stress and other negative emotions), and smoking (e.g., reduce cigarette smoking if relevant). Throughout the program, goals can be reset/modified depending on previous performance. As the user progressed through the program, goals can be increasingly difficult.	Daily average step count change at 6-week follow-up, measured using Sensewear Pro 3 accelerometer technology.	Energy expenditure (EE), duration of sedentary activity (DSA), and duration of moderate activity (DMA) measured using Sensewear Pro 3 accelerometer. Weight, diastolic (DBP) and systolic blood pressure (SBP), and body fat percentage measured using conventional instruments. Fat and fibre intake (measured using the Dietary Instrument for Nutritional Evaluation); anxiety and depression (assessed using the Hospital Anxiety and Depression Scale); selfefficacy and health-related quality of life (QOL) measured using The General Self-Efficacy Scale. In the intervention group, we also monitored the number of logins to the online program.	Change in daily steps walked was +497 (SD 2171) in the intervention group and −861 (SD 2534) in the control group (95% CI 263-2451, P=.02). Significant intervention effects were observed in EE (+43.94 kcal, 95% CI 43.93 309.98, P=.01), DSA (7.79 min, 95% CI −55.01 to −7.01, P=.01), DMA (+6.31 min, 95% CI 6.01 51.20, P=.01), weight (0.56 kg, 95% CI −1.78 to 0.15, P=.02), self-efficacy (95% CI 0.30-4.79, P=.03), emotional QOL score (95% CI 0.01-0.54, P=.04), and angina frequency (95% CI 8.57 35.05, P=.002). Significant benefits in angina frequency (95% CI 1.89-29.41, P=.02) and social QOL score (95% CI 0.05-0.54, P=.02) were also observed at the 6month follow-up.

Supplementary File_ **Appendix 4: RCTs data analysis**

Author & year of publication	Country	Type of study	Population	Intervention	Type of technology	What is the tech for?	Who the technology is for?	Characteristics of goal setting	Outcomes	Results
(Foster et al., 2015)	UK	RCT	N= 163 people with CRF (cancer related fatigue) were randomized. N= 85 intervention group - RESTORE. N= 78 control group - "Coping with Fatigue" Leaflet.	Participants in the RESTORE intervention group were limited to 6 weeks access to RESTORE and presented with sessions at weekly intervals. Sessions 1 and 2 were mandatory and introduced CRF and goal setting. For the following 3 weeks, participant's accessed session 3 and started setting goals and engaging with other activities. Participants had to choose from (i) diet, sleep, exercise, home and work life; (ii) thoughts and feelings; and (iii) talking to others. Participants could choose to complete all available sessions or spend more time on the area/s most important to them. Participants were also encouraged to download and complete a fatigue diary. Participants in the Leaflet group had only access to the sessions informed by Macmillan Cancer Backup's leaflet, "Coping with Fatigue".	Web-based intervention called RESTORE.	It aims to enhance selfefficacy. It provides self-management strategies in addition to education and information.	It is intended as a standalone, self-management app for people with cancer related fatigue.	The website includes training in the concept of goal setting encouraging setting weekly SMART goals (specific, measurable, attainable, relevant, and time bound). Goal setting embeds within a broad self-management intervention. Goal setting emphasises setting and achieving small realistic goals, and stepwise progress towards a higher level of activity. The website allows revision of goals on a weekly basis and provides automatic feedback on goal achievement/nonachievement. The website facilitates identification of life areas related to fatigue that could be the subject of goals, and strategies to support goal pursuit. The website supports selfmonitoring of fatigue scores.	Physical function status measured by the Perceived Self-Efficacy for fatigue selfmanagement; Self-efficacy measured by the Cancer Survivors' Self-Efficacy Scale; Health-related quality of life measured by the Functional Assessment of Cancer Therapy General; Satisfaction measured by the Personal Wellbeing Index; Depression and mental health measured by the Patient Health Questionnaire; Severity and impact of cancer-related fatigue measure by the Brief Fatigue Inventory and intervention adherence was examined by usage data.	There were no statistically significant differences in any of the scores at any time points.

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(Glasgow et al., 2011)	USA	RCT	N= 270 people with Type 2 Diabetes mellitus were randomized. N= 137 intervention group - website only N= 133 intervention group - website plus human support. (The "usual care" group was not reported in this paper)	All participants were tutored in website log-in, navigation, and usage. Participants were then asked to select initial, easily achievable goals to enhance selfefficacy in each of 3 areas: medication adherence, exercise and food choice. Participants weekly recorded their progress using the website dedicated section or via the interactive voice response phone system. Participates received "immediate feedback" on success or struggles in tracking and meeting their goals over last 7 days via both web and IVR (interactive voice response) modalities. After 6 weeks participants were instructed to further tailor their 3 self-management goals by creating action plans. Participants, randomized to the website plus social support group, received all aspects of the website intervention with the addition of follow-up calls and group meetings.	Internet-based website called "My Path to Healthy Life" ("My Path," for short) or My Path/Mi Camino website	It is a website that provides self-management strategies.	The website is for adults with diabetes, intended to be for selfmanagement. The therapist could help but it is not necessary.	The website involves goal setting, action planning, and self-monitoring as well as offering features such as "Ask an Expert" to enhance healthy eating, physical activity, and medication adherence. The website allows the user to choose one goal in each of: 1. Medication adherence - "the right way everyday" or 2. Exercise – steps or minutes walked each day using a pedometer or 3. Dietary – eliminate fast food, fried food or sugarsweetened beverages. The "Track my progress" section allows to keep track and record of the weekly progress. The "Action plan" section allows the user to write a personal message for each goal, by selecting motivating factors from a list or writing individual ones. The website shows graphs comparing personal PA levels with national recommendations.	Health literacy measured by Short Test of Functional Health Literacy (STOFHL); eating patterns measured by the National Cancer Institute Percent Energy from Fat Screener (PFAT); physical activity measured with the Community Healthy Activities Programme for Seniors (CHAMPS); medication adherence measured by the HillBone compliance scale; Biological outcomes included: BMI, Hba1C, total cholesterol, LDL, HDL, systolic BP, smoking status, diabetes medication regime; Website usage measured by mean number of visits, median number or visits, percentage of people visiting each section and number of actions planned.		Participants demonstrated a large variability in website usage over the 4 months period. Although, usage decreased over time, from 70% weekly visits during the first 6 weeks to 47% during the lasts. Exercise action plan pages were visited more often than medication taking and healthy eating pages (mean of 4.3 visits vs 2.8 and 2.0 respectively, P<.001). Engagement, especially in selfmonitoring, was related to improvement in healthy eating (r=.20, P=.04), reduction of dietary fat (r=-.31, P=.001) and improvement in exercise (r=.20, P=.033). There were no significant differences between website alone and website plus human support conditions on most of the engagement variables and on any of the overall use variables.
Author & year of publication	**Country**	**Type of study**	**Population**	**Intervention**	**Type of technology**	**What is the tech for?**	**Who the technology is for?**	**Characteristics of goal setting**	**Primary outcome**	**Secondary outcome**	**Results**
(Moy et al., 2015)	USA	RCT	N= 239 veterans with COPD were	Participants in the intervention group wore the pedometer every day, reminded to upload stepcount data at least weekly and	Automated. Internetmediated, pedometer-	The aim of the website is to encourage user to	The website is for people with COPD	The website has a page called "Your Progress" were the user can upload step-counts from the pedometer and use	Health-related quality of life (HRQL) assessed by the St.	Daily step count assessed with the Omron HJ-720 ITC pedometer.	There was no significant between-group difference in SGRQ-TS (2.3 units, P=.14) at 4 months. For

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			randomized. N = 155 Intervention group – website plus pedometer. N= 84 wait-list control group - pedometer alone.	were provided access to the website. Each week's goal was the lowest of three numbers: (1) the average of the most recent seven days of step counts 1 600 steps, (2) the previous goal 1 600 steps, or (3) 10,000 steps per day. The website showed them: Iterative step-count feedback; weekly goal; education and motivational content; and an online community forum. The 12-month intervention was composed distinctly of an initial intensive 4-month phase followed by a maintenance 8month phase. Control subjects were instructed to wear the pedometer everyday upload stepcount data at least monthly and report adverse events. They received no instructions about exercise, were not assigned stepcount goals, and had access to a webpage that only showed a count of what week they were in the study.	based walking program named "Taking Healthy Steps" linked to a pedometer.	increase their walking/physical activity.	only for selfmanagement.	an interactive graph to review weekly goal, weekly step-counts and daily stepcounts. The user can also change the view from week to day view, by clicking on the graph. There is also a "current goal" shown on the top of the website page. The website has also four key components: 1. Iterative step-count feedback for self-monitoring of step counts; 2. Weekly individualized, dynamic, and concrete goal setting, based on uploaded step counts; 3. Education and motivational content for enhancing disease selfmanagement and selfefficacy, that provide a new educational tip every other day; 4. Online community forum for social support.	George's Respiratory Questionnaire (SGRQ) and composed of a summary total score (SGRQ-TS) and three domain scores: Symptoms, Activities, and Impact.		domain scores, the intervention group had a significantly lower mean (reflecting better HRQL) than the control group by 4.6 units (P=.046) for Symptoms and by 3.3 units (P=.049) for Impact. There was no significant difference in Activities score between the two groups. Compared with the control subjects, intervention participants walked 779 more steps per day at 4 months (P=.005). Taking Healthy Steps is safe and engaging, improves health-related quality of life and increases daily step count at 4 months.
(Moy et al., 2016)	USA	RCT	(As above) N= 239 veterans with COPD were randomized. N = 155 Intervention group – website plus pedometer. N= 84 wait-list control group - pedometer alone.	Participants randomized to "Taking Healthy Steps" completed an intensive 4-month intervention period, followed by 8-month maintenance phase. During the 8month maintenance phase, participants continued to wear the pedometer, upload daily step counts, receive weekly step-count goals and feedback, and had access to the online community forum. Participants randomized to the wait-list control group were instructed to wear the pedometer every day, reminded monthly to log in to the website to upload step-count data, and asked to report all adverse events. The website didn't have any of the 4 characteristics that the intervention group had.	(As above) Automated. Internetmediated, pedometerbased walking program named "Taking Healthy Steps" linked to a pedometer.	(As above) The aim of the website is to encourage user to increase their walking/physical activity.	(As above) The website is for people with COPD only for selfmanagement.	(As above) The website has a page called "Your Progress" were the user can upload step-counts from the pedometer and use an interactive graph to review weekly goal, weekly step-counts and daily stepcounts. The user can also change the view from week to day view, by clicking on the graph. There is also a "current goal" shown on the top of the website page. The website has also four key components: 1. Iterative step-count feedback for self-monitoring of step counts; 2. Weekly individualized, dynamic, and concrete goal setting, based on uploaded step counts; 3. Education and motivational content for enhancing disease selfmanagement and selfefficacy, that provide a new educational tip every other day; 4. Online community forum for social support.	(As above) Health-related quality of life (HRQL) assessed by the St. George's Respiratory Questionnaire (SGRQ) and composed of a summary total score (SGRQ-TS) and three domain scores: Symptoms, Activities, and Impact.	(As above) Daily step count assessed with the Omron HJ-720 ITC pedometer.	There was no significant between-group difference in the primary outcome of SGRQ-TS (mean 1.1 units, 95% CI –2.2 to 4.5; P=.50) and in the SGRQ domain scores of Symptoms (mean 0.5 unit, 95% CI –4.2 to 5.2; P=.84), Activities (mean 0.04 unit, 95% CI –4.2 to 4.2; P=.99), and Impact (mean 2.3 units, 95% CI –1.6 to 6.1; P=.25) at 12 months. There was no significant difference between groups of daily step count at 12 months (P=.73). Differences in daily step counts in the intervention group compared to controls were statistically significant at month 4, but almost zero in months 8 to 12. Between-group P values were <.001 at 4 months, .28 at 8 months, and .82 at 12 months.

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(Wan et al., 2017)	USA	RCT	N=114 subjects with COPD were randomized. N=60 people in the intervention group – website plus pedometer. N= 54 people in the control group - pedometer alone.	Subjects in the website plus pedometer group were instructed to wear the pedometer daily during all waking hours, to upload step counts weekly, and were given access to a website which provided the four key components of individualized goal-setting, iterative step-count feedback for self-monitoring, educational and motivational content to enhance disease self-management and selfefficacy, and an online community forum for social support. Subjects received step-count goals every week based on their current recorded step count or previously set goal. The goals were the minimum value of three possible numbers: 1) the previous goal þ400 steps, 2) the average of the most recently uploaded seven days of step counts þ400 steps, or 3) 10,000 steps. Subjects randomized to the pedometer alone group were given a pedometer and written materials about exercise at study entry but were not assigned step-count goals. They were instructed to wear the pedometer daily while awake and to upload step counts at least monthly via the website; the website had no content except a display of the study week. Both groups uploaded step-count data to the same study server via the website.	Automated. Internetmediated, pedometerbased walking program named "Taking Healthy Steps" linked to a pedometer.	The aim of the website is to encourage user to increase their walking/physical activity.	The website is for people with COPD only for selfmanagement.	The website has a page called "Your Progress" were the user can upload step-counts from the pedometer and use an interactive graph to review weekly goal, weekly step-counts and daily stepcounts. The user can also change the view from week to day view, by clicking on the graph. There is also a "current goal" shown on the top of the website page. The website has also four key components: 1. Iterative step-count feedback for self-monitoring of step counts; 2. Weekly individualized, dynamic, and concrete goal setting, based on uploaded step counts; 3. Education and motivational content for enhancing disease selfmanagement and selfefficacy, that provide a new educational tip every other day; 4. Online community forum for social support.	Daily step count using the Omron pedometer	Spirometry, performed using an Eaglet spirometer; 6MWT distance; exercise adherence, measured using the number of website logins and the hours of wear time; HRQL; dyspnoea using the St. George's Respiratory Questionnaire (SGRQ); depression using the Beck Depression Inventory-II Bristol; COPD knowledge using the COPD Knowledge Questionnaire; exercise self-efficacy using the Exercise Self-Regulatory Efficacy Scale; social support, and motivation and confidence to exercise daily. All outcomes were measured at baseline and end of study (3 months).	At 13 weeks, subjects in the pedometer plus website group had significant increases daily step count from baseline relative to the pedometer alone group (804 ± 356.5 steps per day, p 1/4 0.02). No significant differences in secondary outcomes were noted between groups.

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(Schlosser et al., 2016)	USA	RCT	N= 43 people with schizophrenia were randomized. N=22 Intervention group - PRIME N= 21 Control group – treatment as usual/waitlist.	Participants in the intervention group created a PRIME app username, uploaded a profile picture, selected their interests, goals, and symptoms, and wrote a short bio. Once a user was registered to the app, an assigned motivation coach sent a welcome message and an offer to support on the achievement of the set goals. The coach was available to be contacted by message most day per week and in real time, on the phone or via FaceTime. Participants in the PRIME condition were encouraged to use the app daily, whether it be to message with coaches and/or peers or complete challenges. However, the minimum expectation was logging into PRIME at least 1×/wk over the 12week period. Subjects on the control group received usual treatment for their condition.	PRIME (personalized real-time intervention for motivational enhancement), is a mobile based digital health intervention (app).	The app is designed to improve motivational impairments and quality of life early in the course of schizophrenia.	The app is for self-management, but there are assigned motivation coaches (trained psychologist) and an online peer community platform.	With PRIME, the user can select and document progress towards small, selfreport goals in the domains of health/wellness, social relationships, creativity, and productivity. Goal setting is self-directed and occurs within a supportive online peer community and a cognitive behavioural therapy-based coach. Longterm goals can be select from a 36-item list, which included goals such as "deepen my relationship with my family". Goals can also be modified or changed at any time. Each long-term goal contains more than 15 suggested brief challenges, such as "offer to help a family member with a chore", and space for selfcustom challenges. Challenges for the same goal	Changes in components of motivated behaviour (reward learning, anticipated pleasure, and effort expenditure), measured using a modified version of the Trust Task.	Self-reported defeatist beliefs using the Motivation and PleasureSelf Report scale; realworld functioning in independent living using the Role Functioning Scale; quality of life in social and vocational domains using the abbreviated Quality of Life Scale; defeatist beliefs about successfully performing goal-directed behaviour using the Dysfunctional Attitudes Scale; depression symptom severity with the Beck Depression Inventory and self-efficacy with the Revised Self-Efficacy Scale; positive and negative symptoms using the Positive and Negative Syndrome Scale; patientreported acceptability of	Compared to the control group, people in the PRIME condition had significantly greater improvements from baseline to 12 weeks in self-reported depression, defeatist beliefs and selfefficacy that were maintained 3 months after the end of trial. People in the PRIME condition had significantly greater improvements in Anticipated pleasure (t (55) =-2.39, P=.02, d=0.64) and Effort expenditure (t (55) =−2.17, P=.03, d=0.58) compared with the control group. There were no group differences in changes in positive or negative symptoms, quality of life or functioning (Ps > .28). The
								becomes progressively more ambitious, as they are completed. PRIME sends automatic reminders of challenges, and encouragement to post an "accomplishment moment" to peers and coach on the online network.		features of the app (10point scales); app usage.	results suggest that PRIME has the potential to be an effective mobile-based intervention for improving aspects of mood and motivation in young people with SSDs.

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