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Review Article

Combining mHealth and health-coaching for improving self-management in chronic care. A scoping review

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ABSTRACT

Background: Self-management approaches are widely used to improve chronic care. In this context, health care professionals call for efficient tools to engage patients in managing their illness. Mobile health (mHealth), defined by WHO as medical and public health practice supported by mobile devices, is demonstrated to enhance self-management and health-coaching as an engaging tool in supporting behaviour change. Nevertheless, it is unclear how health-coaching and mHealth can benefit from each other.

Objective: We conducted a scoping review to provide a literature-overview and identify any existing gaps in knowledge of mHealth in combination with health-coaching interventions for improving self-management in patients with chronic diseases.

Patient involvement: No patients were involved in the review process.

Methods: The five-stage framework by Arksey and O'Malley was used. The review surveys; PubMed, CINAHL, Embase, Scopus, and PsycInfo. Two independent reviewers performed review selection and characterization.

Results: The review points at two approaches; (i) coaching used to support mHealth and (ii) mHealth as support for coaching. The findings suggest that patients prefer physical interactions to telecommunication. mHealth was primarily used to facilitate telecommunication and to monitor disease aspects.

Discussion: We found that mHealth and health-coaching interventions benefit from each other. The review report on a considerable unclarity in the coaching-methods and that the patients were more satisfied with physical interactions than mHealth. We suggest to prioritize human contact and to explore more personalized health technology.

Practical value: This scoping review can provide a framework for researchers and care providers to support discussion and introduction of new approaches and technology in self-management for patients with chronic diseases, thereby improving patients' quality of life.

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1. Introduction

1.1. Background

The number of individuals suffering from one or more chronic diseases is rising worldwide [1]; chronic diseases are a significant burden for the patients, who are often left to cope with their illness by themselves [2]. They have to balance adherence to treatment, medication, lifestyle management, and behavioral changes [2]. For most patients, living with chronic diseases causes reduced psychosocial well-being and lower quality of life [1,3,4].

Healthcare systems often lack appropriate strategies for chronic care management [5]. Strategies for the management of chronic diseases requires consistent care and motivated patients [2]. Bodenheimer et al. [6] conclude that interventions that offer self-management support are the most effective [7,8].

1.2. Self-management

Self-management is the care done by individuals towards their health and well-being [9]. It involves the actions individuals take towards a healthy lifestyle, to care for their long-term condition, and to prevent further illness [10]. To deal with these disease-related problems, patients require knowledge, skills, and self-efficacy [11]. Furthermore, it is essential for patients to be involved and gain empowerment over their illness [12]. Many health care professionals have pointed out several barriers, such as lack of time and competing demands to implementing self-management in chronic care management [12]. At the same time, health care professionals lack efficient tools to motivate and engage patients consistently [1].

1.3. mHealth & health-coaching

Mobile health (mHealth) is defined by WHO as "the use of mobile and wireless technologies to support the achievement of health objectives" [13]. mHealth offers convenience and care opportunities to domestic environments and minimizes the barriers of distance, time, and cost [14]. mHealth offers health professionals the ability to evaluate a prescribed course of action, monitor adverse events, and identify improvement areas [14]. mHealth has shown to create opportunities to enhance patients' ability for self-management [12,14].

Studies suggest that mHealth produces positive outcomes when combined with health-coaching [15,16]. Health-coaching can be an engaging tool by enhancing personal insight and supporting behavioral change [17]. Palmer and colleagues define health-coaching as "a practice of health education and health promotion within a coaching context, to enhance the well-being of individuals, and to facilitate the achievement of their health-related goals" [18].

Health care professionals call for efficient tools to motivate and engage patients in managing their illness. mHealth and health-coaching, both independently and together, are seen as new approaches for care interventions that may improve patients in self-management. However, it is unclear how health-coaching and mHealth technologies are described as a part of a self-management intervention, and how do these two benefit from each other? Accordingly, a scoping review was conducted in order to systematically map the research, as well as to identify any existing gaps in knowledge.

2. Methods

We conducted a scoping review, using the PRISMA-ScR Checklist [19]**[**Appendix A**]** in order to map the size and scope of studies on the topic [20]. Scoping reviews embraces diverse methodologies [20]. We used the five-stage-guideline of Arksey and OMalley [20]: These five stages are; 1) the research question is outlined; 2) studies that meet the inclusion criteria are identified; 3) the final study selection is defined; 4) the data is synthesized, and 5) the results are summarized and reported [20]. A review protocol was not registered.

The purpose of the review is encapsulated in the following research question:

- How are health-coaching and mHealth technologies described as a part of a self-management intervention, and how do these two benefit from each other?

2.1. Identifying relevant studies

2.1.1. Data sources

We conducted the literature search between March 2019 and November 2019 using PubMed, CINAHL, Embase, Scopus, and PsycINFO, thereby including articles relevant to nursing. The review does not survey computer science or engineering databases, since the focus is to scope healthcare interventions that use technology, not the construction or evaluation of these technologies. In surveying, we used the following search string:

mHealth AND coaching AND ("chronic illness" OR "chronic disease" OR "chronic") AND ("self-management" OR "self-regulation" OR "self-care" OR "self-efficacy" OR "self-reflection" OR "chronic disease management")

mHealth and coaching were included to guarantee the primary scope. We included the various chronic illness and self-management terms to limit the results to chronic illnesses & self-management practices. The authors decided the terms from their experience in working with self-management interventions [21].

2.1.2. Inclusion and exclusion criteria

The search was limited to peer-reviewed published articles from the last five years to explore the most recent research [22]. The review was limited to create a contemporary picture of research in self-management, health-coaching, and mHealth. Articles were included if they cited: 1) chronic illness, 2) mHealth, 3) self-management, and 4) coaching as an intervention.

We defined chronic illness as a disease of long duration, as being recurrent and requiring medical treatment [23]. Therefore, the included articles should describe an intervention, and the patients should be the primary users of the technology. Furthermore, the review focused on technology use beyond telecommunication. Therefore, the technology should support the treatment (e.g., through tracking, reflection, efficacy, or empowerment), and not only facilitate the conversation between coach and patient. The review view coaching as health-coaching. The coach should be a healthcare professional that coaches the patient to an improved lifestyle. Coaching should be a part of the intervention and not only used as an approach to introducing technology.

The two reviewers (KH & LFO) assessed papers independently. We read the title and abstract of the initial list of papers. We read the full texts of the papers in cases where it was not clear whether the paper should be included from the title and abstract alone. A list of selected papers was agreed upon after resolving disagreements through discussions on eligibility. Excluded papers were documented. Following the inclusion, any references to the selected papers were searched for additional relevant papers. If the title was seen as having potential, we assessed the paper by reading the abstract or full text. We excluded reviews and editorials in going through the collected list of papers, as they did not report on an intervention. We searched for articles reporting on protocols found, before excluding protocols. However, no relevant papers were found.

2.1.3. Data synthesis

We analyzed the selected papers based on the full-text reading of the final papers. The focus of the reading was on (I) research motivation, (II) technology use, (III) health-coaching approaches, and (IV) self-management intervention as a whole. Research motivation was chosen in order to understand the researcher's reasoning for combining mHealth with health-coaching. We expected this motivation would reveal the goals and expectations of using mHealth and coaching together in interventions. Technology use and health-coaching were chosen to understand the papers' use of these concepts. The self-management theme was chosen to look at the papers from a more holistic perspective, revealing interactions between the above themes. Subsequently, data were synthesized using a matrix format, see Table 1.

2.1.4. Quality assessment

The reviewers (KH & LFO) independently assessed the selected papers' methodological quality using a criteria list and a plus or minus scoring system developed by Olsen [24], see Tabel 2. The following five criteria were assessed:

1 Use of control group/random assignment
2 Power analysis reported
3 Inferential statistical analysis clearly reported
4 The intervention described in detail (length, coach education, coaching elements)
5 Minimal potential for confounding variables

Each criterion gave a plus if the study, e.g., used a controlled design, or a minus if there was no control group. A plus resulted in 1 point and a minus in 0 points. The maximum score for each paper was 5 points (Table 2).

3. Results

3.1. Description of process and findings

Searching databases resulted in 43 articles. For the full study selection, see Table 3.

The papers in the review used approaches ranging from single-arm pilot studies [25–29], evaluation of program impact [30], to large multi-centre randomized controlled trials (RCTs) [31–33]. The smaller pilot studies tended to be feasibility studies [25–28] and validation papers [29], whereas the more extensive studies were evidencing implementation [30,31], comparing current approaches [32], as well as feasibility [33]. Study periods ranged from two to eighteen months. The number of participants from 15 to 466 participants. The interventions could overall be seen as two groups of feasibility and evaluation studies. Although outcomes varied in the feasibility studies, the overall focus was on the validity/utility of prototypes and systems [25–29,33]. In the more extensive studies, the focus was on health-related outcomes such as weight loss [32], the post-enrollment rate at hospitals [30], and improved physical activity [30,31]. One study [26] had a health-related focus on anxiety, involving 19 patients. Only one paper involved disciplines beyond health (software professionals).

3.2. Health-coaching

3.2.1. Design of the health-coaching interventions

The design and aim of health-coaching varied throughout the papers. The papers showed two coaching design types: “remote” coaching and a combination of physically present and remote coaching. 8 of 9 papers included only remote coaching [30,27,25,32,28,33,31,29]. Remote health-coaching was delivered through telecommunication [30,27,25,32,28,31,29]. The coaching-sessions lasted between 10 and 30 min [31,33]. In one study, remote coaching was performed by using semi-automated SMS feedback to the patients with the possibility of contacting patients through phone if necessary [33]. In this study, Loeckx et al. argued that this remote coaching form was a low-cost intervention since it reduced the burden of physically present interactions [33]. In one paper, coaching was a combination of physically present visits and telephone calls [26].

Table 1
Matrix of the included studies.

AUTHOR	ILLNESS	SUMMARY	#N	COUNTRY	TECHNOLOGY	COACH/PATIENT INTERACTION	DESCRIPTION OF THE PRACTICING COACH
Mierdel et al.[30]	COPD & Congestive Heart Failure (CHF)	Study of the effect of self-monitoring system. Self-tracking of various aspects of illness. Recorded through tablet.	466	Canada	Self-tracking of oxygen level, blood pressure and heart rate and weight. Recording of self-monitoring data through tablet	Virtual visits. Coaching done through monitoring of recorded data	Specially trained clinicians
Early et al.[26]	COPD	Study of the effect of using off-the-shelf self-management product for COPD patients, supported by nurse coaches. Tool provides a personalized plan for improved physical activity, health-risk assessment and action programs to support behavior change.	19	UK	"Off-the-shelf" Internet-based (browser) program	Home visits, telephone and email contact.	Respiratory nurse-coach with training in communication
Jongstra et al.[27]	Cardiovascular Disease	Development and validation study of web-based self-management system for elderly with cardiovascular disease.	41	The Netherlands, France, Finland, Sweden.	Self-management web (browser) application	Patients are supported by the coach through the application.	Personal online coach
Benzo et al. [25]	COPD	Development and feasibility study of self-prompting & management system, that assists in physical activity. 12 min of walking and 6 full-body exercises, to be completed 6 d/ week.	3 & 12	USA	Activity monitor and oximeter for self-tracking of physical activity. Computer tablet is used to answer questionnaire. All three are connected to a cloud server	Weekly coaching calls (12 min) to discuss rehabilitation and health progress. The calls are structured using motivational interviewing.	Trained health coach
Bennett et al.[32]	Obesity	Study of effectiveness of weight-loss intervention, comprising smartphone application to self-monitor behavior change goals with tailored feedback, smart scale and health professional counseling and coaching.	351	USA	Smartphone based self-monitoring, recorded through smart scale.	Coaching through phone calls (18 calls in 12 months).	Counselling by a dietitian
Wayne et al.[28]	Diabetes (Type 2)	Study to develop and test a smartphone-assisted intervention to improve behavioral management of type 2 diabetes among a lower socio-economic strata population.	21 (19 completed)	Canada	Smartphone application for recording of psycho and physiological aspects of illness. Recording of weight, blood glucose and blood pressure is done with other or own devices	Coach and patient interacted in person, through phone and by text message.	Graduate student trained in behavioral change techniques
Loeckx et al.[33]	COPD	Study to assess acceptability, usage and flexibility of physical activity telecoaching intervention. Physical activity were recorded through step counter and smartphone application.	159	Belgium, Greece, Luxembourg, UK, Switzerland, The Netherlands, Spain.	Step counter and smartphone application for the intervention. Patient and coach contact were through telephone.	Automated or semi-automated SMS feedback to the patients. Coaches were activated to contact patients in case patient had no or low compliance to the intervention.	Telecoach
Bender et al.[31]	COPD	Study of patient-centered walking program for COPD. Patient were assisted by wellness coach in setting personal activity goals. The intervention was recorded through self-tracking of activity through a step counter.	115	USA	Step counter for recording physical activity and phone calls to interact with coach	Patients and coach interacted through 5 calls at 2 weeks intervals	Wellness-coach and licensed professional counsellor
Selter et al.[29]	Chronic Lower Back Pain	Study of Physical therapy program with mobile phone application to promote adherence to exercise rehabilitation regimen, increase engagement in self-directed management of pain and improve self-reported outcome for pain.	93	USA	Phone application	Coaching is done through calls in 6 out of the 8 weeks.	Certified health-coach

3.2.2. Aim of health-coaching

The coaching interventions' overall aim was to engage, motivate, and give social support to the participant in achieving meaningful goals or establishing new goals [30,26,27,25,28,33,31]. Additionally, health-coaching was used to create a lively conversation [31]. Selter et al. describe that their coaching-intervention aimed to improve compliance with mHealth technology [29]. In the review, health-coaching addressed topics like generating an

Table 2
Methodological Quality Ratings of Included Studies*.

author	USE OF CONTROL GROUP/RANDOM ASSIGNMENT	POWER ANALYSIS REPORTED	INFERENTIAL STATISTICAL ANALYSIS CLEARLY REPORTED	INTERVENTION DESCRIBED IN DETAIL (LENGTH, COACH EDUCATION, COACHING ELEMENTS)	MINIMAL POTENTIAL FOR CONFOUNDING VARIABLES	QUALITY RATING
Mierdel et al.[30]	+	–	+	+	–	3
Early et al.[26]	+	+	+	+	+	5
Jongstra et al.[27]	N/A	N/A	N/A	+	–	1
Benzo et al.[25]	–	–	+	+	–	2
Bennett et al.[32]	+	–	+	–	–	2
Wayne et al.[28]	–	–	–	–	–	0
Loeckx et al.[33]	+	–	+	–	–	2
Bender et al.[31]	+	–	+	+	–	3
Selter et al.[29]	–	–	+	+	+	3

+ : 1 point, - : 0 points.
* N/A implies not applicable based on qualitative methodology.

action plan, a healthy lifestyle, being active, and managing symptoms [30,28,33,31,29] to provide knowledge to the participant in order to develop self-management skills [26], and as a tool to stimulate behavioral change [27,25,32].

3.2.3. Education of coaches

In the studies, health-coaching was performed by a range of different actors, including:

1 A certified health-coach [29]
2 Personal online coach [27]
3 Wellness-coach and licensed professional counselor [31]
4 Trained health coach [25], nurse-coach with training in communication [26]
5 Counseling by a dietitian [32]
6 Specially trained clinicians [30]
7 Telecoach [33]
8 A graduate student trained in behavioral change techniques [28]

In most studies, motivational interviewing was used as part of the coaching sessions and reported as an evidence-based and efficient method of guiding patients into sustained behavior change [25]. The coaches had access to the patients' data in all papers to evaluate progress and stimulate the achievement of new goals [32].

3.2.4. The key to the success and barriers of health-coaching

The participant found that the coaching interventions depended on the fact that the patients knew that they were *kept an eye on* and monitored by the coach [30,27,25,32,28,33,29]. Bender referred to the patient-centered approach with the actual presence of a skilled coach as the key to success [31]. When the participants felt that they had established a personal relationship, e.g., through colloquial language, with the health-coach, Selter et al. showed that the participants were more willing to achieve one or more goals [29]. Bennett et al. supported the fact that digital intervention produces a maximal outcome when combined with personal counseling [32]. Benzo et al. highlighted that coaching was leading to a feeling of being supported [25]. Some participants found the intervention impersonal, especially with usage of technology as the way to communicate with health professionals [26].

3.3. mHealth technology and use

The different pilot studies and more extensive randomized controlled studies all used technology commonly available in electronics shops. This included smartphones, pedometers, or activity trackers. If prototypes were specially constructed, they were web-based applications [27] or smartphone applications [32,28]. The interventions primarily consisted of smartphones [32,28,33,29], tablets [25,30] or browser-based applications [26,27]. Sensor or monitoring equipment such as step counter [25,33,31], oximeters [30,34], activity trackers [10,34], blood pressure and heart rate monitor [30], or digital weights [30,32] were frequently used as tracking parts of the systems.

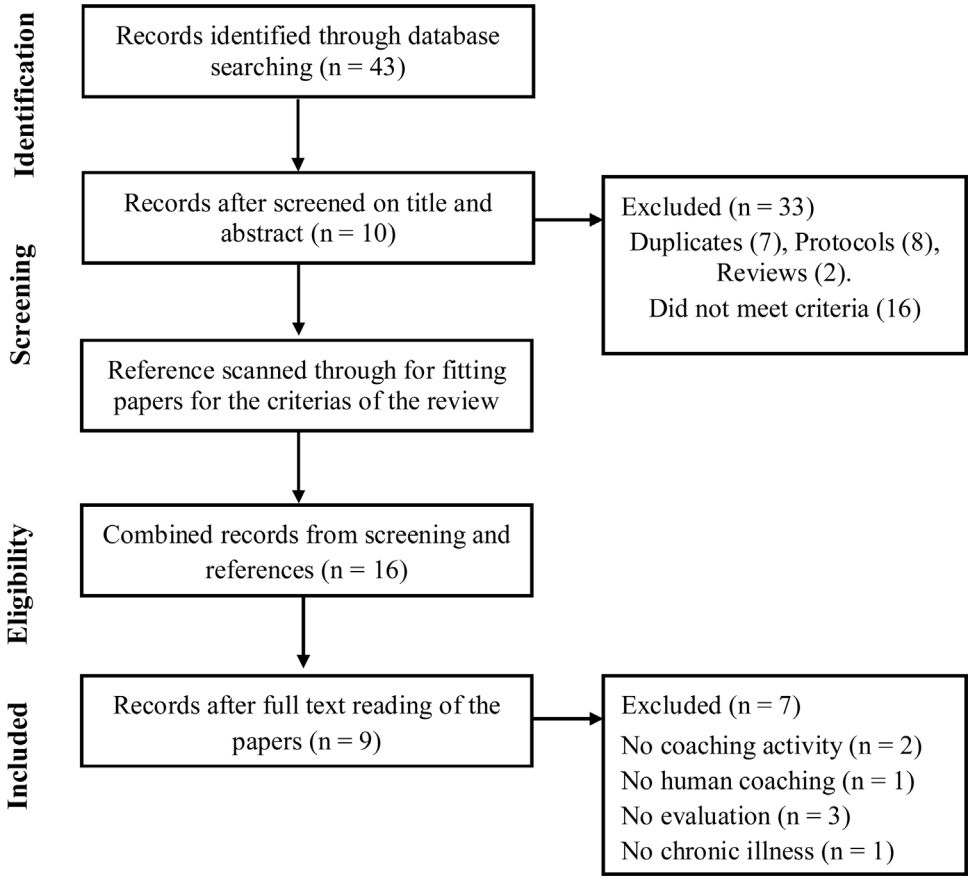
The technology was seen as a tool to guarantee ongoing support throughout the intervention, especially in the time between coaching sessions [31]. The technology was used to monitor symptoms [30,32,29] or goals for physical activity [25,30,27,31]. The various applications offered chat-systems for patients to contact the coach [27,32], activity tutorials [27], and computer-generated activity goal plans to improve physical activity [25,26,32,28,30,33].

Coach communication was supported directly through various telecommunication (text-messages [26,28,31], WhatsApp [27], and emails [26,28]). Coach contact in the studies was either face-to-face in combination with some telecommunication [26,28,31], or pure telecommunication [25,30,27,32,33,29] (Table 4).

3.4. Self-management through mHealth and health-coaching

Overall, the included studies represented two different approaches to using mHealth and health-coaching in self-management interventions. Some studies reported on interventions that used mHealth to support coaching. This support was done by providing data for further analysis and usage in the conversation with the patient or as support between coaching sessions [25,27,32,31]. Other studies used coaching in a more supportive role. These studies used coaching to motivate the patient or support the patient in using the mHealth device or system, or to create engagement with the system [33,29]. For the first approach, Jongstra argues that mHealth is a patient-centered and cost-effective solution. When combined with coaching, can facilitate patient education by offering tutorial videos, self-

Table 3
PRISMA flowchart of study selection process.



reporting-tools, and activity tracking [27]. Wayne and Ritmo [28] and Bender et al. [32] argues that mHealth supports coaching-interventions by offering a multi-faceted communication channel to reach, treat and provide immediate feedback to more patients, which especially could benefit patients from lower socioeconomic communities. Mierdel and colleagues claim that by combining mHealth with health-coaching, health professionals may enable patients to develop self-management skills by monitoring vital signs and then subsequently transform their health data to healthy behavioral changes [30].

The technology used in the interventions had, in some studies, no interaction between health professionals and patients [26]. The coach was seen as the element that brought personal relations into the intervention [32,31]. While the technology was seen as impersonal, it was also described as providing advantages compared to the current systems. mHealth was reported as creating cohesion between patient and coach, e.g., supporting goal setting and analyzing monitored data [26]. The mHealth devices were reported to support the memory of the patients, allowing them to remember how and when to exercise [29].

The interventions primarily focused on the improvement of physical activity [25,33,31]. Only two of the nine interventions looked into psychosocial aspects of illness, such as anxiety [26] or depression [32], and only as secondary outcomes [26] or used as characteristics of participants [32].

The patient's role in self-management interventions was primarily monitoring their health [30] or documenting physical activity [25,28,33,31] or lifestyle changes [27,32]. The technology in the interventions compelled the patient to take responsibility for their illness, and at times achieve a higher level of mastering illness [26,25]. The patients saw the coach as a translator of everyday monitored data [33]. The coach was seen as a human, capable of understanding the complex context of the patients.

4. Discussion and conclusion

4.1. Discussion

This scoping review aimed to explore the literature of interventions involving mHealth and health-coaching as part of self-management in chronic care. The papers all found that a critical element to developing self-management skills is patient engagement [32,31]. Furthermore, the literature points to health-coaching as a significant method to engage patients [32,31]. The review report on a diverse variety of different coaching-methods, duration, and frequency. There seems to be a lack of training and education of the coaches since only 2 of 9 studies clearly defined specific education of the coaches [25,29]. Despite referring to

Table 4
Overview of the diagnosis in the included papers.

Illness	Papers
Chronic Obstructive Pulmonary Disease (COPD)	5[25, 30, 26, 33, 31]
Chronic Lower Back Pain	1[29]
Cardiovascular Illness	1[27]
Obesity	1[32]
Diabetes	1[28]
Congestive Heart Failure (CHF)	1[30]

specific titles, none of the papers reported or described a specific coaching-theory. This deficiency makes it difficult to understand what was meant by the term 'coaching.' Coaching was done without a certified coach [30,32,28]. Unclarity in coaching-terminology appears to be a common challenge in coaching-interventions [8]. In all papers, no reflection was found on the choice and use of telecommunication in coaching and its effect on the interventions.

No papers focused on mental illness. This lack may be explained by the search strategy, focusing on coaching, and not psychology. We do find it surprising that only two of nine papers dealt with psychosocial aspects of having a chronic illness [26,32] since the definition of self-management includes psychological and social aspects of illness [35]. The absence of papers with a primary focus on psychosocial aspects of chronic illnesses highlights opportunities for the field.

4.2. Everyday technology

Commonly accessible technology is prominent throughout the interventions [25,28,29,31–33,35]. We expected researchers to be critical in examining these *wellness* technologies before they were appropriated into chronic illness care. Most of these commonly accessible technologies, such as activity trackers, have seen their origin in working environments, and popularized for health through sport [34], and not for ill patients. We find it relevant for researchers and developers in technical disciplines to gain from having mHealth designed for the specific context, instead of re-using wellness devices.

4.3. Treatment, self-management and relations in care

All papers approached the use of coaching and mHealth for monitoring self-management in distinct ways. These ways may be described as two different approaches. It is unclear whether one or the other is more rewarding [25–33].

The mHealth devices used in the included papers play different roles throughout the interventions. It was common to use the devices as data collectors for health professionals [25,28,30]. The review shows examples of mHealth that were used to create 'shared treatment responsibility.' In involving patients in setting goals to reach improved physical activity through guidance by the coach, these papers tried to create a higher degree of responsibility in the patients [25,29,31,33]. If patients are to take more responsibility for their well-being, the healthcare sector needs to make room for them.

The interventions in the review rely heavily on patient-health professional relations. We question whether social aspects of illness, such as informal care provided by relatives, peer support, or social aspects of rehabilitation groups, may be lost or left behind.

Using self-management in healthcare have the potential to change the power-relation between patient and health professional. Nunes et al. [21] point to a spectrum between two poles. That of the autonomy of the patient and that of control of the chronic condition by clinicians. When the patient is more aware of their symptoms, they become more involved in the treatment.

Nunes et al. [21] touch upon many of these concerns in their self-management technology review. They describe the many directions and questions health professionals might have as different future approaches with distinct requirements and outcomes. Nunes and colleagues provide a set of questions that may assist health researchers and patients in discussing and designing technology and treatments, in which this spectrum is in play.

a Which self-management decisions are patients making? Which are safe for patients to do autonomously?
b Do these vary for different stages of the chronic condition? What about different patients?
c Which self-management decisions should be monitored by or performed together with clinicians?
d What are the consequences of wrong self-management decisions or not making self-management decisions?
e What tools do patients use currently to make self-management decisions?
f How can technology further inform patients to make self-management decisions or support the "negotiation" of autonomy between patients and clinicians?

4.4. Conclusion

mHealth and health-coaching interventions benefit from each other. The papers point at two different approaches: interventions using coaching as support for mHealth, and interventions using mHealth as support for health-coaching. We conclude that the papers describe health coaching's purpose in the interventions as an approach to create a conversation to help patients' in achieving personals health goals. The patients describe satisfaction with the coach's physical presence and the establishment of a personal relationship between patient and health-coach as an essential element of the coaching intervention. Interventions in all published studies were reported without describing specific coaching-method and were partly or entirely done through various telecommunication methods. We suggest that health-coaching would benefit from more clarity in coaching methods, coaching education, and with a higher degree of physically present coaching visits and to explore personalized health technology.

4.5. Practical implication

The surveyed papers report on mHealth technologies that were primarily used to facilitate telecommunication and monitor disease aspects. To improve self-management for patients with chronic diseases and thereby improve their quality of life, we suggest prioritizing human contact higher in future research and exploring personalized health technology.

5. Authors' contributions

LFO and KH conceived the paper and undertook the literature review process. PGK, JA, GTP, CH and PJO developed challenges and recommendations. All authors drafted the manuscript. All authors read and approved the final manuscript.

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Declaration of Competing Interest

The authors report no declarations of interest.

Appendix A.

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.	2
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.	4
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.	4
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.	4
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.	5
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.	5
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6
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.	4
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).	–
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	4,6
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.	10
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	7,810
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	–
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.	7,8
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	7,8
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.	15
Limitations	20	Discuss the limitations of the scoping review process.	1516
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.	17
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.	17

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).

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