

## PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	I would never have done it if it hadn't been digital": A qualitative study on patients' experiences of a digital management program for hip and knee osteoarthritis in Sweden
<b>AUTHORS</b>	Cronström, Anna; Dahlberg, Leif; Nero, Håkan; Ericson, Jennifer; Hammarlund, Catharina Sjodahl

### VERSION 1 – REVIEW

<b>REVIEWER</b>	Corelien Kloek PhD Researcher at HU University of Applied Sciences Utrecht, The Netherlands
<b>REVIEW RETURNED</b>	08-Jan-2019

<b>GENERAL COMMENTS</b>	<p>Interesting topic which reflects a new and promising field (i.e. digital health care). However, to my opinion the topic-list as used in this study is lacking in quality and does not correspondent with the research question. The purpose of the study is described as informing other developers in this field. However, in-dept information about the "why" of most conclusions is missing. I don't see any options to improve the paper, using these interviews. My recommendation is to develop a new topic list, which is based on a theoretical framework and which specifically focusess on individual elements of the digital application. After reading this paper I still do not know which part of the intervention was beneficial and which part wasn't useful.</p> <p>Detailed feedback:</p> <p>Page 5-Line 11: web-based or digital management options is not the same as eHealth. Although a clear and up-to-date definition of eHealth up until now missing in literature, your description is too limited for sure. I recommend to be specific as possible and not to use the word eHealth.</p> <p>Page 6 - Line 44: it comes as a surprise that the authors also investigated expectations, next to experiences. I would like to have more background information with respect to these expectations. Are there specific reasons to suspect positive or negative expectations? And with respect to experiences: experiences with which construct? Usability? Please specify.</p> <p>Page 6-line 55: where the patients invited by their physician to participate in the study? Was the program part of usual care? Was the patient offered to every patient or were there specific criteria?</p> <p>Page 7-line 16: numbers and description of included participants should be replaced to the result section</p> <p>Page 7: information about the theoretical framework of the interviews is missing, how did you come to these topics?</p>
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	<p>Topic list: I have major concerns about the topic list since no specific questions about functionalities in the digital system are included. In terms of external validity I would recommend to include questions per specific element of the intervention. This could provide usefull information for other developers and researcher. I would like to have more insight in the theoretical framework behind this questionnaire and recommend to compare this topic list with your main research question once again. Your reserach question is very interesting, but I'm afraid that your topic list is too limited to answer your question.</p> <p>Page 8-line 42: categories should be main categories</p> <p>Page 8 results section: a description of participants as missing and should be replaced from the methods section to the results. Do you also have information about the educational level of the participants? And do you have information about partiicipants' usage of the application? How many times did they use it?</p> <p>Page 18-line 6: please be consistent in terminology: experiences instead of perspectives.</p> <p>Page 18-line 12: results of progression are previously investigated in a quantitative study, as the authors mentioned in the introduction. Can you compare these results with results of that previous study?</p> <p>Next to that, in a qualitatieve study I expect to get more in-depth information which explain why patients improve or not. Can you rewrite your results and provide the "why" of improving or not.</p> <p>Discussion: please compare your results with other studies in OA, like <a href="https://www.ncbi.nlm.nih.gov/pubmed/28525310">https://www.ncbi.nlm.nih.gov/pubmed/28525310</a></p> <p>Page 19-line 26: can you specify these barriers?</p> <p>Page 20-line 11: the online diagnosis is new for me, can you specify these details in the method section?</p> <p>Page 20-line 60: this seems to be new information. The discussion is purposed as a reflection of the result section in which no new information can be provided. Please add this information to your result section - or remove it from the discussion.</p> <p>Page 22-line 22: I can not agree with your statement that this research can help others to develop online applications since the results does not reflect which parts of the application are usefull or not.</p>
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<b>REVIEWER</b>	Kay Cooper Robert Gordon University Scotland, UK
<b>REVIEW RETURNED</b>	16-Jan-2019

<b>GENERAL COMMENTS</b>	<p>Thank you for the opportunity to review this interesting and well-written manuscript. In my opinion this is a well-conducted and reported study with only some minor points to attend to:</p> <ol style="list-style-type: none"> <li>1. "strengths and limitations" box - check grammar in bullet 1 towards end. Bullet 3 consider adding to the end of this point that although it was a limitation telephone allowed for the inclusion of participants form wide geographic area</li> <li>2. Line 8/9 not sure what "limited options" means</li> <li>3. Background paragraph 2- not clear why the focus is on CBT literature when this isn't the approach in the OA intervention</li> <li>4. In general e-health, web-based &amp; digital used somewhat interchangeably in the background - suggest that you use e-health as you have defines web-based and digital as being e-health early on</li> <li>5. Methodology - as this is a qualitative study I would expect there to be a stated methodology - even if it is a pragmatic or qualitative-</li> </ol>
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	<p>descriptive approach. Good to state as has implications for the methods &amp; interpretation of findings</p> <p>6. Page 7 lines 59/60 - piloted on who/how many would be useful information</p> <p>7. Page 8 - was a CAQDAS program used or just word documents?</p> <p>8. Results - paragraph 1 - you might consider presenting this as a table/figure, making it easier for the reader to follow the relationship between categories &amp; sub-categories</p> <p>9. I had to look up "desirous" and am a native English speaker - suggest reviewing</p> <p>10. Page 10 lines 39-45 - is there a quote to illustrate this?</p> <p>11. page 12, lines 39-46 - again is there a quote?</p> <p>12. Page 14 - line 1 "typically" - did any other participants have opposite view? Some studies have found that people don;t like daily reminders...</p> <p>13. Page 14, lines 33-47 - any quote for this?</p>
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<b>REVIEWER</b>	Lindsay Bearne King's College London, United Kingdom
<b>REVIEW RETURNED</b>	05-Feb-2019

<b>GENERAL COMMENTS</b>	<p>Thank you for the opportunity to peer review this paper. The paper reports an interesting study that explores the expectations and experiences of a digital management programme for hip and knee osteoarthritis. This is an under explored area, thus the research question is both novel and appropriate.</p> <p>There are some suggestions below that I believe could enhance the paper.</p> <ul style="list-style-type: none"> <li>- More information about the intervention (e.g. format, content and any theoretical underpinning) would be helpful so that the findings can be contextualised. Please reference any intervention development or protocol publications.</li> <li>- Recent literature should be considered and referenced in the introduction and discussion (e.g. Griffith et al., 2019 the effect of interactive digital interventions on physical activity in people with inflammatory arthritis: a systematic review, Berry et al.,2018 Digital behaviour change interventions to facilitate physical activity in osteoarthritis: a systemic review)</li> <li>- Please use the COREQ or other published guidelines to ensure that the study is fully reported. For example, a statement about the researcher characteristics and prior relationship with/ knowledge of the participants and any checking or validation of findings should be included in the manuscript.</li> <li>- Please include demographic details of the participants e.g. age, years of diagnosis</li> </ul> <p>Please clarify the process of identifying your themes in your analysis.</p> <ul style="list-style-type: none"> <li>- Could your analysis be presented in a table to illustrate the development of your final themes</li> <li>- There is no data reported on inter-rater reliability of coding between each of the researchers that completed analysis – was this considered?</li> </ul>
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	<p>- It was quite difficult to understand and interpret the results. Some findings were reported that did not relate to the research question and several themes appeared to overlap and perhaps could be condensed.</p> <p>- How have themes been validated? i.e. did the researchers check with participants if they agreed with the themes, did they capture their experiences? (i.e. PPI involvement?)</p> <p>- If applicable the authors may want to consider grounding the results in a theoretical framework, which would make it easier to follow and interpret the findings For example: Sekhon, Cartwright and Francis (2017) Acceptability of healthcare interventions: an overview of reviews, and development of a theoretical framework.</p> <p>- A summary of whether participants expectations mapped onto their experiences of using the digital application needs to be provided, in order to answer the papers research question.</p> <p>- Limitations, only one real limitation is reported. Can the researchers offer a more balanced view and acknowledge other limitations to the study?</p> <p>Minor consideration Please check introduction of abbreviations throughout (e.g. abstract – OA)</p>
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### VERSION 1 – AUTHOR RESPONSE

#### Reviewer comment

Interesting topic which reflects a new and promising field (i.e. digital health care). However, to my opinion the topic-list as used in this study is lacking in quality and does not correspondent with the research question. The purpose of the study is described as informing other developers in this field. However, in-dept information about the "why" of most conclusions is missing. I don't see any options to improve the paper, using these interviews. My recommendation is to develop a new topic list, which is based on a theoretical framework and which specifically focusses on individual elements of the digital application. After reading this paper I still do not know which part of the intervention was beneficial and which part wasn't useful.

#### Authors' response and action

The theoretical framework has been described in the background lines 84-93. The digital program is based on the face to face management program "Better management of Patients with OsteoArthritis (BOA) [1] which in turn is based on international guidelines and recommendations [2].

To clarify, references for studies on this digital program is added to Line 84 and changes have been made to lines 86-90; "The program, as thoroughly described previously (ref), comprises OA education (instructional videos on OA, physical activity and weight management), individualized neuromuscular exercises with increasing difficulty aiming at improving lower extremity strength and neuromuscular control, and an option to chat asynchronously with an assigned physical therapist for feedback and questions."

Digital management for OA is a new and promising area. However, patients' experiences of having OA treatment delivered online instead of traditional face to face treatment is to our knowledge not previously studied. According to the aim of this study, to investigate the patients' experiences of receiving digital management for hip and knee osteoarthritis (OA) as stated in the abstract on line 21 and in the background line 96, this first step towards deeper understanding of the participants' experiences of digital treatment show promising results for this group of patients. In addition, but not a specific aim of the study, we do believe that our results of the participants' user experiences, may be useful in further development of digital management programs as stated on line 94.

It is correct that it is not possible to improve the paper to answer why of most conclusions using these interviews. It is however important to acknowledge that in a qualitative study it is only possible to draw conclusions about the participants' experiences of the area studied. For example, the participant may perceive that they have improved/not improved by using this program but we cannot say anything about the cause (the why) of this improvement/lack of improvement, neither was it the aim of this study.

A summary of the result is provided at the start of the discussion which reveals that the program was easy to execute, the flexibility of deciding when to perform the exercises as well as the daily communication with the online physiotherapist were thought of as very important for a positive experience of the program. To further clarify, we have now added a sentence on the participants' suggestions to further improvement of the program to this summary. "In addition, the participants suggested more variation in the exercises and follow-up by video-calls." Line 408

#### Reviewer comment

Page 5-Line 11: web-based or digital management options is not the same as eHealth. Although a clear and up-to-date definition of eHealth up until now missing in literature, your description is too limited for sure. I recommend to be specific as possible and not to use the word eHealth.

#### Authors' response and action

We have now replaced "e-health" with "digital" throughout the manuscript

#### Reviewer comment

Page 6 - Line 44: it comes as a surprise that the authors also investigated expectations, next to experiences. I would like to have more background information with respect to these expectations. Are there specific reasons to suspect positive or negative expectations? And with respect to experiences: experiences with which construct? Usability? Please specify.

#### Authors' response and action

We agree with the reviewer that expectations of the program may not add to the result of this study. Thus, to avoid confusion, this part is now deleted. Furthermore, the word "using" is added to the aim on line 97 and the sentence now reads; "Thus, the aim of this qualitative study was to investigate the patients' experiences of using a digital management program for hip and knee OA."

#### Reviewer comment

Page 6-line 55: where the patients invited by their physician to participate in the study? Was the program part of usual care? Was the patient offered to every patient or were there specific criteria?

#### Authors' response and action

The patients were not invited by their physician to participate in the study. The participants' contact details were collected from the program's register and invitations were then sent out by email by the first author of this study. This is now further clarified in the methods line 113-116; "From a total sample of 462 individuals that had completed six weeks in the digital OA management program

between 2015 and 2018, 73 invitations with written information about the study were sent out by e-mail by the first author (AC).”

Furthermore, this digital program is an alternative to “usual care” which in Sweden is the face-to-face BOA program, and is, similarly to BOA, subsidized by the region in which the patient lives. The patient can join the program at a regional clinic (if there is an affiliated clinic nearby) or just go online and register. Hence, the program was not part of any form of intervention study, and participants were recruited through the Joint Academy patient registry.

#### Reviewer comment

Page 7-line 16: numbers and description of included participants should be replaced to the result section

#### Authors' response and action

We appreciate that this is performed differently by different authors as well as between different journals. We agree with the reviewer that it may be better to have the sample description in the result section. However, we have chosen to report according to ICMJE guidelines and recommendations, <http://www.icmje.org/>, and we will leave this to the editor to decide.

#### Reviewer comment

Page 7: information about the theoretical framework of the interviews is missing, how did you come to these topics?

#### Authors' response and action

In the phenomenological approach, the semi-structured interview is based on covering areas that are related to areas of interest and to the aim of the study. We identified areas of interest such as the set-up, educational contents, feed-back, feed-forward, availability and design. However, these areas are only guiding the interviewer and do not constitute a template for asking precise questions to the participants. Here, we aim at capturing the experiences as described by each participant and to remain neutral during this process.

We have given some examples for clarification on lines 136-137. “... set-up, educational contents, feed-back, feed-forward, availability and design”.

Furthermore, this study is based on systematic text condensation [3] which in turn is influenced by Giorgi's phenomenological analysis [4]. A clarification of this method is added to the method section “The transcripts were analyzed using systematic text condensation (STC) according to Malterud [3], which is based on Giorgi's phenomenological analysis [4]. The procedure of the analysis consists of the following steps: 1) creating an overall impression and identifying themes; 2) distinguishing and sorting meaning units to codes; 3) formulating the meaning of each code meaning and 4) synthesizing the condensed meaning into descriptions and concepts (See Online resource one for examples). STC was chosen as the procedure facilitates cross-case synthesis of text and meaning [3]” (Lines 152-156)

#### Reviewer comment

Topic list: I have major concerns about the topic list since no specific questions about functionalities in the digital system are included. In terms of external validity I would recommend to include questions per specific element of the intervention. This could provide useful information for other developers and researcher. I would like to have more insight in the theoretical framework behind this questionnaire and recommend to compare this topic list with your main research question once again. Your research question is very interesting, but I'm afraid that your topic list is too limited to answer your question.

#### Authors' response and action

As explained previously (lines 84-93) the theoretical framework was based on a previously reported evidence-based self-management program for people with OA [1]. The educational part of the program aimed at providing information about the pathology and etiology of osteoarthritis, available treatments and treatment guidelines. This was done in order to explain biomechanical and physiological mechanisms behind the viable benefits of specific exercises in order to increase the participants' motivation to exercise. Biomechanical principles and guidelines with special focus on maintaining proximal strength constituted the theoretical base for the exercises along with aligning the hip-knee-ankle and having good neuromuscular control. The intensity and progress of exercises increased gradually following the evaluations of the supervising physiotherapist based on improved individual function [1, 5].

With regard to specific questions, using pre-specified questions of a questionnaire is not within the scope of the phenomenological approach. On the contrary, it is more important to have rich and varied data in order to get a deeper understanding of experiences that may have affected their participation in the program. The next step, however, may be to test this qualitative data using quantitative methods. Please, see answer to comment above.

Reviewer comment

Page 8-line 42: categories should be main categories

Authors' response and action

The word "main" is now added to this sentence

Reviewer comment

Page 8 results section: a description of participants as missing and should be replaced from the methods section to the results. Do you also have information about the educational level of the participants? And do you have information about participants' usage of the application? How many times did they use it?

Authors' response and action

See answer to the comment above. We have chosen to report according to the ICMJE guidelines. Unfortunately, education level is not recorded in the program. However, a table of the participants' characteristics is now added to the manuscript, including activity in the program (Table 1).

Reviewer comment

Page 18-line 6: please be consistent in terminology: experiences instead of perspectives.

Authors' response and action

The word "perspectives" is now replaced with "experiences" Line 401

Reviewer comment

Page 18-line 12: results of progression are previously investigated in a quantitative study, as the authors mentioned in the introduction. Can you compare these results with results of that previous study?

Authors' response and action

We have added the following sentences on line 468:

"The results confirmed the findings of previous studies (Ref) in that the participants reported that the most important results of the program were improvements such as reduced pain, increased flexibility,

and improved walking abilities, which brought a sense of improved quality of life and less focus on the disease. In addition, previous....”

#### Reviewer comment

Next to that, in a qualitative study I expect to get more in-depth information which explain why patients improve or not. Can you rewrite your results and provide the "why" of improving or not.

#### Authors' response and action

As per comment above, in a qualitative study we are only able to draw conclusions about the participants' experiences of the area studied. For example, the participant may perceive that they have improved/not improved by using this program but we cannot say anything about the cause of this improvement/lack of improvement.

#### Reviewer comment

Discussion: please compare your results with other studies in OA, like <https://www.ncbi.nlm.nih.gov/pubmed/28525310>

#### Authors' response and action

Thank you for this suggestion. A sentence is added to the discussion "..., there seem to be good adherence to treatment delivered online in these patients (ref)." (Lines 429-430)

#### Reviewer comment

Page 19-line 26: can you specify these barriers?

#### Authors' response and action

Information is added and the sentence now reads; "...some of the barriers associated with exercise participation, such as access and time constrains,..." Line 436

#### Reviewer comment

Page 20-line 11: the online diagnosis is new for me, can you specify these details in the method section?

#### Authors' response and action

The vast majority of patients included in Joint Academy already have an OA diagnose (from previous care taker) when entering Joint Academy. For the others, they are offered a consultation with an orthopedist before entering the program, and if there is any doubt about differential diagnosis, the orthopedist refers the patient to their regular care taker for further assessment. The recommendation to enter the program is based on typical OA symptoms according to ACR criteria [6], the patient's anamnesis and history of illness, traumas, etcetera. This is now clarified in the methods line 117. "The inclusion criterion was clinical hip or knee OA, previously confirmed or diagnosed according to the ACR criteria (ref)..."

#### Reviewer comment

Page 20-line 60: this seems to be new information. The discussion is purposed as a reflection of the result section in which no new information can be provided. Please add this information to your result section - or remove it from the discussion.

#### Authors' response and action

The subject discussed is reported in the result section "Another reason was that it might help them to be well prepared for any upcoming surgery." (line 361) and "On the other hand, reduced pain and scheduled surgery were described by some participants as reasons for not continuing the program" (line 368).



#### Reviewer comment

Page 22-line 22: I can not agree with your statement that this research can help others to develop online applications since the results does not reflect which parts of the application are usefull or not.

#### Authors' response and action

We do not fully understand this comment. Clearly results from this study are not enough to develop a digital OA treatment program. Obviously, more background knowledge needs to be collected. However there is a general consensus that when developing patient centred health care, focus groups including patients with the specific ailment is mandatory. In this respect we do believe that the result as well as in the discussion includes several factors relevant for developers. Specifically those that contribute to the participants' positive or negative experience of the program. For example, the daily contact with the physio is described as very important for a positive experience. Those that did not think the contact with the physio was satisfying, did not experience the program as positive as the ones that perceived that the contact was really good. The email-reminders, flexibility and the easiness of the program were other factors that they experienced as very positive. Furthermore, the participants suggested further improvements such as more variation in the exercises as well as follow-up by video calls. To further clarify this, these suggestions are now added to the summary in the first paragraph of the discussion (line 408).

#### Reviewer: 2

Reviewer Name: Kay Cooper

Institution and Country: Robert Gordon University, Scotland, UK

Please state any competing interests or state 'None declared': None declared

Thank you for the opportunity to review this interesting and well-written manuscript. In my opinion this is a well-conducted and reported study with only some minor points to attend to:

#### Reviewer comment

"strengths and limitations" box - check grammar in bullet 1 towards end. Bullet 3 consider adding to the end of this point that although it was a limitation telephone allowed for the inclusion of participants form wide geographic area

#### Authors' response and action

Bullet 1 now reads, "Participants were purposefully selected, including both sexes, who differed in age, osteoarthritis severity and physical function in order to have rich and varied data, when synthesizing shared patterns across cases"

Thank you for this suggestion. This information is now added to bullet 3 and reads; "Conducting the interviews via telephone may have resulted in less depth of the interviews due to a loss of visual input, but also allowed inclusion of participants form a wide geographic area."

#### Reviewer comment

Line 8/9 not sure what "limited options" means

#### Authors' response and action

The words "limited option" are now replaced with "difficulty" (line 55)

#### Reviewer comment

Background paragraph 2- not clear why the focus is on CBT literature when this isn't the approach in the OA intervention

Authors' response and action

To avoid confusion the sentence on CBT is now deleted

Reviewer comment

In general e-health, web-based & digital used somewhat interchangeably in the background - suggest that you use e-health as you have defines web-based and digital as being e-health early on

Authors' response and action

The word "e-health" is now deleted from the manuscript and changed to "digital" according to the suggestion by reviewer 1.

Reviewer comment

Methodology - as this is a qualitative study I would expect there to be a stated methodology - even if it is a pragmatic or qualitative-descriptive approach. Good to state as has implications for the methods & interpretation of findings

Authors' response and action

Systematic text condensation is a qualitative descriptive-explorative method. We have now further clarified each step of this process in the methods. "The transcripts were analyzed using systematic text condensation (STC) according to Malterud (ref), which is based on Giorgi's phenomenological analysis (ref). The procedure of the analysis consists of the following steps: 1) creating an overall impression and identifying themes; 2) distinguishing and sorting meaning units to codes; 3) formulating the meaning of each code meaning and 4) synthesizing the condensed meaning into descriptions and concepts. STC was chosen as the procedure facilitates cross-case synthesis of text and meaning (ref)." Lines 151-157.

Reviewer comment

Page 7 lines 59/60 - piloted on who/how many would be useful information

Authors' response and action

The interview guide was pilot-tested on three older individuals with OA, not included in the study. This is now clarified in the methods (Lines 142-143)

Reviewer comment

Page 8 - was a CAQDAS program used or just word documents?

Authors' response and action

The data was analysed following the procedure of STC analysis as described on lines 151-157 using word documents. We are not familiar with the CAQDAS platforms.

Reviewer comment

Results - paragraph 1 - you might consider presenting this as a table/figure, making it easier for the reader to follow the relationship between categories & sub-categories

Authors' response and action

Figure 1 representing the categories and sub-categories is now added to the manuscript

Reviewer comment

I had to look up "desirous" and am a native English speaker - suggest reviewing

Authors' response and action

Thanks for this helpful suggestion. The word "desirous" is now replaced with "eager"

Reviewer comment

Page 10 lines 39-45 - is there a quote to illustrate this

Authors' response and action

These sentences represent an introductory summary of contents of the sub-categories of each main category. The quotes representing these statements are reported under each sub-category. We have done a slight change to the font of the headings for easier distinguishing between main categories and sub-categories.

Reviewer comment

page 12, lines 39-46 - again is there a quote?

Authors' response and action

The quote for: "Receiving an OA diagnosis without any physical meeting was perceived as a bit awkward to some participants. Some concerns were revealed regarding the risk of missing serious diseases if the diagnosis was given by phone or internet". Is reported on lines 271-273

"It's somewhat hard to give a diagnosis over the phone. You can do it, but it's more difficult and you can miss things... there could have been a tumor there..."

Reviewer comment

Page 14 - line 1 "typically" - did any other participants have opposite view? Some studies have found that people don;t like daily reminders...

Authors' response and action

In the current study none of the participants expressed that they did not like the reminders

Reviewer comment

Page 14, lines 33-47 - any quote for this?

Authors' response and action

Just as above, this section is a summary of the main category with sub-categories and the quotes are reported under each sub-category.

Reviewer: 3

Reviewer Name: Lindsay Bearne

Institution and Country: King's College London, United Kingdom

Please state any competing interests or state 'None declared': None declared

Thank you for the opportunity to peer review this paper. The paper reports an interesting study that explores the expectations and experiences of a digital management programme for hip and knee osteoarthritis. This is an under explored area, thus the research question is both novel and appropriate.

There are some suggestions below that I believe could enhance the paper.

Reviewer comment

- More information about the intervention (e.g. format, content and any theoretical underpinning) would be helpful so that the findings can be contextualised. Please reference any intervention development or protocol publications.

Authors' response and action

The digital program is based on the face to face management program “Better management of Patients with OsteoArthritis (BOA) [1] (Line 84) which in turn is based on international guidelines and recommendations [2].

To clarify, references for studies on this digital program is added to Line 84 and minor changes have been made to lines 84-90; “The program, thoroughly described previously (ref) comprises OA education (instructional videos on OA, physical activity and weight management), individualized neuromuscular exercises with increasing difficulty aiming at improving lower extremity strength and neuromuscular control, and an option to chat asynchronously with an assigned physical therapist for feedback and questions.”

Reviewer comment

- Recent literature should be considered and referenced in the introduction and discussion (e.g. Griffith et al., 2019 the effect of interactive digital interventions on physical activity in people with inflammatory arthritis: a systematic review, Berry et al.,2018 Digital behaviour change interventions to facilitate physical activity in osteoarthritis: a systemic review)

Authors’ response and action

We thank the reviewer for this update. A sentence is added to the background including these newly published studies. “Unlike in patients with inflammatory arthritis where digital management does not seem to increase physical activity or quality of life (Griffith 2019) a few studies have shown promising results of digital interventions on physical activity (Berry 2018), quality of life, pain and physical function in patients with hip or knee OA (ref).” (Lines 78-81)

Reviewer comment

- Please use the COREQ or other published guidelines to ensure that the study is fully reported. For example, a statement about the researcher characteristics and prior relationship with/ knowledge of the participants and any checking or validation of findings should be included in the manuscript.

Authors’ response and action

The COREQ checklist was filled in and provided at the end of the submission. We will, however, provide it again.

Reviewer comment

- Please include demographic details of the participants e.g. age, years of diagnosis

Authors’ response and action

A Table with the participants’ characteristics is now added to the manuscript (Table 1). Year of diagnosis is presently not recorded in the program.

Reviewer comment

Please clarify the process of identifying your themes in your analysis.

- Could your analysis be presented in a table to illustrate the development of your final themes

Authors’ response and action

A clarification of each step in systematic text condensation is added to the methods (Lines 151-157). In addition, a table is added for clarification of the process (Appendix 2)

Reviewer comment

- There is no data reported on inter-rater reliability of coding between each of the researchers that completed analysis – was this considered?

Authors’ response and action

Inter-rater reliability was considered. Please see below:

Lines 160-163: The three authors (JE, AC, and CSH) that performed the analysis worked individually to identify as many perspectives and perceptions as possible in the material. Then, all authors worked

together with the coded data to produce one set of data, extracting duplicates and data that were not relevant for the aim of the study.

Lines 166-168: To validate the categories and make sure that no important aspects had been overlooked, the clusters were referred back to the raw data, and read through once again by the authors.

Line 498: Throughout the data analysis reflexivity has been considered, i.e., we have been aware that the pre-understanding that the authors may have as clinicians and researchers could affect the data, if one is not fully aware of previous experiences [7]. All authors worked separately during the data processing and there were continuous discussions during the analysis aimed at eliminating possible influences of previous experiences, which helped us to stay neutral to the data. In addition, we have also presented a signature after each quotation to show the representation of our participants, and to add transparency and trustworthiness to our findings and interpretations of the data.

Reviewer comment

- It was quite difficult to understand and interpret the results. Some findings were reported that did not relate to the research question and several themes appeared to overlap and perhaps could be condensed.

Authors' response and action

In an effort to clarify, some changes to the results have been made. Expectations of the program have been excluded as per comment from reviewer 1 and participants' suggestions have been removed from the main categories and represent an addition to the categories. The new categories will be as follows;

"1) Management options for mitigating the consequences of OA, 2) Experiences of the digital program, with four sub-categories a) Easy to execute, b) Flexibility to choose when and where, c) The importance of interacting with healthcare professionals and d) Other motivating factors and 3) Perceived effects of the digital program over time, with two subcategories a) Perceived effects of the program after the initial six weeks and b) Reasons for continuing to participate in the program. In addition we have asked for the suggestion for improvement of the program."

Furthermore, we have done some slight changes to the fonts of the headings and sub-heading and hope that the result section is now easier to interpret.

Reviewer comment

- How have themes been validated? i.e. did the researchers check with participants if they agreed with the themes, did they capture their experiences? (i.e. PPI involvement?)

Authors' response and action

The participants were not involved in the analysis of the results. This is reported under "Patient and public involvement statement" (Line 101) and the COREQ checklist. However, to validate the categories the clusters were referred back to the raw data, and read through once again by the authors to make sure that no important aspects had been overlooked. (lines 166-168)

Reviewer comment

- If applicable the authors may want to consider grounding the results in a theoretical framework, which would make it easier to follow and interpret the findings

For example: Sekhon, Cartwright and Francis (2017) Acceptability of healthcare interventions: an overview of reviews, and development of a theoretical framework.

Authors' response and action

This is an interesting suggestion. However, this was not the aim of this study. This study is the first step in evaluating the patients' perspectives on digital treatment. It would, however, be interesting to evaluate acceptability using the suggested framework or the effects of the treatment on their daily life using models such as ICF in future studies.

Reviewer comment

- A summary of whether participants expectations mapped onto their experiences of using the digital application needs to be provided, in order to answer the papers research question.

Authors' response and action

Expectations are now excluded from the result as per comment from reviewer 1.

Reviewer comment

- Limitations, only one real limitation is reported. Can the researchers offer a more balanced view and acknowledge other limitations to the study?

Authors' response and action

In addition to that the interviews were conducted by telephone and that a few participants completed the programs one year ago we have also added the following to the limitations:

“Another limitation may be that some demographic data of the participants, such as education level, previous experience of using digital applications and year of OA diagnosis were not recorded. This information may have increased the generalizability of the results.” (Lines 493-496)

Reviewer comment

Minor consideration

Please check introduction of abbreviations throughout (e.g. abstract – OA)

Authors' response and action

Thank you for highlighting this. The abbreviations are now checked and corrected throughout the manuscript

References

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7. Malterud K: Qualitative research: standards, challenges, and guidelines. Lancet (London, England) 2001, 358(9280):483-488.

**VERSION 2 – REVIEW**

<b>REVIEWER</b>	Kay Cooper Robert Gordon University, UK
<b>REVIEW RETURNED</b>	29-Mar-2019

<b>GENERAL COMMENTS</b>	Thank you for addressing the comments I made on the previous version
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<b>REVIEWER</b>	Lindsay Bearne King's College London, United Kingdom
<b>REVIEW RETURNED</b>	25-Mar-2019

<b>GENERAL COMMENTS</b>	<p>The authors have extensively revised this manuscript in light of previous reviewers comments.</p> <p>Overall comment: The COREQ guidelines should be followed when reporting this study. For example, methods of data validation, a summary of the researcher experience and any prior relationship with participants should be included in the manuscript. I note that the authors have completed the COREQ checklist and submitted this as supplementary information, but these aspects should also be included in the manuscript.</p> <p><b>Abstract</b> Please remove the words 'asynchronous chat' and rephrase this term for readability</p> <p><b>Data collection</b> Please define stopping criteria for data collection, add details of researcher background and experience and relationship with participants as described in COREQ guidelines. Please describe any methods for data corroboration / validation undertaken</p> <p><b>Results</b> The first theme is poorly illustrated and only the final two sentences relate the theme title. Further development of this theme (i.e. details and explanation of this theme) is needed and more pertinent examples from the data are required to fully explore this important theme.</p> <p><b>Discussion</b> It would be helpful if the explanation of the results and discussion could be expanded and considered in greater depth. The participants' contrasting experiences of the digital intervention could be explored further and it may be helpful to consider the findings in the context of an appropriate health behaviour change or other theory. Referring to the contemporary literature on adherence to exercise/ self-management would strengthen the discussion (see: Meade, L. B., (2019) British journal of health psychology, 24(1), 10-30.</p>
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### VERSION 2 – AUTHOR RESPONSE

Reviewer: 3

Reviewer comment

Overall comment:

The COREQ guidelines should be followed when reporting this study. For example, methods of data validation, a summary of the researcher experience and any prior relationship with participants should be included in the manuscript. I note that the authors have completed the COREQ checklist and

submitted this as supplementary information, but these aspects should also be included in the manuscript.

#### Authors' response and action

This information is now added to the manuscript, see detailed information in answer to comments below

#### Reviewer comment

##### Abstract

Please remove the words 'asynchronous chat' and rephrase this term for readability

#### Authors' response and action

The term "asynchronous" is now replaced with "an option to" (line 22 and line 488) .

#### Reviewer comment

##### Data collection

Please define stopping criteria for data collection, add details of researcher background and experience and relationship with participants as described in COREQ guidelines. Please describe any methods for data corroboration / validation undertaken

#### Authors' response and action

The stopping criterion stated on lines 139 - 140 is now further clarified "Data collection stopped when no further information was added, i.e., the interviews did not add any new information to the results."

Furthermore, information regarding interviewers' experiences etc. are added to line 125 "The interviews were conducted by two of the authors (JE, physical therapy student & AC, physical therapist and PhD)." and line 136 "The two interviewers completed basic training in interview technique prior to data collection and had no relation to the participants in this study."

The methods for validating the data is described on lines 153 - 164 "...meaning units were identified and formulated into codes that represented the core of the statements. During this phase, three of the authors (JE, AC, and CSH) worked individually to identify as many perspectives and perceptions as possible in the material. Next, all authors worked together with the coded data to produce one set of data, extracting duplicates and data that were not relevant for the aim of the study. The coded data were then organized into subcategories, and the content of the meaning units of each category was re-examined. The meaning and representation of the data was formulated into aspects representing the content. Thereafter, the subcategories were organized into categories. To validate the categories and make sure that no important aspects had been overlooked, the clusters were referred back to the raw data, and read through once again by the authors."



And lines 479 - 486

“Throughout the data analysis reflexivity has been considered, i.e., we have been aware that the pre-understanding that the authors may have as clinicians and researchers could affect the data, if one is not fully aware of previous experiences [41]. All authors worked separately during the data processing and there were continuous discussions during the analysis aimed at eliminating possible influences of previous experiences, which helped us to stay neutral to the data. In addition, we have also presented a signature after each quotation to show the representation of our participants, and to add transparency and trustworthiness to our findings and interpretations of the data.”

Reviewer comment

Results

The first theme is poorly illustrated and only the final two sentences relate the theme title. Further development of this theme (i.e. details and explanation of this theme) is needed and more pertinent examples from the data are required to fully explore this important theme.

Authors' response and action

We have made a slight change to this theme on line 177: “This category entailed the experiences of the perceived consequences of OA leading to the patients' eager search...” We have also replaced the quote “The expectations that I had were to be more flexible and to reduce the pain. That was how I figured it could be.” (118) with two other quotes “You take every chance for improvement that you get. In the end you know it'll be beneficial.” (13) and “...you know...I wasn't able to go downtown without thinking about how I would get back home again, when it was at its worst. I was also considering having surgery and other options, but only to get better. I was feeling really bad ...” (112)

Reviewer comment

Discussion

It would be helpful if the explanation of the results and discussion could be expanded and considered in greater depth. The participants' contrasting experiences of the digital intervention could be explored further and it may be helpful to consider the findings in the context of an appropriate health behaviour change or other theory.

Referring to the contemporary literature on adherence to exercise/ self-management would strengthen the discussion (see: Meade, L. B., (2019) British journal of health psychology, 24(1), 10-30.

Authors' response and action

Thank you for this suggestion. The discussion has now been extended including this reference. ” There were, however, some contrasting experiences of the digital program, mostly related to perceived symptom improvement and contact with the physical therapist. Future quantitative investigations may reveal if such differences are related to adherence, i.e., activity level in the program. Previous research conclude that including behavioral change techniques may increase

adherence to exercise [35] and a digital delivery may enable the patients to continue their treatment week after week to further improvements and to sustain their achieved behavioral change.” (Lines 417 – 423)

**VERSION 3 – REVIEW**

<b>REVIEWER</b>	Lindsay Bearne King's College London, United Kingdom
<b>REVIEW RETURNED</b>	18-Apr-2019
<b>GENERAL COMMENTS</b>	Thank you for addressing my comments