

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

TITLE (PROVISIONAL)	Clinician perceptions of a prototype wearable exercise biofeedback system for orthopaedic rehabilitation: a qualitative exploration.
AUTHORS	Argent, Rob; Slevin, Patrick; Bevilacqua, Antonio; Neligan, Maurice; Daly, Ailish; Caulfield, Brian

VERSION 1 – REVIEW

REVIEWER	Maria Ehn, researcher Mälardalen University Sweden
REVIEW RETURNED	06-Sep-2018

GENERAL COMMENTS	<p>Question 1: Is the research question or study objective clearly defined? Answer: Yes Comment: I had to read the objectives in the introductions a few times in order to understand them. It is good that they are presented as two separates, I think the sentence here should be rephrased or shortened. The presentation of the research objectives in the introduction should be the same as in the introduction, here the text needs to be focused</p> <p>Question 2: Is the abstract accurate, balanced and complete? Answer: Yes Comment: Challenges perceived by the participants should be included in the conclusions. The abstract lacks “background” section.</p> <p>Question 3: Is the study design appropriate to answer the research question? Answer: Yes Comment: Combination of different types of data could enrich the study (data now consists of individual interviews with clinicians in a one-hour session). Also, I think that the interview guide could be revised in order to make the questions more neutral (especially the section about perceived impact could also include questions about potential risks and potential inconvenience that the participants see). My main concern about this manuscript is the qualitative analysis of the interview data (see my answer to question 4 below).</p> <p>Question 4: Are the methods described sufficiently to allow the study to be repeated? Answer: No Comment: My main concern about the manuscript is that the</p>
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	<p>qualitative analysis of the interview data is not carried out in accordance with the Grounded Theory Approach as stated in the methods section: The analysis should be performed in a much more inductive way and not use the themes from the interview guide as themes in the analysis.</p> <p>I also lack a description of how the sub-themes relate to each other. A table or figure showing this would improve the presentation of the results significantly.</p> <p>Question 5: Are research ethics (e.g. participant consent, ethics approval) addressed appropriately? Answer: Yes Comment: Written consent has been collected from all participants and the study protocol has been approved by the hospital's ethics committee.</p> <p>Question 6: Are the outcomes clearly defined? Answer: N/A Comment: This is a qualitative study; therefore it is difficult to define outcomes very clearly.</p> <p>Question 7: If statistics are used are they appropriate and described fully? Answer: N/A Comment: No statistics used</p> <p>Question 8: Are the references up-to-date and appropriate? Answer: Yes Comment: Seems OK with the following comments: Ref 5 is valid for older adults. Other refs also for younger patients? Ref 13: No year given in reference list. Ref 16: The reference needs to be cited correctly: It is now used in a sentence stating that there are few studies with clinicians. However, [16] seems to be an example of a study with clinicians. Either, find a review article stating that there are few studies made with clinicians and cite [16] as an example of a study with clinicians.</p> <p>Question 9: Do the results address the research question or objective? Answer: N/A Comment: Please, see my comments on question 4.</p> <p>Question 10: Are they (the results) presented clearly? Answer: N/A Comment: Please, see my comments on question 4.</p> <p>Question 11: Are the discussion and conclusions justified by the results? Answer: No Comment: The results contain perceived challenges that are not presented in the discussion parts "principal findings from demonstrating the prototype" and "conclusions". In both parts, challenges perceived by the participants should be included. In my opinion, the discussion section could be further developed, for example: Can the results from this study be related to studies (for example other studies on technology-based rehabilitation interventions?) Can the results from this study be related to relevant theory (for example regarding motivation, technology use)?</p>
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	<p>Question 12: Are the study limitations discussed adequately? Answer: Yes Comment: Partly. I think the following limitations should be discussed: Only interview data (what could other types of data contribute with), the interview guide (was it balanced in relation to the research objectives), only clinicians interviewed (why not also patients?). Nothing is said about the analysis (see my comments on question 4)</p> <p>Question 13: Is the supplementary reporting complete (e.g. trial registration; funding details; CONSORT, STROBE or PRISMA checklist)? Answer: Yes Comment: Funding and ethical approval from hospital presented.</p> <p>Question 14: To the best of your knowledge is the paper free from concerns over publication ethics (e.g. plagiarism, redundant publication, undeclared conflicts of interest)? Answer: Yes Comment: To the best of my knowledge, the paper is free from concerns over publication ethics.</p> <p>Question 15: Is the standard of written English acceptable for publication? Answer: Yes Comment: It is generally acceptable. I think the abstract should be revised and some prepositions added</p>
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REVIEWER	Kazuhiro Yasuda Research Institute for Science and Engineering, Waseda University, Tokyo, JAPAN
REVIEW RETURNED	18-Sep-2018

GENERAL COMMENTS	<p>Authors performed an exploration of clinicians' perceptions of wearable technology, and the clinicians were provided with a demonstration of a prototype system for exercise biofeedback after TKR, and their perceptions of its potential use in the clinical setting were evaluated. Results showed that a prototype system for interactive exercise biofeedback consisting of a single wearable sensor and an Android application was perceived to potentially have a positive impact on the rehabilitation of patients following knee replacement surgery.</p> <p>The experiment itself is carried out with careful treatments, but I think the approach is quite common and also old, therefore not so much valuable information will be included in the draft.</p> <p>What is proposed looks like too much a summary of technical reports. This note too looks like an inventory during which some of the questions asked remain without answer, at least without argued answer. It reports on impression for biofeedback device and their evaluations of a routine nature, with findings which do not reach the significance nowadays expected from process related development of wearable devices.</p> <p>The report is probably useful from a user-centered development point of view, but it does not really extend our understanding of user impression for wearable or biofeedback device. In my view this manuscript is not suitable for publication in BMJ open and should be</p>
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	submitted elsewhere. This certainly does not imply anything negative regarding the work itself.
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VERSION 1 – AUTHOR RESPONSE

Reviewer 1

Thank you very much for your prompt and thorough review of our paper. We feel that your review has enabled us to construct a stronger paper, as well as provided a valuable learning experience. We have made attempts to address each of your points in your review which we have highlighted below.

Reviewer 1, Comment 1

I had to read the objectives in the introductions a few times in order to understand them. It is good that they are presented as two separates, I think the sentence here should be rephrased or shortened. The presentation of the research objectives in the introduction should be the same as in the introduction, here the text needs to be focused

Thank you for your comment, the paragraph commencing on line 129 has been revised to improve the clarity in description of the objectives.

Reviewer 1, Comment 2

Challenges perceived by the participants should be included in the conclusions. The abstract lacks "background" section.

Thank you for your comment, we have revised the abstract to improve readability and to ensure that the challenges are discussed in the results and conclusions. The abstract structure is a requirement of the journal, hence there is no 'background' section.

Reviewer 1, Comment 3:

Combination of different types of data could enrich the study (data now consists of individual interviews with clinicians in a one-hour session).

Also, I think that the interview guide could be revised in order to make the questions more neutral (especially the section about perceived impact could also include questions about potential risks and potential inconvenience that the participants see).

My main concern about this manuscript is the qualitative analysis of the interview data (see my answer to question 4 below).

Thank you for your comment, please see our response to comment 4. Whilst a mixed-methods study would have been preferable, the use of questionnaire data such as the uMARS or System Usability Scale would have been unsuitable as the system has been designed for the patient to be the end-user. However, the insight of clinicians is valuable, hence why this study was conducted based solely on interview data.

Reviewer 1, Comment 4:

My main concern about the manuscript is that the qualitative analysis of the interview data is not carried out in accordance with the Grounded Theory Approach as stated in the methods section: The analysis should be performed in a much more inductive way and not use the themes from the interview guide as themes in the analysis. I also lack a description of how the sub-themes relate to each other. A table or figure showing this would improve the presentation of the results significantly.

Thank you for your comments regarding the data analysis of this study, as this has highlighted a very pertinent point to address. On review of our submission and in light of your review we feel that the interview topic guide submitted may be a source of confusion regarding how the analysis was conducted.

In an attempt to improve the readability of the topic guide, the themes that emerged from thematic analysis were retrospectively added to the topic guide. In hindsight, we realise this may portray that we had already defined these themes prior to developing the initial coding template which was used for early thematic analysis. Furthermore, this would also suggest that we did not iterate the coding template as further themes and sub-themes emerged. In both instances we understand how this would contradict the inductive nature of the grounded theory approach.

In order to improve the clarity of the methods used, we have removed the themes and instead added examples of the follow up questions posed. We have also revised the coding template by offering descriptions of each subtheme as we feel this clarifies how they are related. We have also added a clarifying sentence regarding the data analysis on lines 196-197.

Reviewer 1, Comment 8

Ref 5 is valid for older adults. Other refs also for younger patients?

Ref 13: No year given in reference list.

Ref 16: The reference needs to be cited correctly: It is now used in a sentence stating that there are few studies with clinicians. However, [16] seems to be an example of a study with clinicians. Either, find a review article stating that there are few studies made with clinicians and cite [16] as an example of a study with clinicians.

Thank you for your comments regarding the references, we feel that reference 5 is most appropriate given the population that the exemplar system has been designed for. The median age of total knee replacement in the UK is 69 (IQR 63-76) [National Joint Registry 2017 Report, p112]. We have updated the year in ref 13 – thank you for highlighting. We have revised the manuscript on line 125 and have removed the reference to 16 to a later part of the paper.

Reviewer 1, Comment 11

The results contain perceived challenges that are not presented in the discussion parts “principal findings from demonstrating the prototype” and “conclusions”. In both parts, challenges perceived by the participants should be included. In my opinion, the discussion section could be further developed, for example: Can the results from this study be related to studies (for example other studies on technology-based rehabilitation interventions?) Can the results from this study be related to relevant theory (for example regarding motivation, technology use)?

Thank you for your comment, we have made substantial revisions to the discussion in order to better place the findings in the literature, and link to relevant theory. The challenges reported in the findings have also been presented in the principal findings section and as part of the conclusion.

Reviewer 1, Comment 12:

Comment: Partly. I think the following limitations should be discussed: Only interview data (what could other types of data contribute with), the interview guide (was it balanced in relation to the research objectives), only clinicians interviewed (why not also patients?). Nothing is said about the analysis (see my comments on question 4)

Thank you for your comment, along with the revisions made in answer to comment 4, we have highlighted that the lack of patient involvement is a limitation, and that the results are based solely on interview data.

Reviewer 1, Comment 15:

It is generally acceptable. I think the abstract should be revised and some prepositions added.

Thank you for your comment, we have revised the abstract to improve readability and to ensure that the challenges are discussed in the results and conclusions.

Reviewer 2

The experiment itself is carried out with careful treatments, but I think the approach is quite common and also old, therefore not so much valuable information will be included in the draft.

What is proposed looks like too much a summary of technical reports. This note too looks like an inventory during which some of the questions asked remain without answer, at least without argued answer. It reports on impression for biofeedback device and their evaluations of a routine nature, with findings which do not reach the significance nowadays expected from process related development of wearable devices.

The report is probably useful from a user-centered development point of view, but it does not really extend our understanding of user impression for wearable or biofeedback device. In my view this manuscript is not suitable for publication in BMJ open and should be submitted elsewhere. This certainly does not imply anything negative regarding the work itself.

Thank you for your review. As stated in the manuscript, there is a lack of literature relating to user-evaluation and input into the user-centred design process for wearable systems in the rehabilitation sector, particularly from healthcare professionals. We appreciate that whilst these results may not be from a longitudinal study and be statistically significant with objective data, we feel the process undertaken is an important one, particularly in terms of determining clinical validation in the development of such systems. To that end we feel the paper adds to the evidence base to support the clinician view that there is a need for these platforms, and that they can be both meaningful and useful. We feel we have employed the most appropriate methodology based on the research objectives, and with revisions to the discussion, have attempted to ensure that those objectives have been answered.