Peer review report The feasibility of virtual reality therapy for upper extremity mobilization during and after ICU admission

Peer review report overview

ABSTRACT

I hope you are well. I am writing to thank you for the opportunity to peer-review your manuscript: 'the feasibility of virtual reality therapy for upper extremity mobilisation during and after ICU admission.' it was an honour to be able to review your manuscript, which presents an innovative and timely intervention for ICU rehabilitation.
I am very impressed with your thorough efforts to solve the impor- tant problem of ICU-acquired weakness and its related challenges, particularly, the patients' motivation and adherence to early mobilisation. You also creatively intend to use the innovative VR therapy as the method to help patients better engage in the rehab programme, which makes your study the first one that combines the promising VR technology with the classic rehab practice.Keywords

Your study demonstrated that the therapeutic approach was viable and potentially successful, and it could be used in a setting where, at times, anxiety and physical inability to move might prevent patients from truly participating. Your participatory approach, with experts in ICU care, ICU patients, and their family members, is an important addition. The result is a VR game engaging and then possibly therapeutic for ICU patients, so practitioners should approach this approach with optimism.

And your results of remarkable improvements in mobility and balance, as well as a high degree of patient satisfaction, seem to be pointing in the direction of a useful adjunct to standard physical therapy, and to a more engaging and perhaps more effective rehabilitation option for ICU survivors. As the field of critical care continues to make improvements in patient outcomes, the quality of life of patients after an ICU admission will become more of a priority; this represents an important step in that direction.

The fact that your study is the first in the field to systematically use VR in such a compelling way is a major strength, of course; so is the attention you pay to developing and characterising your VR intervention, and to describing it in warm, almost humorous detail, which will be especially helpful to anyone seeking advice about how to replicate or expand your work in the future.

Please keep this important work going. I encourage you to explore larger sample sizes and design it to include control groups, which may help to confirm your findings and assess long-term effects of VR therapy. Finally, i encourage you to explore the application to other ICU contexts and diverse patient populations, which could reveal deeper insights and increase broad applicability.

Your work to help improve patient outcomes through new innovation is truly inspiring and i am sure will encourage further research and development in this area and will eventually lead to new and effective rehabilitation strategies for ICU patients.

Thanks again for giving me the chance to read your manuscript. I look forward to seeing your important work impact ICU rehabilitation.

OBJECTIVES AND RATIONALE

Clarity of objectives and rationale:

It tested whether VR therapy via a head-worn VR device would be feasible and effective when implemented during ICU and on the general ward following ICU (lines 23-39, p1). This is motivated by the notion that early mobilisation reduces long-term post-icu muscle weakness, but barriers of anxiety and motivation limit adherence to programmes (lines 24-28, p1).

SUGGESTIONS FOR IMPROVEMENT:

Clearly outline how it fills a knowledge gap that is not covered by the other studies (lines 68-74, page 1).

Express the hypotheses, referencing them by number, state how they relate to the predicted outcomes (70-74, page 1).

Further context on the differences between VR e and traditional early mobilisation (lines 61-66, page 1) 61 due to all of the changes that occur to the body during an extended period of bed rest, the challenge of restoring physical function increases substantially.

Replicability and reproducibility

Detailing of methodology:

Moreover, authors described in enough detail that the study could be replicated (patients' recruitment strategy, description of the VR -therapy protocol, data-collection procedures) (lines 77-140, pages 2-4).

SUGGESTIONS FOR IMPROVEMENT:

Add some more details to the participatory design sessions for the VR -game (lines 99-109, page 2).

Elaborate on the training provided to researchers administering the VR -therapy (lines 114-120, page 2).

Make sure that the protocol for managing adverse events is clearly written up (lines 127-130, page 3).

Statistical analyses

Appropriateness of statistical methods:

The analytical decisions (eg, the wilcoxon signed-rank tests) are sound and relevant for the data which are reported (lines 140-143; page 4).

SUGGESTIONS FOR IMPROVEMENT:

Give reasons for using the specified statistical tests, especially when dealing with small numbers of observations (lines 140-43, page 4).

Discuss potential biases and how they were mitigated (lines 144-172, pages 4-5).

Figures and tables

Completeness and quality of figures/tables:

Would say that overall, the tables and figures are well-designed and clearly explained

SUGGESTIONS FOR IMPROVEMENT:

Ensure numbered sequentially and it is clear which is figure 1, 3 and so on. Legends are needed for figures where it isn't immediately obvious what the image shows. (177-179 page 5)

Improve the clarity of tables by providing more detailed captions (lines 1-376, pages 5-8).

Interpretation of results

Support for conclusions:

The results are in line with what you present, lending support to the feasibility and even some efficacy of VR -therapy (lines 242–249, page 7).

SUGGESTIONS FOR IMPROVEMENT:

Further consider the potential shortcomings more extensively, such as the small sample size and lack of control group of the study (lines 234-240, page 7).

Suggest specific directions for future research based on the findings (lines 242-249, page 7).

Strengths of the study

Clear emphasis on strengths:

Therefore, the study demonstrates the feasibility of treatment via VR -therapy, with high patient satisfaction (181-190, p 5).

SUGGESTIONS FOR IMPROVEMENT:

Highlight the novelty of the approach of the study in relation to the existing literature (lines 225-231, page 6).

Highlight any unique methodologies or significant findings that stand out (lines 225-231, page 6).

Limitations

Clear statement of limitations:

Authors acknowledge the limitations of their trial – a small sample size and no control group (lines 234-240, page 7).

SUGGESTIONS FOR IMPROVEMENT:

Discuss how these limitations impact the generalizability of the findings (lines 234-240, page 7).

Suggest methodological improvements for future studies (lines 234-240, page 7).

Clear and unambiguous, professional english used throughout:

Writing is clear in professional english; generally up to the technical standards of correctness and professional expression for its field. Sentence structure and flow is uneven, although not irredeemably mangled. There are some awkward pauses, some run-on sentences, and a few instances where a word or cut appears to be missing. Perhaps final proofreading under a strict deadline led to some small oversights.

SUGGESTIONS FOR IMPROVEMENT:

Check the text for any minor mistakes such as typos and word choices that could make it more pleasant to read. A good option is to use a proof-reading service or someone who speaks english well and can provide help.

Literature references, sufficient field background/context provided:

The introduction and background sections do a good job placing this work in the context of the wider field of knowledge, and an adequate range of reference is made to prior literature relevant to the study.

SUGGESTIONS FOR IMPROVEMENT:

In your opening paragraphs, state clearly how your study will provide new information on a specific question. By telling readers how your study will fill a specific information gap in the existing literature, you can provide a rationale for your work, and make it clear what distinctive contribution your study will make.

Professional article structure, figures, tables, and raw data shared:

The body of the manuscript is well-structured and formed into common sections, figures and tables are present, properly named and described.

SUGGESTIONS FOR IMPROVEMENT:

Use the same labels throughout choose more descriptive captions for tables and figures.

Ensure all relevant raw data is shared appropriately in line with peerj's data sharing policy and that there is descriptive metadata to help future scientists interpret the data.

Self-contained with relevant results to hypotheses:

The submission is a freestanding content unit containing a cohesive body of work that records all the results relevant to the hypotheses; the findings are well-supported by the data; and the paper provides a clear narrative from objectives and methods in the beginning to results and conclusions towards the end.

To sum up, the manuscript in general, as well as its major parts, follows the usual standards of reporting, but needs some polishing for more precise language and presentation in order to improve its clarity and readability.

No further comments.

EXPERIMENTAL DESIGN

Original primary research within aims and scope of the journal:

The study falls squarely under the inclusion criteria and scope of the journal since it addresses whether a VR program is feasible and effective for mobilising the upper extremities during an ICU stay.

SUGGESTIONS FOR IMPROVEMENT:

Clearly describe the novel contribution of your work to published literature, highlighting how your research design will address literature gaps and shortcomings, such as identifying the reason for low patient adherence to early mobilisation protocols.

Research question well defined, relevant & meaningful:

Which brings me to my second point: the research question is very clear, relevant and significant. And the hypothesis perfectly identifies the question. This was about the feasibility of adding VR to standard care, in the ICU setting.

Rigorous investigation performed to a high technical & ethical standard:

Approval for the study by a medical ethics committee of nWMO83 number: nWMO 20210056) was obtained; all patients gave written informed consent (pages 2-3, lines 77-93).

SUGGESTIONS FOR IMPROVEMENT:

Provide additional detail about the efforts that were made to minimise potential sources of bias. For example, you could provide details about specific plans to create an objective and fair accounting of findings (pages 4-5, lines 140-143).

METHODS DESCRIBED WITH SUFFICIENT DETAIL & INFORMATION TO REPLICATE:

The section on methods is detailed enough for another investigator to be able to replicate the study procedures, for example how patients were recruited, the vr-therapy protocol and how the data was collected (pages 2-4, lines 77-140).

SUGGESTIONS FOR IMPROVEMENT:

Give more details about the participatory design sessions used to develop the vr game, including who the stakeholders were and the process that took place to iteratively refine and adapt the game to make it appropriate for icu patients (page 2, lines 99-109).

Describe the training that researchers providing the vr-therapy underwent to ensure that they treated content the same way each time (p2, lines 114-120)

Describe the protocol for managing unexpected events in more depth so that your readers know that patient safety was a priority for you in the design of the study (page 3, lines 127-130).

Validity of the findings

Impact and novelty not assessed:

Although impact and originality are not major criteria for acceptance, your manuscript does lead to meaningful progress in the field. It is an important piece of work early on in exploring the use of vr therapy in the icu with a large body of evidence needed before claiming efficacy of this novel approach.

SUGGESTIONS FOR IMPROVEMENT:

Explain how it makes sense to replicate this study in light of the literature. Consider how replication studies using your methodology could be seen as a confirmation of your results and an extension of your findings, making a contribution to the field.

All underlying data provided, statistically sound, and controlled:

All relevant information for evaluating the manuscript is present, the statistical analyses are presented appropriately, and the conclusions drawn from the data include prominent uncertainties. In the presence of well-controlled data, both authors agree that these results would be publishable.

CONCLUSIONS WELL STATED, LINKED TO ORIGINAL RESEARCH QUESTION, AND LIMITED TO SUPPORTING RESULTS:

Conclusions are clearly stated, and thoughtfully restricted to the experimental research question, findings were clearly presented and correlated with higher than expected hand mobility.

SUGGESTIONS FOR IMPROVEMENT:

Provide more detailed discussion of the limitations and how they might limit the generalisability of the findings, e.g., the small sample, the lack of control group.this helps readers understand the scope and ideas might apply to similar problems.

In conclusion, your findings are shown to have good internal validity supported by the data and methods described, with a few options for minor improvement in the discussion of limitations and potential confounding.

Thanks again for giving me the chance to read your manuscript. I look forward to seeing your important work impact ICU rehabilitation.

Yours truly,
Serving peer reviewer