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Motivational influence of virtual reality in physical therapy for children with cerebral palsy: a systematic review protocol

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ABSTRACT

Introduction Emulating the vast inclusion of advanced technology in everyday practice, the medical world is no exception to its implementation, in particular, virtual reality (VR). Initially, its introduction as a therapy was accompanied by high aspirations and expectations for its growth and potential. Motivation is said to be the most associated benefit; although it is imperative to note that there exists a paucity of research that specifically quantifies its tangible impact on cerebral palsy (CP). There has yet to be a systematic review of the instruments used to precisely measure motivation and examine its association with the benefits of VR for children with cerebral palsy.

Methods and analysis This review will evaluate comparative studies that used VR therapy as part of interventions for children with CP. Qualitative studies, single-case studies, systematic reviews, literature reviews and guideline audits will be excluded. This review will be conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA-P) guidelines. The methodological protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO). The following electronic databases will be used to access related studies published between January 2012 and December 2023: MEDLINE (via EBSCOhost), Web of Science, Scopus, PubMed and Cochrane. The Peer Review of Electronic Search Strategies checklist will be employed to develop database search strategies.

Ethics and dissemination This review does not require ethical approval as it uses secondary data. The findings will be published in a scientific journal. We intend to contribute to the expansion of knowledge concerning the motivational implications of VR on children with CP.

PROSPERO registration number International Prospective Register of Systematic Reviews (identification number CRD42023401079).

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This review prioritises measuring tools that capture the motivation of cerebral palsy children undergoing virtual reality therapy.
⇒ This review will provide an evidence-based guideline for healthcare providers to select appropriate tools to measure and monitor motivation in therapeutic and clinical settings.
⇒ There is a risk of bias due to the inclusion of studies published in English language only, with valuable studies written in other languages not considered in this review.

INTRODUCTION

Cerebral palsy (CP) is an umbrella term for permanent and unprogressive interference, lesion or abnormality of the developing immature brain causing disorders of movement and/or posture and motor function. In addition, the illness may be accompanied by impairment of sensation, cognition, perception, communication and/or behaviour epilepsy, as well as secondary musculoskeletal disorders.[1–4] The physical impairment faced by individuals with CP often necessitates regular attendance at physical therapy sessions, which are typically ongoing or lifelong. This is because, unless they are intrusive, the present therapies for CP mostly are aimed at sustaining current conditions or preventing the deterioration of their condition.[5 6]

Prolonged rehabilitation that consists of monotonous, repetitive activities may induce boredom, resulting in a lack of motivation among the patients.[7 8] This pushes practitioners to find alternatives to retain patients' interest in rehabilitation and encourage them to continue activities independently.[9] This is where practitioners encounter virtual reality (VR) as a means of therapy for CP. The potential of VR to provide a partial solution for CP patients' lack of motivation to participate and continue with therapy leads to an increase in its research.

Motivation is the psychological stimulus that directs and maintains goal-oriented behaviour.[10] It is the force that compels individuals to perform or exhibit a specific behaviour in order to achieve a desired

outcome, earn a reward or avoid an undesirable consequence or punishment. Motivation is influenced by a complex interplay of personal, social and environmental factors, such as beliefs, values, expectations, goals and incentives.[11] It is a key determinant of individual performance and achievement in a variety of contexts, including work and education, to sports and leisure activities.[12] Motivation is an essential component of physical rehabilitation because it has a significant impact on a person's ability to recover and achieve rehabilitation goals.[13 14] Physical rehabilitation can be a lengthy and challenging process that requires perseverance, tolerance and diligence. Without motivation, a person may struggle to adhere to their rehabilitation programme, lose focus and become discouraged, which can impede their progress and potentially lead to a delayed or incomplete recovery.[13]

Motivation can be classified into two types: intrinsic motivation and extrinsic motivation .[15] Intrinsic motivation is the action taken due to it being inherently interesting or enjoyable, whereas extrinsic motivation is the pursuit of a distinct outcome.[16 17] As one begins to engage in a game, whether it is an immersive game or a non-immersive game, the desire to accomplish specific levels and the ability to complete the game may come instinctively. This naturally occurring desire is an example of intrinsic motivation. If the activities were made into a competition with rewards granted for certain achievements, the desire to obtain the reward, which leads to involvement in the game, is considered an extrinsic motivation.[18]

The encroachment of technology is no longer a matter of debate, and its pervasiveness in people's everyday lives is no longer strange. VR, in particular, is a simulation of a real or imagined environment that can be experienced visually in the three dimensions of width, height and depth and that may additionally provide an interactive visual experience in full real-time motion with sound and possibly with tactile and other forms of feedback.[19 20] Since the implementation of VR as a form of therapy was made known to the medical world,[21] researchers have been continuously exploring the 'what' and 'how' of its application, delving deeper into the benefits and drawbacks of the technology as well as the consequences of its usage.[22]

The utilisation of VR as a form of therapy for children with CP was presumed to stimulate intrinsic motivation for therapy engagement. Thus, this review is intended to comprehensively evaluate the existing literature that uses measuring tools to quantify the motivational impact of VR for children with CP.

METHODS AND ANALYSIS

Protocol and registration

A systematic review will be performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.[23] The methodological protocol for this systematic review was registered in the PROSPERO International Prospective Register of Systematic Reviews (ID: CRD42023401079). Empirical studies investigating the effectiveness of virtual reality therapy among children with CP in comparison to those of a control group that received conventional therapy will be identified.

Eligibility criteria

Inclusion criteria

Types of studies that will be included are original studies that involve VR exposure as part of CP intervention. Studies with comparator(s) of the VR therapy (ie, in the form of a clinical control group or a comparison of measuring variables pre- and post-VR intervention) will also be included. For the publication criteria, studies and literature in English language in the form of an empirical study, published in the years between January 2012 and December 2023. The type of participants in the studies that will be included are children who are clinically diagnosed with CP.

Exclusion criteria

Qualitative research, single-case studies, systematic reviews, literature reviews and guideline audits will also be excluded.

Patient and public involvement

No patient or public will be involved.

Information sources

Literature search will target relevant articles published between January 2012 and December 2023 as recent studies may better reflect the current patient population, interventions and healthcare settings, which can improve the generalisability of the findings to current practice.[24] Extraction of studies will be performed via the following electronic databases: MEDLINE (via EBSCOhost), Web of Science, Scopus, PubMed and Cochrane. Grey literature will be obtained from Google Scholar. Thesaurus terms specified for databases will be followed and the Peer Review of Electronic Search Strategies checklist will be used in forming the search strategies for databases. Only literature in English language will be included since reviewers and researchers may not have proficiency in all languages, which can make it challenging to assess the content of non-English articles accurately.[25 26]

Search

An example of the search keyword strategy is as follows:

Virtual reality = ("virtual realit*"[MeSH Major Topic] OR "Virtual Reality"[Title/Abstract] OR "VR"[Title/Abstract] OR "virtual rehab*"[Title/Abstract] OR "virtual environment*"[Title/Abstract] OR "VE"[Title/Abstract] OR "artificial environment*"[Title/Abstract] OR "simulat*"[Title/Abstract] OR "game*"[Title/Abstract])

Physiotherapy = ("physio*"[Title/Abstract] OR "Physical therap*"[Title/Abstract] OR "rehab*"[Title/Abstract] OR "exercis*"[Title/Abstract])

Children = ("child*"[Title/Abstract] OR "adolescen*"[Title/Abstract] OR "Teen*"[Title/Abstract] OR

"pubescent"[Title/Abstract] OR "youth"[Title/Abstract] OR "young adult*"[Title/Abstract] OR "emerging adult*"[Title/Abstract])

Cerebral palsy = ("cerebral palsy"[MeSH Major Topic] OR "CP"[Title/Abstract])

Motivation = ("motivation*"[Title/Abstract] OR "encourag*"[Title/Abstract] OR "adhere*"[Title/Abstract] OR "complian*"[Title/Abstract] OR "will*"[Title/Abstract])

The combination for search will be: (Virtual reality) AND (Physiotherapy) AND (Children) AND (Cerebral palsy) AND (Motivation).

Study selection

Each title and abstract of all references collected through the search strategy will be screened by two reviewers to identify studies that meet the inclusion criteria. Following that, parallel independent assessments of the full-text manuscripts will be done for eligibility. Referrals to a third reviewer will be made in order to address disagreements that may arise during full-text screening. Data from studies that meet all the eligibility criteria will be recorded and analysed in an Excel spreadsheet.

Risk of bias

The two reviewers will independently assess the included literature for bias using the Joanna Briggs Institute Critical Appraisal tools (JBI)[27] as a guide. The judgement of bias will be based on nine domains; bias related to temporal precedence, confounding factors, administration of intervention/exposure, selection and allocation, participant retention, assessment, detection and measurement of the outcome, and finally statistical conclusion validity. Disagreements will be discussed and resolved with a third party.

Data items

Main data that will be extracted from each study includes: author, year/country, study design, title, sample size, participants' age and characteristics, intervention content and duration and outcome measures.

Primary outcome

This study will focus on CP children's motivation in response to participating in VR therapy as its primary outcome. Any suitable motivational evaluation tools will be considered, whether they are self or parent/proxy-reported motivation, as assessed by a standardised, single or multi-item motivation questionnaire (ie, individuals assessed on their willingness or unwillingness to participate, enjoyment and interest in intervention) or any specific measurable method of evaluating motivation.

Synthesis of results

Narrative synthesis will be used for the analysis of results. Treatment duration, age of participants, type of treatments provided, blindness of the study and outcome measure used are among the variables to be reported. In addition, this review will compare the instruments used for assessing motivation to establish the most relevant outcome measures.

DISCUSSION AND CONCLUSION

The purpose of this systematic review protocol is to evaluate and compile the body of research on motivational factors for children with CP receiving VR therapy. This analysis fills a significant knowledge gap regarding the appropriate integration of VR into therapy procedures for children with cerebral palsy by concentrating on methods that assess motivation.

VR may potentially be a powerful tool to heighten motivation and promote engagement in rehabilitation therapy. Immersive and interactive VR provide engaging and interesting activities, resulting in a greater sense of control and autonomy.[28 29] This, in turn, leads to improved performance, increased engagement and greater satisfaction, which are the preconditions for the motivational aspect of VR.[30 31]

It has been demonstrated that VR therapy for CP improves motor skills,[32 33] as well as balance and coordination,[34–36] thereby facilitating the improvement of patients' walking abilities.[37 38] In addition, studies have shown that cognitive abilities such as spatial awareness, visuomotor construction and thinking abilities improve in children with CP receiving VR therapy.[39]

Motivation being one of the fundamental causes for the implementation of virtual reality-based therapies calls for the usage of effective measuring instruments to quantify its value. Understanding the correlation between the two factors is important for developing effective guidelines and plans for implementing VR for the CP population.[40] The reviews' focus on finding useful motivational strategies has the potential to greatly improve the standard of care given to children with cerebral palsy. Understanding how VR can affect motivation, a critical component of rehabilitation outcomes may result in more specialised and potent therapeutic strategies. Additionally, this study findings can help healthcare providers choose the best instruments to assess and monitor motivation, which will eventually improve patient outcomes and engagement, by offering evidence-based suggestions.

This systematic review will contribute to the growing body of knowledge on the use of VR therapy for children with CP by identifying and evaluating the tools used to measure motivation. The results will provide medical practitioners with empirically supported suggestions for the selection of suitable motivational evaluation instruments, an essential step in optimising rehabilitation outcomes. Despite its potential shortcomings, this evaluation has the power to influence future studies and clinical procedures, facilitating the successful incorporation of VR into therapeutic environments for children with CP.

ETHICS AND DISSEMINATION

Formal ethical approval is not required as primary data will not be collected in this study. The findings of this study will be disseminated through peer-reviewed journals and presented at conferences and scientific meetings.

Contributors HAMI and AZ contributed to the conception of the study. The manuscript protocol was drafted by HAMI and was revised by AZ and NAMN. The search strategy was developed by HAMI and will be performed by HAMI and AZ, who will also independently screen the potential studies, extract data from included studies, assess the risk of bias and complete the data synthesis. NAMN will arbitrate the disagreements and ensure that no errors are introduced during the study. All authors approved the publication of the protocol. The guarantor of the study is AZ.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

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