Assessment of Postural Control and Proprioception Using the Delos Postural Proprioceptive System

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ABSTRACT

Background. Proper postural control and proprioception are essential for maintaining balance, preventing falls, and performing daily activities. Traditional methods of assessing postural control and proprioceptive function often lack objectivity and precision. The DPPS offers a promising solution by providing a quantitative and comprehensive evaluation of postural stability and proprioceptive performance.

Methods. The DPPS utilises advanced sensor technology and computerised analysis to measure various parameters related to postural control, including stability indexes, weight distribution, sway patterns, and proprioceptive responses. It incorporates both static and dynamic tests, allowing for a comprehensive assessment of postural control in different conditions.

Results. Numerous studies have demonstrated the effectiveness of the DPPS in evaluating postural control and proprioception in various populations, such as athletes, older adults, individuals with balance disorders, and patients undergoing rehabilitation. The DPPS has shown good reliability and validity, with its measurements correlating well with other established assessment tools. It has also proven to be sensitive in detecting changes in postural control and proprioceptive function over time.

Conclusions. The DPPS represents a valuable tool for objective assessment and monitoring of postural control and proprioceptive function. Its ability to provide quantitative data in a reliable and sensitive manner makes it an attractive option for researchers, clinicians, and rehabilitation professionals. By enhancing our understanding of postural control and proprioception, the DPPS can contribute to the development of targeted interventions and personalised treatment strategies aimed at improving balance, preventing falls, and optimising functional performance.

Keywords: Delos Postural Proprioceptive System, Postural control, Proprioception, Assessment, Balance.

INTRODUCTION

The Delos Postural Proprioceptive System (DPPS) is a sophisticated instrumental device that has gained attention in the field of postural control and proprioception assessment. Designed to evaluate balance and body stability, the DPPS provides objective measurements that enable a comprehensive understanding of

an individual's postural control capabilities (Riva et al., 2016). Postural control, the ability to maintain a stable body position during various activities, is crucial for everyday movements, such as walking, standing, and reaching. It relies on the integration of sensory information from the visual, vestibular, and somatosensory systems, which allows for accurate motor responses to maintain equilibrium (Riva et al., 2013, 2019) improvement of stance stability could play an important role in fall prevention. This study aimed to determine whether high-frequency proprioceptive training (HPT. Proprioception, on the other hand, refers to the sense of body position and movement in space, primarily relying on feedback from muscles, tendons, and joints. Accurate assessment of postural control and proprioception is essential for understanding functional limitations, identifying deficits, and designing appropriate rehabilitation strategies. Traditional assessment methods, such as subjective questionnaires and observational tests, lack objectivity and may not capture subtle changes or variations in performance.

The introduction of advanced technologies, such as the DPPS, has provided researchers and clinicians with a valuable tool for quantifying and analysing postural control and proprioceptive function (*DELOS INTERNATIONAL – Leader in Proprioception*, n.d.). The DPPS consists of various components, including a flat table, an electronic unstable proprioceptive board, a Delos Vertical Controller, a monitor, and a horizontal bar fitted with an infra-red sensor for hand support. This comprehensive setup allows for the evaluation of both static and dynamic postural control, as well as proprioceptive function, under different conditions, such as eyes open or closed. By utilising the DPPS, researchers and clinicians can gather objective data on postural stability, sway patterns, weight distribution, and proprioceptive accuracy. These measurements offer valuable insights into an individual's balance capabilities, identify specific impairments, and monitor progress over time. Furthermore, the DPPS provides a standardised and reliable assessment tool, allowing for comparisons between individuals and different populations (Benedetti et al., 2019; De Carli et al., 2010; Mosca et al., 2020; Riva et al., 2013, 2016, 2019)the development of proprioception may play an important role in injury prevention. This investigation considered a professional basketball team for 6 years, integrating systematic proprioceptive activity in the training routine. The purpose was to assess the effectiveness of proprioceptive training programs based on quantifiable instability, to reduce ankle sprains, knee sprains, and low back pain through developing refined and long-lasting proprioceptive control. Fifty-five subjects were studied. In the first biennium (2004-2006).

The Delos Postural Proprioceptive System (DPPS) is a sophisticated instrumental device that offers a comprehensive assessment of postural control and proprioception. Its objective measurements and detailed analysis provide valuable

information for researchers, clinicians, and rehabilitation specialists, aiding in the understanding, diagnosis, and treatment of balance-related conditions. The DPPS represents a significant advancement in the field of postural control assessment and contributes to improving patient outcomes and optimising rehabilitation strategies.

This study aims to assess how well the Delos Postural Proprioceptive System (DPPS) can measure postural control and proprioception in different groups, including healthy individuals and those with balance issues. We want to find out if the DPPS is a reliable and effective tool for accurately evaluating these aspects of balance in various people.

METHODS

The present scoping review was conducted following the JBI methodology (*Peters: Joanna Briggs Institute Reviewer's Manual, JBI - Google Scholar*, n.d.) for scoping reviews. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (Tricco et al., 2018) Checklist for reporting was used.

Research team. To support robust and clinically relevant results, the research team included authors with expertise in evidence synthesis, quantitative and qualitative research methodology, sport and musculoskeletal rehabilitation.

Review question. The following research question is formulated: What is the impact of Delos Postural Proprioceptive System on postural control and proprioception in individuals with balance impairments?

Eligibility criteria. Studies were eligible for inclusion if they met the following criteria:

1. Population: Individuals with balance impairments or related conditions.
2. Concept: Studies investigating the effects of the Delos Postural Proprioceptive System on postural control and proprioception.
3. Context: Research conducted in various settings, including clinical settings, rehabilitation centres, or community-based environments.

Exclusion criteria. Studies that did not meet the specific PCC criteria were excluded.

Search strategy. An initial limited search of MEDLINE was performed through the PubMed interface to identify articles on the topic and then the index terms used to describe the articles were used to develop a comprehensive search strategy for MEDLINE. The search strategy, which included all identified keywords and index terms, was adapted for use in Cochrane Central, Scopus, PEDro. In addition, grey literature (e.g. Google Scholar, direct contacts with experts in the field) and refe-

rence lists of all relevant studies were also searched. Searches were conducted on 23 May 2023 with no date limitation.

Study selection. After completing the search strategy, the search results were collected and imported into EndNote V.X9 (Clarivate Analytics). To ensure the accuracy of the dataset, duplicates were removed using the EndNote deduplicator, resulting in a file containing a unique set of records. This file was then made available to the reviewers for further processing. The selection process involved two levels of screening using the Rayyan QCRI online software. In the first level, titled "title and abstract screening", two authors independently reviewed the articles based on their titles and abstracts. Any conflicts or discrepancies between the reviewers' decisions were resolved by a third author. The goal of this level was to assess the relevance of each article to the research question based on the provided information. The second level of screening, known as "full-text selection", also involved two authors independently reviewing the full texts of the selected articles. The purpose of this level was to assess the eligibility of each article based on its complete content. Again, any conflicts or disagreements between the reviewers were resolved through discussion and, if necessary, consultation with a third author. Throughout the selection process, detailed records were maintained, documenting the reasons for excluding articles that did not meet the inclusion criteria. This documentation followed the latest published version of the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA 2020) flow diagram. The PRISMA flow diagram visually represents the screening process, indicating the number of articles identified, screened, assessed for eligibility, and included in the final analysis. By adhering to these rigorous selection procedures and reporting guidelines, transparency and reliability were ensured in the article selection process, enabling a comprehensive and systematic approach to be taken in the scoping review.

Data extraction and data synthesis. Data extraction was conducted using a pre-designed data extraction form, specifically developed for this scoping review. The form was created based on the JBI (Joanna Briggs Institute) data extraction tool, tailored to capture key information from the selected articles. The extracted data included the following details: authors, country of publication, year of publication, study design, patient characteristics, pertinent findings or outcomes, type of intervention, related procedures, and any relevant additional information. Descriptive analyses were performed on the extracted data to summarise the characteristics of the included studies. The results were presented in a numerical format, using frequencies and percentages to report the studies identified and included in the scoping review. This approach allowed for a concise representation of the distribution and composition of the included studies. The description of the search

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