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

decision process, including the number of articles identified, screened, assessed for eligibility, and ultimately included in the review, was systematically mapped. This mapping process provides transparency and clarity in documenting the selection process, allowing for a comprehensive understanding of the article selection flow. Importantly, the extracted data were summarised in tabular form, presenting the main characteristics of the included studies. These summary tables provide a structured overview of the key information extracted from each study, facilitating comparison and analysis of the findings across the included articles. Overall, the presentation of the extracted data in this scoping review primarily relies on concise and informative summary tables, providing a clear and organised representation of the main characteristics and results of the included studies.

RESULTS

As presented in the PRISMA 2020-flow diagram (Figure 1), from 53 records identified by the initial literature searches, 43 were excluded and 10 articles were included (Table 1).
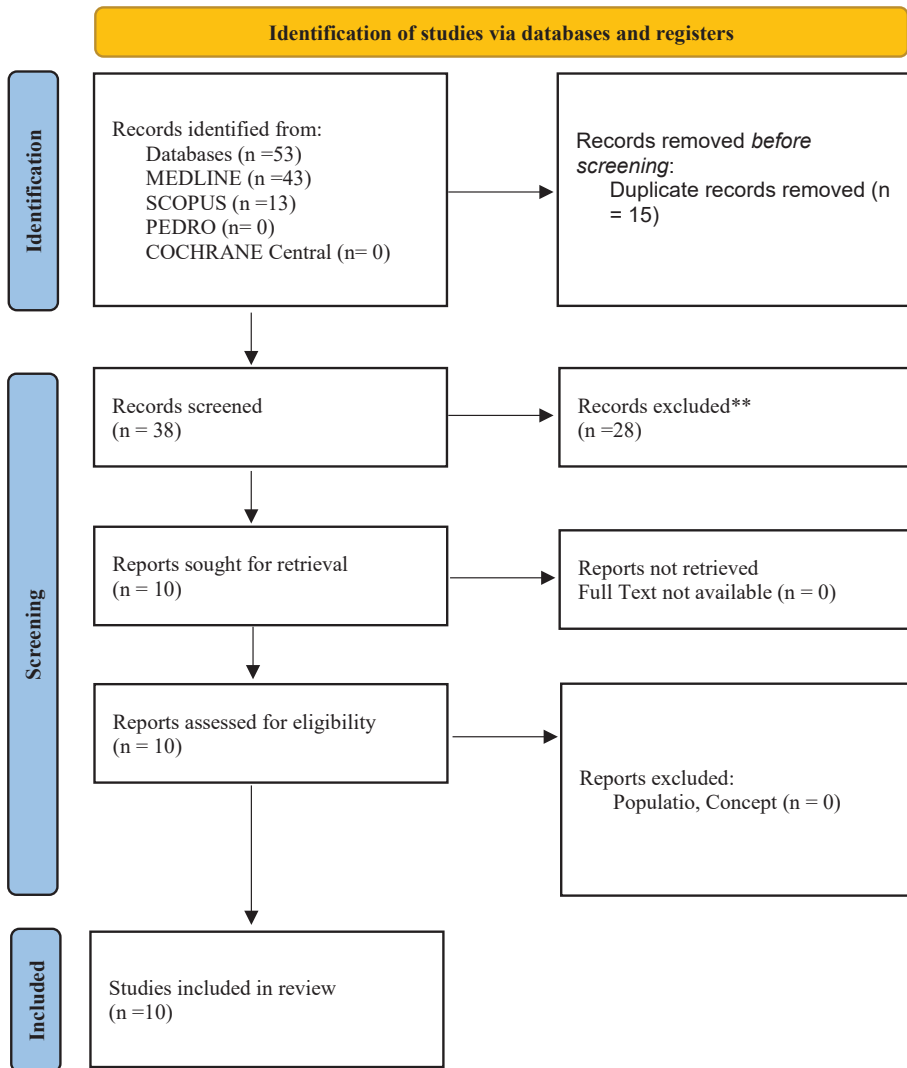
Identification of studies via databases and registers

Identification

Records identified from:
 Databases (n =53)
 MEDLINE (n =43)
 SCOPUS (n =13)
 PEDRO (n= 0)
 COCHRANE Central (n= 0)

Records removed *before screening*:
 Duplicate records removed (n = 15)

Screening

Records screened
(n = 38)

Records excluded**
(n =28)

Reports sought for retrieval
(n = 10)

Reports not retrieved
Full Text not available (n = 0)

Reports assessed for eligibility
(n = 10)

Reports excluded:
 Populatio, Concept (n = 0)

Included

Studies included in review
(n =10)

Fig.1 **Preferred reporting items for systematic reviews and meta-analyses 2020 (PRISMA) flow-diagram**

Table 1. **Types of interventions.**

N°	Author	Title	Description
1	(Piontek et al., 2009)	Postural control strategy in patients with anterior cruciate ligament deficiency	Population: 46 patients (6 females and 40 males) with clinically and/or radiologically diagnosed anterior cruciate ligament (ACL) injury. Methods: Clinical evaluation using the Lysholm knee scale and subjective knee evaluation form IKDC 2000. Measurement of anterior knee laxity using the Aircast Rolimeter during tests. Assessment of visual proprioceptive control with dynamic and static Riva tests in monopodal stance using the DELOS Postural Proprioceptive System. Results: The postural control strategy in both dynamic and static Riva tests does not differentiate between the ACL deficient leg and the mechanically stable leg. Knee joint extension (hyperextension) may help maintain functional knee joint stability.
2	(De Carli et al., 2010)3 females	Postural control and risk of falling in bipodalic and monopodalic stabilometric tests of healthy subjects before, after visuo-proprioceptive vestibulo-postural rehabilitation and at 3 months thereafter: role of the proprioceptive system	Population: 9 healthy volunteers (6 males, 3 females) with a mean age of 34.5 years. Methods: Evaluation with bipodal and monopodal stabilometric tests before treatment, immediately after treatment, and 3 months later. The Delos Postural Proprioceptive System® (DPPS) was used for the tests. Results: The bipodal test showed no postural deficits before or after rehabilitation. The monopodal test with closed eyes indicated a potential risk of falling in 2/3 of the participants before treatment. After visuo-proprioceptive vestibulo-postural rehabilitation, there was a significant reduction in the risk of falling during the monopodal test with closed eyes. Three months after rehabilitation, results were similar to the pre-treatment stage.

N°	Author	Title	Description
3	(Riva et al., 2013) falls in older people represent a rising problem. As effective prevention should start before the risk becomes evident, an early predictor is needed. Single stance instability would appear as a major risk factor. The aims of the study were to describe single stance stability, its sensory components, and their correlation with age and gender. A random sample of 597 older adults (319 men, 278 women	Single stance stability and proprioceptive control in older adults living at home: gender and age differences	Population: 597 older adults (319 men, 278 women) aged 65-84 living at home. Methods: Stability tests using an electronic postural station. Results: Older individuals (aged 75-84) showed a decline in single stance stability, attributed to impaired proprioceptive control, decreased compensatory visual stabilisation, and reduced emergency responses. Younger subjects (aged 65-74) exhibited better but still inadequate proprioceptive control. Women were significantly less stable than men.
4	(Riva et al., 2016)	Proprioceptive Training and Injury Prevention in a Professional Men's Basketball Team: A Six-Year Prospective Study	Population: 55 subjects from a professional basketball team. Methods: Integration of systematic proprioceptive activities over a 6-year period. Different training approaches were used in three bienniums. Injury rates and proprioceptive control were analysed. Results: Significant reductions in ankle sprains and low back pain were observed. Proprioceptive control improved significantly in single limb stance.

N°	Author	Title	Description
5	Riva D et al.	Effects of High-Frequency Proprioceptive Training on Single Stance Stability in Older Adults: Implications for Fall Prevention	Population: 61 subjects (30 men, 31 women) aged 65-85 years. Methods: Subjects were assigned to three intervention groups: High-frequency proprioceptive training (HPT), treadmill, and no intervention. Stability tests and HPT sessions were conducted using computerised postural stations. Results: HPT significantly improved single stance stability (SSS) and proprioceptive control. The treadmill and no intervention groups did not show significant changes.
6	(Jadczak, Grygorowicz, Wieczorek, et al., 2019)	Analysis of static balance performance and dynamic postural priority according to playing position in elite soccer players	Population: 101 elite professional soccer players divided by playing positions. Methods: Delos Postural System Test, static balance assessments, and dynamic postural priority tests. Results: Differences in postural control between playing positions were observed. Non-dominant legs showed greater differences compared to dominant legs.
7	(Jadczak, Grygorowicz, Dzudziński, et al., 2019)	Comparison of Static and Dynamic Balance at Different Levels of Sport Competition in Professional and Junior Elite Soccer Players	Population: 52 professional football players and 102 junior elite soccer players. Methods: Delos Postural Proprioceptive System used for measurement. Results: Significant effects in dynamic and static balance tests were observed, emphasising the importance of evaluating and monitoring balance for injury prevention and improved performance.

N°	Author	Title	Description
8	(Benedetti et al., 2019)long-term survivor patients often report frequent falls, and a sense of instability during gait, particularly on uneven terrain. This study aimed to assess the postural control, the proprioception, and the risk of fall in these patients, which have not been explored before. Eighteen long-term survivor patients participated in the study. The mean follow-up from surgery was 23 years, mean age 32 years. Patients were assessed using a specific instrumental device (Delos Postural Proprioceptive System	Postural control skills, proprioception, and risk of fall in long-term survivor patients treated with knee rotationplasty	Population: 18 long-term survivor patients with knee A1 rotationplasty. Results: Postural instability values within the normal range for healthy individuals in double-stance tests. In single-stance tests, the operated limb was very unstable, while the non-operated limb performed close to normal.
9	(Dąbrowska et al., 2020)which integrates the stimuli from the proprioceptors (deep feeling sensors	The Postural Control Indexes during Unipodal Support in Patients with Idiopathic Scoliosis	Population: 80 patients with idiopathic scoliosis and 40 healthy children without scoliosis. Methods: Cobb angle technique used to measure deformity. Results: Significant differences in stability indexes between study and control groups during single stance tests with eyes open and eyes closed.

N°	Author	Title	Description
10	(Mosca et al., 2020)	Evaluation of proprioception and postural control at a minimum 1 year follow-up after ankle capsuloligamentous lateralplasty with Brostrom technique: A cohort study	Population: 11 patients with post-traumatic lateral Chronic Ankle Instability (CAI). Methods: Assessment using AOFAS ankle-hindfoot score. Results: Significant differences in Static Stability Index (SSI) and Dynamic Stability Index (DSI) were observed between the operated and contralateral leg.

Legend: • AOFAS: American Orthopaedics Foot and Ankle Society; BMI- Body Mass Index; CAI - Chronic Ankle Instability; CD - Central Defenders; CM - Central Midfielders; DL - Dominant Leg; DPPT - Dynamic Postural Priority Test; DSI - Dynamic Stability Index; DT - Dynamic Test; ED - External Defenders; EM - External Midfielders; F – Forwards; G – Goalkeepers; HPT - High-frequency proprioceptive training; NL - Non-dominant Leg; SSI - Static Stability Index; ST CE - static test with closed eyes; ST OE - Static Test with Open Eyes; ST - Static test

DISCUSSION

The following discussion integrates the results and conclusions derived from all 10 articles reviewed in this study. These articles have examined various aspects related to the Delos Postural Proprioceptive System (DPPS) and have provided valuable insights into the assessment of postural balance and proprioceptive control in different contexts and populations (*DELOS INTERNATIONAL – Leader in Proprioception*, n.d.; 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. The findings from the various studies demonstrate that the use of DPPS is a reliable and valid method for assessing static and dynamic balance as well as proprioceptive control under diverse conditions. The studies have shown that DPPS can detect significant differences in balance and postural control between groups of athletes at different levels of competition, among different positions in soccer, and among patients with different pathological conditions. In the context of sports, several studies have highlighted that professional and elite soccer players exhibit better postural control and postural priority compared to less experienced players or those in different positions (Jadczak, Grygorowicz, Dzudziński, et al., 2019; Riva et al., 2016). Furthermore, it has been observed that soccer players with better postural stability have a lower risk of injuries and demonstrate more effective performance during gameplay. In

the field of rehabilitation, the use of DPPS has allowed for the evaluation of the effectiveness of therapeutic interventions, such as high-frequency proprioceptive training, in improving balance and postural control in patients with chronic ankle instability and following ligament reconstruction surgeries (Benedetti et al., 2019; Mosca et al., 2020)long-term survivor patients often report frequent falls, and a sense of instability during gait, particularly on uneven terrain. This study aimed to assess the postural control, the proprioception, and the risk of falling in these patients, which have not been explored before. Eighteen long-term survivor patients participated in the study. The mean follow-up from surgery was 23 years, mean age 32 years. Patients were assessed using a specific instrumental device (Delos Postural Proprioceptive System. The results have shown significant improvements in balance and postural stability following the intervention and training. Overall, the findings from the articles indicate that DPPS is a useful and reliable tool for assessing postural balance and proprioceptive control in various contexts. It provides detailed information on postural control abilities and can be utilised in both sports settings to enhance athletic performance and prevent injuries, as well as in rehabilitation settings to assess the efficacy of therapeutic interventions. However, it is important to note certain limitations. For instance, the sample sizes in the studies reviewed may be small, which could impact the generalisability of the results. Additionally, further research is needed to examine the relationship between DPPS outcomes and other objective measures of balance and postural control. In conclusion, the studies included in this review have provided consistent evidence regarding the use of DPPS for assessing postural balance and proprioceptive control in diverse contexts. This tool holds potential value for healthcare practitioners, coaches, and researchers in the fields of sports and rehabilitation. Future research should aim to deepen the understanding of underlying mechanisms and evaluate the practical application of DPPS in injury prevention and optimising human performance.

Research implications and suggestions for clinical practice. The findings from the reviewed studies have several implications for both research and clinical practice. Firstly, the use of objective assessment tools like the Delos Postural Proprioceptive System (DPPS) provides valuable insights into postural control, proprioception, and balance in different populations. These tools offer clinicians and researchers a standardised and quantitative way to evaluate and monitor these parameters over time. Additionally, the identification of specific factors influencing postural control, such as playing positions in soccer players or surgical interventions in patients with chronic ankle instability, can guide targeted interventions. For example, incorporating high-frequency proprioceptive training programs tai-

lored to the needs of athletes in specific positions may help optimise their postural stability and performance on the field.

Moreover, the observed differences in postural control between the operated and non-operated limbs in patients undergoing capsulo-ligamentous reconstructive surgery highlight the importance of individualised rehabilitation programs. These programs should focus on improving proprioception and postural control on the operated limb to reduce the risk of falls and enhance overall functional outcomes. Clinicians should also consider the long-term effects of surgical interventions, such as knee A1 rotationplasty, on postural control and proprioception. Rehabilitation interventions should be designed to address the specific challenges faced by these patients, including instability during single stance on the operated limb. Incorporating balance training exercises and proprioceptive retraining into post-surgical rehabilitation protocols may help mitigate the risk of falls and improve functional outcomes. Future research should further explore the mechanisms underlying postural control and proprioception in various populations, including athletes, patients with chronic ankle instability, and those undergoing limb salvage surgeries. Longitudinal studies assessing the long-term effects of specific interventions and rehabilitation programs on postural control and functional outcomes would provide valuable insights into optimising treatment approaches. In conclusion, the findings from these studies emphasise the importance of assessing and addressing postural control, proprioception, and balance in clinical practice. By utilising objective assessment tools and tailoring interventions to individual needs, clinicians can optimise rehabilitation outcomes and reduce the risk of falls in different populations. Future research should continue to explore these areas to advance our understanding and improve clinical management strategies.

Strengths and limitations

Strengths:

1. The reviewed studies employed standardised and objective assessment tools, such as the Delos Postural Proprioceptive System (DPPS), which enhance the reliability and validity of the findings.
2. The inclusion of diverse populations, including athletes, patients with chronic ankle instability, and individuals undergoing limb salvage surgeries, increases the generalisability of the results.
3. Longitudinal designs in some studies allowed for the assessment of long-term effects and outcomes, providing valuable insights into postural control and proprioception over time.
4. The use of statistical analyses and control groups in several studies strengthened the validity of the findings and allowed for comparisons between different groups or conditions.

5. The identification of specific factors influencing postural control, such as playing positions in soccer players or surgical interventions, provides targeted information for designing tailored interventions and rehabilitation programs.

Limitations:

1. The sample sizes in some studies were relatively small, which may limit the generalisability of the findings to larger populations.
2. The retrospective nature of some studies and the reliance on self-report measures, such as patient-reported outcome scores, may introduce recall bias and subjectivity.
3. The heterogeneity of interventions and assessment protocols across studies makes it challenging to draw direct comparisons and generalise the findings.
4. The lack of long-term follow-up in some studies restricts the understanding of the sustainability of the observed effects on postural control and proprioception.
5. Potential confounding variables, such as previous injuries, comorbidities, or training regimens, were not consistently accounted for in all studies, which may impact the interpretation of the results.

These strengths and limitations should be considered when interpreting the findings and applying them to clinical practice. Future studies should address these limitations by employing larger sample sizes, utilising prospective designs, standardising assessment protocols, and controlling for potential confounders to enhance the robustness and applicability of the results.

CONCLUSIONS

In conclusion, the reviewed studies shed light on the importance of postural control and proprioception in various populations and clinical conditions. The use of objective assessment tools, such as the DPPS, provides valuable insights into balance deficits and can guide targeted interventions. The findings highlight the need for individualised treatment plans, incorporating rehabilitation interventions aimed at improving postural control and proprioceptive abilities. Patient education plays a crucial role in promoting active participation and self-management. Interdisciplinary collaboration and staying updated with the latest research are essential for delivering evidence-based practice. By implementing these findings into clini-

cal practice, healthcare professionals can enhance patient outcomes and promote better functional outcomes in balance and proprioception.

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CONFLICT OF INTERESTS

The authors are doctoral students, clinicians, who have no financial relationships with organisations that might have an interest in the work presented in the last 3 years and have no other relationships or activities that might influence the work presented.

REFERENCES

Benedetti, M. G., Coli, M., Campanacci, L., & Manfrini, M. (2019). Postural control skills, proprioception, and risk of fall in long-term survivor patients treated with knee rotationplasty. *International Journal of Rehabilitation Research*, 42(1), 68–73. doi: https://doi.org/10.1097/MRR.0000000000000331

Dąbrowska, A., Olszewska-Karaban, M. A., Permoda-Białozorczyk, A. K., & Szalewska, D. A. (2020). The postural control indexes during unipodal support in patients with idiopathic scoliosis. *BioMed research international*, 2020. doi: https://doi.org/10.1155/2020/7936095

Carli, D. P., Patrizi, M., Pepe, L., Cavaniglia, G., Riva, D., & D'ottavi, L. R. (2010). Postural control and risk of falling in bipodalic and monopodalic stabilometric tests of healthy subjects before, after visuo-proprioceptive vestibulo-postural rehabilitation and at 3 months thereafter: role of the proprioceptive system. *Acta Otorhinolaryngologica Italica*, 30(4).

DELOS INTERNATIONAL – Leader in proprioception. (n.d.). Retrieved June 25, 2023, from https://www.delos-international.com/

Jadczak, L., Grygorowicz, M., Dzudzinski, W., & Sliwowski, R. (2019). Comparison of Static and Dynamic Balance At Different Levels of Sport Competition In Professional And Junior Elite Soccer Players. *The Journal of Strength & Conditioning Research*, 33(12), 3384–3391. doi: https://doi.org/10.1519/JSC.0000000000002476

Jadczak, Ł., Grygorowicz, M., Wieczorek, A., & Śliwowski, R. (2019). Analysis of static balance performance and dynamic postural priority according to playing position in elite soccer players. Gait & posture, 74, 148–153. doi: https://doi.org/10.1016/j.gaitpost.2019.09.008

Mosca, M., Caravelli, S., Massimi, S., Fuiano, M., Catanese, G., Barone, G., ... & Benedetti, M. G. (2020). Evaluation of proprioception and postural control at a minimum 1 year follow-up after ankle capsuloligamentous lateralplasty with Brostrom technique: A cohort study. *Medicine*, 99(17). doi: https://doi.org/10.1097/MD.0000000000019862

Peters: Joanna Briggs Institute Reviewer's Manual, JBI - Google Scholar. (n.d.). Retrieved June 9, 2022, from https://scholar-google-com.ezproxy.unibo.it/scholar_lookup?hl=en&publication_year=2020&author=MDJ+Peters&author=C+Godfrey&author=P+McInerney&author=Z+Munn&author=AC+Tricco&author=H+Khalil&title=Joanna+Briggs+Institute+Reviewer%27s+Manual%2C+JBI

Piontek, T., Ciemniewska-Gorzela, K., Szulc, A., Pyda, A., Dudziński, W., & Hejna, R. (2009). Postural control strategy in patients with anterior cruciate ligament deficiency. *Chirurgia Narzadow Ruchu i Ortopedia Polska*, 74(6), 353–360.

Riva, D., Bianchi, R., Rocca, F., & Mamo, C. (2016). Proprioceptive training and injury prevention in a professional men's basketball team: a six-year prospective study. Journal of strength and conditioning research, 30(2), 461. doi: https://doi.org/10.1519/JSC.0000000000001097

Riva, D., Fani, M., Benedetti, M. G., Scarsini, A., Rocca, F., & Mamo, C. (2019). Effects of high-frequency proprioceptive training on single stance stability in older adults: implications for fall prevention. *BioMed research international*, 2019. doi: https://doi.org/10.1155/2019/2382747

Riva, D., Mamo, C., Fanì, M., Saccavino, P., Rocca, F., Momenté, M., & Fratta, M. (2013). Single stance stability and proprioceptive control in older adults living at home: gender and age differences. *Journal of aging research*, 2013. doi: https://doi.org/10.1155/2013/561695

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., ... & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Annals of internal medicine, 169(7), 467–473. doi: https://doi.org/10.7326/M18-0850

Laikysenos kontrolės ir propriocepcijos vertinimas, naudojant „Delos" laikysenos propriocepcinę sistemą

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SANTRAUKA

Tyrimo pagrindimas. Tinkama laikysenos kontrolė ir propriocepcija – labai svarbios, norint išlaikyti pusiausvyrą, išvengti kritimų ir atlikti kasdienę veiklą. Tradiciniai laikysenos kontrolės ir propriocepcijos funkcijos vertinimo metodai dažnai nėra objektyvūs ir tikslūs. „Delos" laikysenos propriocepcinė sistema – perspektyvus sprendimas, leidžiantis kiekybiškai ir visapusiškai įvertinti laikysenos stabilumą, propriocepcinę funkciją.

Metodai. „Delos" laikysenos propriocepcinėje sistemoje naudojama pažangi jutiklių technologija ir kompiuterizuota analizė įvairiems su laikysenos kontrole susijusiems parametrams, įskaitant stabilumo indeksus, svorio pasiskirstymą, svyravimo modelius ir propriocepcines reakcijas, matuoti. Sistema apima ir statinius, ir dinaminius testus, todėl galima visapusiškai įvertinti laikysenos kontrolę įvairiomis sąlygomis.

Rezultatai. Remiantis tyrimų duomenimis, „Delos" laikysenos propriocepcinė sistema yra veiksminga, vertinant laikysenos kontrolę ir propriocepciją įvairiose populiacijose, pavyzdžiui, sportininkų, vyresnio amžiaus suaugusiųjų, pusiausvyros sutrikimų turinčių asmenų ir pacientų, kuriems atliekama reabilitacija. „Delos" laikysenos propriocepcinė sistema yra patikima priemonė, o jos matavimai koreliuoja su kitomis pripažintomis vertinimo priemonėmis. Be to, įrodyta, kad tai tinkamas būdas, siekiant nustatyti laikysenos kontrolės ir propriocepcijos funkcijos pokyčius laikui bėgant.

Išvados. „Delos" laikysenos propriocepcinė sistema yra vertinga priemonė objektyviam laikysenos kontrolės ir propriocepcinės funkcijos vertinimui bei stebėsenai. Dėl gebėjimo patikimai ir jautriai pateikti kiekybinius duomenis ji yra naudinga mokslininkams, gydytojams ir reabilitacijos specialistams. Pagerindama supratimą apie laikysenos kontrolę ir propriocepciją, „Delos" laikysenos propriocepcinė sistema gali padėti kurti tikslines intervencijas ir individualizuotas gydymo strategijas, skirtas pusiausvyrai gerinti, kritimų prevencijai ir funkciniam darbingumui optimizuoti.

Raktažodžiai: „Delos" laikysenos propriocepcinė sistema, laikysenos kontrolė, propriocepcija, vertinimas, pusiausvyra.