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Review

Cueing Interventions for Gait and Balance in Parkinson's Disease: A Scoping Review of Current Evidence

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Abstract: Background: Cueing interventions, which utilize external auditory, visual, or somatosensory stimuli, are increasingly used to improve motor performance in individuals with Parkinson's disease (PD). This review explores the effectiveness of cueing on gait, balance, and quality of life outcomes in PD. Methods: A scoping review of six studies was conducted, focusing on the impact of cueing interventions on gait parameters, balance stability, and functional outcomes in PD patients. Studies were evaluated for methodological quality using the PEDro scale, and risk of bias was assessed with RoB 2. Results: Cueing interventions consistently improved gait parameters, with five studies showing significant increases in step length. The results for walking speed were more varied, with some studies reporting statistically significant gains while others found non-significant or mixed outcomes. Balance improvements were noted in dynamic balance measures, though static balance effects were less consistent. Two studies observed long-term benefits at follow-up, particularly when interventions were structured and supervised. The quality of life improvements were limited, with only one study measuring this outcome and showing no significant changes. Conclusions: Cueing interventions demonstrate potential for enhancing gait and dynamic balance in PD, though effects on quality of life remain uncertain. Early and structured implementation of cueing, especially with auditory stimuli, may support functional gains in PD management. Further research is required to establish optimal cueing protocols and long-term benefits.

Keywords: Parkinson's disease; cueing intervention; gait; balance; quality of life

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1. Introduction

Parkinson's disease (PD) is a progressive neurodegenerative disorder, second in prevalence only to Alzheimer's disease. With over 1.2 million individuals affected in Europe and projections suggesting a rise to 17 million cases by 2040, PD represents a substantial clinical and economic burden [1–3]. In Italy alone, PD impacts approximately 300,000 individuals, with an annual incidence rate of 18 cases per 100,000 inhabitants. While more prevalent in men, women with PD experience faster progression and increased mortality [1,2]. Though typically diagnosed around age 60, over 10% of cases occur in individuals under 50, underscoring PD's broad demographic reach [4–8]. Clinically, PD is characterized by motor symptoms such as tremor, bradykinesia, rigidity, and postural instability, which progressively impair daily functioning. However, non-motor symptoms—cognitive decline, mood disturbances, autonomic dysfunctions, and sleep disorders—are equally debilitating, contributing significantly to diminished quality of life [9–18]. Managing these symptoms in advanced stages of PD intensifies the need for comprehensive care, escalating healthcare costs that include both direct medical expenses and indirect socioeconomic impacts [13]. The underlying pathology of PD involves the degeneration of dopaminergic neurons in the substantia nigra, resulting in impaired motor control. Current pharmacological treatments, primarily dopamine precursors and agonists, provide symptomatic relief but often lose efficacy as the disease advances, leaving residual symptoms that are challenging to manage [16,19–24]. Given these limitations, non-pharmacological interventions, particularly physiotherapy, are increasingly recognized as essential components of PD management [25–29]. Cueing strategies have emerged as a promising approach within physiotherapy for enhancing motor control in PD. Cueing involves external temporal or spatial stimuli—visual, auditory, or somatosensory—designed to aid movement initiation and continuity, bypassing dysfunctional basal ganglia circuits [30–36]. For example, visual cues, such as laser markings, can reduce freezing episodes during gait, while auditory rhythms or tactile vibrations provide structured guidance for movement regularity and coordination. Despite evidence supporting cueing as a therapeutic tool, optimal cue types and their long-term benefits remain unclear, with patient responses varying widely. Cueing offers a low-cost, accessible, and non-invasive intervention that contrasts favorably with pharmacological treatments, making it an attractive addition to PD management [30,37,38]. This review aims to critically assess the existing literature on cueing strategies in PD, focusing on outcomes related to gait, balance, and quality of life. By consolidating current evidence, we seek to clarify the therapeutic value of cueing and identify directions for future research to enhance clinical application.

2. Methods

This scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) methodology for scoping reviews, which provides a systematic framework for identifying, evaluating, and synthesizing evidence (Peters et al., 2020) [39]. The reporting process adhered to the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) checklist to ensure transparency and completeness (Tricco et al., 2018) [40].

2.1. Review Question

We formulated the following research question: "What is the effectiveness of cueing strategies in improving gait, balance, and quality of life in patients with Parkinson's disease?".

2.2. Eligibility Criteria

Studies were eligible for inclusion if they met the following population, concept, and context (PCC) criteria.

Population (P): The studies included adults diagnosed with Parkinson's disease (PD). The eligible participants were those with confirmed PD who could ambulate independently (without assistive devices) and were classified at Hoehn and Yahr stages ≤ 4, indicating mild to moderate motor impairment. The studies focusing on populations with significant comorbidities that could affect motor function, such as musculoskeletal, rheumatic, or severe cardiorespiratory conditions, were excluded to ensure that the results specifically reflected the outcomes related to PD.

Concept (C): The primary concept of interest was the use of cueing strategies as an intervention to improve motor function. Cueing strategies involve the use of external stimuli—visual, auditory, or somatosensory cues—aimed at facilitating motor performance. Studies were included if they applied cueing as a standalone intervention or combined it with other non-pharmacological treatments, provided that cueing was the distinct component in at least one group. Studies that used cueing during the "ON" phase of dopaminergic therapy (when symptoms are generally better controlled) were prioritized, as this setting maximizes the potential observable effect of the cues on motor outcomes.

Context (C): Eligible studies focused on evaluating cueing strategies within clinical or rehabilitation settings aimed at improving specific outcomes: gait, balance, and quality of life in individuals with PD. Studies conducted in various settings—clinical, outpatient, or home-based—were included to capture a range of environments where cueing interventions may be applied. Additionally, only randomized controlled trials (RCTs) were considered, given their high level of evidence. The studies conducted solely in exploratory or quasi-experimental designs were excluded to maintain methodological rigor.

2.3. Exclusion Criteria

Studies that did not align with the specified PCC criteria were excluded.

2.4. Search Strategy

An initial, targeted search was conducted in MEDLINE using the PubMed interface to identify relevant articles on the topic. The indexing terms associated with these articles were then utilized to develop a comprehensive search strategy for MEDLINE. This strategy, which incorporated all the identified keywords and indexing terms, was subsequently adapted for use in Cochrane Central, Scopus, PEDro, and Web of Science. Additionally, gray literature sources, including conference proceedings, theses, dissertations, and unpublished reports, as well as the reference lists of all the pertinent studies, were reviewed to ensure comprehensive coverage of available evidence. The searches were completed on 30 September 2024 without any restrictions on publication date.

The search strings used for each database were as follows:

- MEDLINE (PubMed):

“Parkinson Disease” [MeSH] AND (“cueing” [All Fields] OR “cues” [MeSH] OR “cueing strategies” [All Fields] OR “cued intervention” [All Fields]) AND (“gait” [MeSH] OR “balance” [MeSH] OR “quality of life” [MeSH]);

- Cochrane Central:

(“Parkinson Disease” OR “Parkinson’s”) AND (cues OR cueing OR “cueing strategies” OR “cued intervention”) AND (gait OR balance OR “quality of life”);

- Scopus:

TITLE-ABS-KEY (“Parkinson Disease” OR “Parkinson’s”) AND TITLE-ABS-KEY (cues OR cueing OR “cueing strategies” OR “cued intervention”) AND TITLE-ABS-KEY (gait OR balance OR “quality of life”);

- PEDro:

(“Parkinson*” AND “cues” OR “cueing” OR “cueing strategies” OR “cued intervention”) AND (“gait” OR “balance” OR “quality of life”);

- Web of Science:

TS = (“Parkinson Disease” OR “Parkinson’s”) AND TS = (cues OR cueing OR “cueing strategies” OR “cued intervention”) AND TS = (gait OR balance OR “quality of life”).

2.5. Study Selection

The outlined process follows a systematic method for selecting studies in a scoping review. Initially, the search results were gathered and organized in Zotero, where duplicates were removed. Screening was conducted in two phases: first, a review of titles and abstracts, followed by a full-text evaluation. Both of the stages were completed independently by two reviewers, with any disagreements resolved by a third reviewer. The selection process adhered to PRISMA 2020 [41] guidelines to ensure transparency and consistency. This structured approach was designed to identify studies relevant to the research question, ensuring a thorough and systematic review process.

2.6. Data Extraction and Data Synthesis

Data extraction involved systematically collecting key information from each included study, such as the study design, population characteristics, intervention details, the outcomes measured, and the findings relevant to the research question. A standardized data extraction form was used to ensure consistency across studies. For data synthesis, the findings were organized by outcome categories, allowing for comparison across the studies. Qualitative synthesis was employed to interpret patterns, variations, and gaps within the data, providing a comprehensive overview of the evidence related to the intervention's effectiveness. The quantitative findings, where applicable, were summarized to highlight trends and significant results across the included studies. This approach enabled a structured and coherent synthesis of the data to answer the research question.

3. Results

As presented in the PRISMA 2020-flow diagram (Figure 1), from the 359 records identified by the initial literature searches, 353 were excluded and 6 articles were included (Table 1). The quality of the studies was assessed using the PEDro scale and the risk of bias 2 (RoB-2) tool, which evaluates bias across five domains in randomized controlled trials (Table 2).

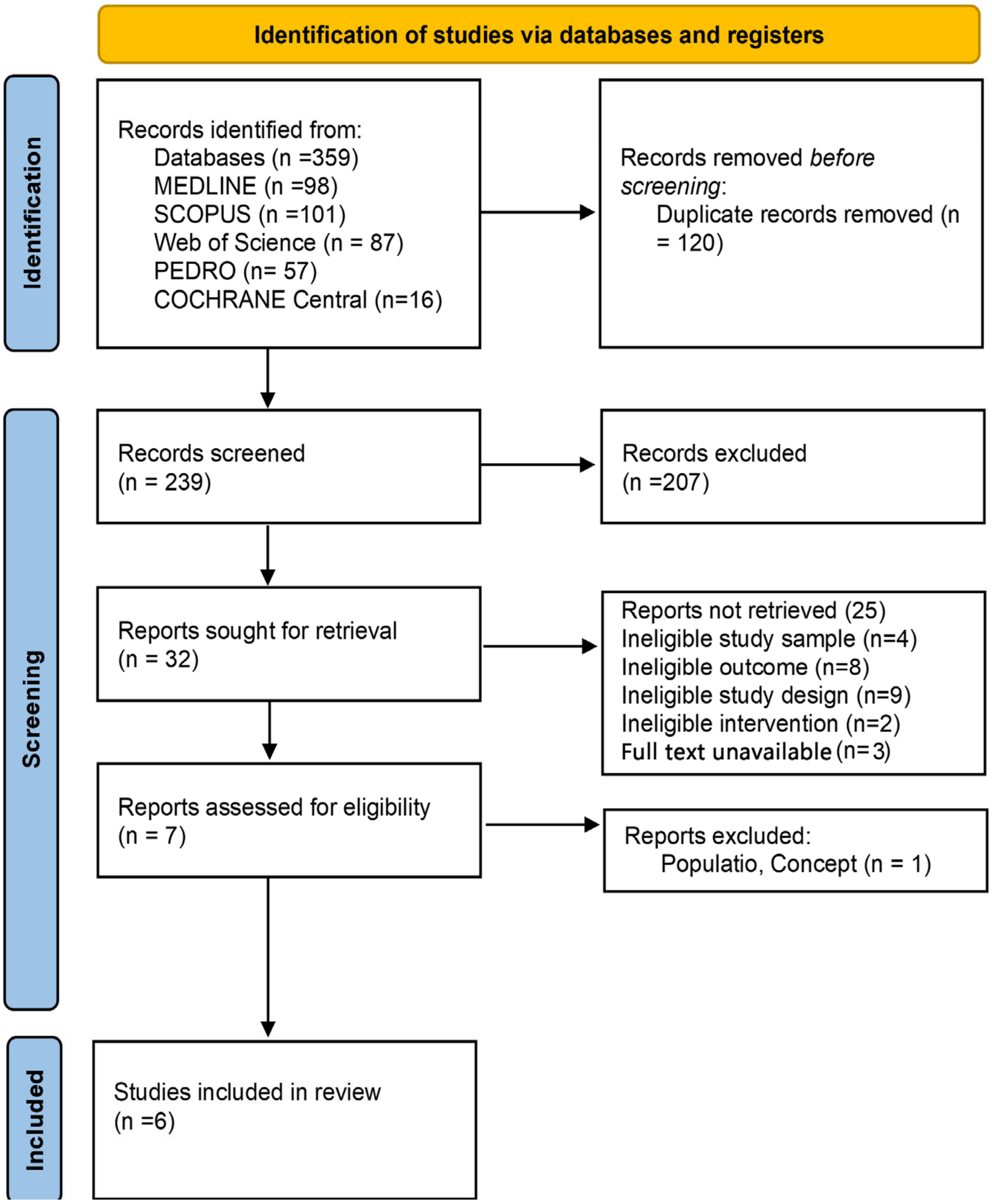

Figure 1. Preferred reporting items for systematic reviews and meta-analyses 2020 (PRISMA) flow-diagram.

Table 1. Main characteristics of included studies.

Author	Study Design	Participants	Outcome Measures	Interventions	Baseline Outcomes	Follow-Up Results
Nieuwboer et al., 2007 [29]	RCT	Early intervention (n = 76), age: 67.5 (61.5–72), M/F: 48/28, H&Y: 2.5 (2.5–3)	Primary outcomes: PG score, walking speed	3-week "home cueing" program using a cueing prototype device, followed by 3 weeks without training	PG score (0–20): 6.0 (4.0–8.0), walking speed (m/s): 0.86 (0.73–0.98)	PG score (0–20): 4.0 (3.0–7.0), walking speed (m/s): 0.94 (0.76–1.1)
		Late intervention (n = 77), age: 69 (62.5–73), M/F: 40/37, H&Y: 3 (2.5–3)	Secondary outcomes: step length, frequency	Patients tested all cueing modes (visual, auditory, somatosensory), trained in their preferred mode	Step length (m): 0.51 (0.44–0.58), step frequency (steps/m): 101.6 (92.5–110)	Step length (m): 0.55 (0.48–0.60), step frequency (steps/m): 104.2 (97.2–112)
Chaiwanichsiri et al., 2011 [36]	RCT	Group A: treadmill + music (n = 10), Age: 67.1 ± 4.0, M/F: 10/0, H&Y: 2.35 ± 0.36	Step length, frequency, walking speed, TUG, 6 min walk	Stretching + 20 min treadmill with music cues 3x/week for 4 weeks, then 4 weeks home program	Step length (cm): 62.2 ± 7.3, walking speed (m/s): 1.24 ± 0.20	Step length (cm): 69.6 ± 5.8, walking speed (m/s): 1.35 ± 0.09
		Group B: treadmill only (n = 10), age: 67.9 ± 6.3, M/F: 10/0, H&Y: 2.5 ± 0.5	6 m walk time, 6 min walk distance	20 min treadmill without cues, 3x/week for 4 weeks, then 4-week home program	6 m walk time (s): 5.2 ± 0.97, walking speed (m/s): 1.18 ± 0.21	6 m walk time (s): 4.8 ± 0.69, walking speed (m/s): 1.26 ± 0.17
Sayed et al., 2013 [37]	RCT	Intervention (n = 14), age: 63.45 ± 4.85, M/F: 14/0, H&Y (on): 2.45 ± 0.43	TUG, step length, speed, hip/knee flexion	Physical therapy program 3x/week for 6 weeks with 10 m walk using visual cues	TUG (s): 13.65 ± 2.42, step length (m): 0.46 ± 0.2, speed (m/s): 0.81 ± 0.12	TUG (s): 16.15 ± 3.98, step length (m): 0.42 ± 0.1, speed (m/s): 0.76 ± 0.18
		Control (n = 14), age: 61.6 ± 5.08, M/F: 14/0, H&Y (on): 2.48 ± 0.47	Max flexion angle (hip, knee, ankle)	Same physical therapy program without visual cues	Hip flexion (°): 32.1 ± 4.12, knee flexion (°): 36.87 ± 5.97	Hip flexion (°): 28.19 ± 5.41, knee flexion (°): 32.4 ± 5.63
De Icco et al., 2015 [32]	RCT	Acoustic cues (n = 11), age: 78.1 ± 6.1, M/F: 7/4, UPDRS-III: 32.1 ± 9.8	Step count, step duration, speed	20 min gait training sessions with acoustic or visual cues, 5x/week for 4 weeks	Step count: 7.2 ± 3.3, speed (m/s): 0.63 ± 0.22	Step count: 6.2 ± 1.7, Speed (m/s): 0.77 ± 0.3
		Visual cues (n = 11), age: 73.2 ± 6.9, M/F: 5/6, UPDRS-III: 29.1 ± 7.9	FIM, UPDRS-III	Floor markers for visual guidance, avoiding stepping on lines	Step duration (ms): 1362.9 ± 216.6, swing phase (%): 27.6 ± 3.5	Step duration (ms): 1332.9 ± 263.1, swing phase (%): 36.6 ± 3.5
Calabrò et al., 2019 [33]	RCT	RAS-Treadmill (n = 25), Age: 70 ± 8, M/F: 11/9, H&Y (on): 3 ± 1	Primary: FGA, Secondary: BBS, UPDRS	Daily 45 min treadmill training with rhythmic auditory stimuli, 5x/week for 8 weeks	10MWT (s): 7.5 ± 5, UPDRS: 29 ± 3	10MWT (s): 6.9 ± 5, UPDRS: 21 ± 5
		Non-RAS-treadmill (n = 25), age: 73 ± 8, M/F: 14/6, H&Y (on): 3 ± 1	FGA, TUG	30 min treadmill training without auditory stimuli	FES (score): 34 ± 9, FGA (score): 18 ± 2	FES (score): 28 ± 9, FGA (score): 22 ± 2
Capato et al., 2020 [34]	RCT	RAS-supported (n = 56), age: 74 ± 8, M/F: 27/29, H&Y (on): 2.39 ± 0.79	Primary: mini BESTest, Secondary: BBS	5-week balance training with rhythmic auditory stimuli, 2x/week	Mini BESTest: 14.8 (12.9; 16.6), BBS: 38.9 (35.6; 42.3)	Mini BESTest: 21.1 (20.2; 22.0), BBS: 45.6 (44.2; 46.9)
		Regular (n = 50), age: 67 ± 13, M/F: 32/18, H&Y (on): 2.46 ± 0.91	Retropulsion, push/release, falls efficacy	Routine balance exercises without auditory cues	Retropulsion test: 2.3 (1.9; 2.7), FES: 31.5 (26.8; 36.2)	Retropulsion test: 1.2 (1.0; 1.4), FES: 27.8 (22.1; 29.3)

H&Y: Hoehn and Yahr scale—a commonly used system for describing the progression of Parkinson's disease, ranging from stage 1 (mild symptoms) to stage 5 (severe disability). Legend: 10MWT: 10-meter walk test, BBS: Berg Balance Scale, CSI: carer strain index, FES: falls efficacy scale, FGA: Functional Gait Assessment, FIM: functional independence measure, H&Y: Hoehn and Yahr stage, LEDD: Levodopa equivalent daily dose, Mini BESTest: Mini Balance Evaluation Systems Test, NEADL: Nottingham Extended Activities of Daily Living Index, NFOG-Q: New Freezing of Gait Questionnaire, PG score: Patient Global Score, RAS: rhythmic auditory stimuli, RCT: randomized controlled trial, TUG: timed up and go test, UPDRS: unified Parkinson's disease rating scale.

An overview of the included studies evaluating cueing interventions in Parkinson's disease, focusing on participant demographics, outcome measures, interventions, baseline outcomes, and follow-up results, follows.

The results from the six included studies consistently demonstrate that cueing interventions, particularly auditory and visual cues, can improve gait parameters, balance, and stability in individuals with Parkinson's disease (PD). Nieuwboer et al. (2007) [30] showed significant improvements in the walking speed and step length following a 3-week home-based cueing program, with early intervention groups experiencing sustained benefits even after training cessation. Similarly, Chaiwanichsiri et al. (2011) [37] reported superior gains in gait speed and step length when treadmill training was combined with music-based auditory cues, outperforming treadmill-only groups. These findings highlight the effectiveness of rhythmic auditory cues in optimizing gait performance.

Table 2. Quality assessment using PEDro and RoB-2 scales. PEDro scores and detailed risk of bias (RoB 2) assessment across five domains for six studies included in the review.

Author	Year	PEDro Score	RoB-2 Domains
			Randomization
Nieuwboer et al. [30]	2007	07-ott	Low risk
Chaiwanichsiri et al. [37]	2011	06-ott	Some concerns
Sayed et al. [38]	2013	04-ott	High risk
De Icco et al. [33]	2015	04-ott	Some concerns
Calabrò et al. [34]	2019	08-ott	Low risk
Capato et al.	2020	08-ott	Low risk

Legend: PEDro score: physiotherapy evidence database score, RoB-2: risk of bias 2 tool.

Visual cueing also showed positive, though less pronounced, results. For example, Sayed et al. (2013) [38] found modest improvements in the step length and speed when visual cues were employed during walking tasks, although the observed benefits were not as substantial as those achieved with auditory cues in other studies. This observation aligns with the results from De Icco et al. (2015) [33], where the participants who received acoustic cues demonstrated more significant gains in walking speed compared to those who used visual cues. These findings suggest that auditory cues may exert a more robust effect on temporal gait parameters, such as walking speed and cadence, than visual cues.

Regarding balance and stability, studies consistently demonstrated that cueing interventions could enhance dynamic balance, although their effects on static balance were less clear. Calabrò et al. (2019) [34] and Capato et al. (2020) [35] reported significant improvements in Functional Gait Assessment (FGA), the Berg Balance Scale (BBS), and Mini BESTest scores, particularly in the groups utilizing rhythmic auditory stimuli. These results indicate that auditory cueing may facilitate postural control and dynamic stability, which are crucial for reducing fall risk in PD. However, static balance improvements, such as those measured by single-leg stance or functional reach tests, were less consistent across studies.

The authors' interpretation of these findings emphasizes the specific benefits of cueing interventions on gait and dynamic balance, with auditory cues showing the most substantial effects. While visual cues provide some improvements, particularly in spatial guidance during gait, auditory rhythms appear to better synchronize movement patterns and enhance walking regularity. Furthermore, structured and supervised interventions, as observed in Capato et al. (2020) [35], produced longer-lasting benefits compared to home-based or less intensive programs. Despite these positive outcomes, the limited impact of cueing on static balance and quality of life highlights the need for multimodal approaches that integrate targeted balance exercises and functional training.

In summary, the evidence underscores the potential of cueing interventions, particularly auditory stimuli, as effective tools for improving gait, balance, and stability in PD patients. These findings provide a foundation for integrating cueing into clinical practice, with an emphasis on early, intensive, and supervised implementation to maximize functional gains.

4. Discussion

This review examined six randomized controlled trials exploring the effects of cueing interventions—auditory, visual, and somatosensory—on gait, balance, and stability in individuals with Parkinson's disease (PD) [30,37]. The findings support the consistent efficacy of cueing, particularly auditory stimuli, in improving temporal gait parameters like walking speed and step length [42,43]. Improvements in dynamic balance were also observed, although the effects on the static balance and quality of life were less conclusive [44–46].

Gait improvements: Across the studies, rhythmic auditory stimuli emerged as the most effective cueing strategy for improving walking speed, step length, and regularity. For instance, Nieuwboer et al. (2007) [30] and Chaiwanichsiri et al. (2011) [37] demonstrated significant increases in walking speed and step length with structured, auditory cue-based programs. The ability of auditory cues to synchronize motor rhythms likely explains their superiority over visual cues, which primarily guide spatial components of gait.

Balance and stability: Cueing interventions were particularly effective in enhancing dynamic balance, as indicated by improvements in outcomes like the Berg Balance Scale (BBS) and Functional Gait Assessment (FGA) (Calabrò et al., 2019 [34]; Capato et al., 2020 [35]). However, the effects on static balance—such as single-leg stance or functional reach—were inconsistent, suggesting that cueing predominantly benefits postural control during movement rather than stationary tasks. This distinction highlights the need for complementary interventions to address static balance deficits in PD patients.

Quality of life: Although gait and balance improvements were evident, their translation into measurable changes in quality of life was limited. Only one study evaluated quality of life outcomes, reporting non-significant changes (Nieuwboer et al., 2007) [30]. This finding underscores the importance of multimodal approaches that combine cueing interventions with psychosocial or cognitive strategies to achieve broader benefits for patients. Although cueing interventions demonstrated improvements in motor outcomes, their impact on quality of life remains limited and underexplored. Only one study (Nieuwboer et al., 2007) [30] assessed the quality of life, reporting non-significant changes. This highlights a critical area for future research, as improved motor function does not necessarily translate into enhanced well-being. Comprehensive assessments of quality of life, including physical, psychological, and social dimensions, are needed to fully understand the broader implications of cueing interventions for Parkinson's disease patients.

4.1. Interpretation and Clinical Relevance

The results of this review align with previous research highlighting the role of auditory cueing in bypassing dysfunctional basal ganglia circuits and facilitating motor performance [47,48]. Visual cues, while effective for spatial guidance, appeared less impactful for temporal gait improvements. The sustained benefits observed in structured, supervised interventions compared to home-based programs emphasize the importance of intervention intensity and clinician oversight.

The findings from this review suggest that cueing interventions, particularly auditory stimuli, may have the potential to improve gait parameters and dynamic balance in individuals with Parkinson's disease (PD). However, given the small sample sizes, methodological variability, and inconsistent follow-up in the included studies, these results should be interpreted with caution.

Auditory cues appear to offer more benefits for temporal gait parameters, such as walking speed and step length, compared to visual cues, which seem more effective for spatial guidance. Structured, supervised interventions, rather than home-based programs, might provide greater and more sustained improvements, but further research is necessary to confirm these findings. Clinicians could consider incorporating cueing strategies as part of a broader rehabilitation plan for PD, particularly for improving dynamic stability and gait performance.

Nevertheless, it remains unclear whether cueing interventions alone can address static balance deficits or lead to measurable improvements in quality of life. As such, these strategies should be viewed as adjunctive tools rather than standalone solutions. Combining cueing with other interventions, such as targeted balance training, cognitive–motor exercises, or assistive technologies, may offer a more comprehensive approach to managing motor impairments in PD.

The variability in the outcomes observed across studies may be explained by differences in cueing protocols, patient characteristics, and disease severity. For instance, studies with more frequent or supervised cueing interventions tended to show greater improvements in gait and balance outcomes (Calabrò et al., 2019 [34]; Capato et al., 2020 [35]). Conversely, less intensive home-based interventions yielded more modest results. Additionally, variations in patient motor abilities, such as baseline gait impairments and Hoehn and Yahr stages, likely influenced responsiveness to cueing strategies. These findings underscore the importance of tailoring cueing interventions to individual patient profiles to optimize effectiveness.

Future research, particularly high-quality trials with standardized protocols and larger sample sizes, is needed before definitive recommendations for clinical practice can be made.

4.2. Limitations

Several limitations must be acknowledged. The included studies had relatively small sample sizes, limiting statistical power and generalizability. Heterogeneity in intervention duration, cueing modalities, and patient characteristics may also have influenced the results. Furthermore, follow-up assessments were inconsistently reported, making it difficult to draw conclusions about the long-term sustainability of cueing effects.

While the PEDro scale and RoB-2 tool were employed to assess methodological quality and risk of bias, it is important to acknowledge specific limitations within the included studies. Several studies exhibited small sample sizes, high variability in intervention protocols (e.g., duration, intensity, and mode of cueing), and inconsistent follow-up assessments. For example, Nieuwboer et al. (2007) [30] demonstrated overlapping age groups, which may have affected group comparisons. Furthermore, issues related to randomization and blinding, particularly in studies with 'some concerns' or 'high risk' of bias, may limit the generalizability of the findings. These methodological flaws suggest caution when interpreting the evidence and highlight the need for more rigorous, well-powered trials.

4.3. Future Directions

Future studies should focus on standardizing cueing protocols to optimize their efficacy. Longitudinal studies with larger sample sizes are needed to evaluate the long-term benefits of cueing on gait, balance, and quality of life. Additionally, exploring the synergistic effects of cueing combined with balance-specific exercises, cognitive-motor training, or technology-based solutions (e.g., virtual reality) may yield more comprehensive improvements for PD patients.

The absence of long-term follow-up data in most included studies represents a critical gap. While short-term benefits of cueing interventions on gait and dynamic balance are evident, the sustainability of these effects remains uncertain. Future research should prioritize longitudinal trials to evaluate the long-term impact of cueing on functional outcomes and fall risk in Parkinson's disease. Additionally, understanding the role of continuous and sustained cueing programs in rehabilitation settings will be essential for integrating these interventions into routine clinical practice.

5. Conclusions

Cueing interventions show promise for improving gait, dynamic balance, and motor performance in individuals with Parkinson's disease. However, these findings should be interpreted cautiously due to the methodological limitations and variability observed in the included studies. While short-term benefits are evident, the long-term effects and impacts on quality of life require further investigation through rigorous, well-designed longitudinal trials. Tailored, supervised cueing programs may hold particular value when integrated into comprehensive rehabilitation strategies.

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Conflicts of Interest: There are no conflicting relationships or activities.

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