Examining the Clinical Effectiveness of Rhythmic Auditory Stimulation in Dynamic Balance and Gait Training in Patients with Parkinson’s Disease: a Systematic Review

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Background and Objectives
This study’s purpose was to systematically review randomized controlled trials evaluating the effectiveness of rhythmic auditory cues with gait training for patients with Parkinson’s disease (PD). Rhythmic Auditory Cues (RAC) combined with physical therapy may, theoretically, improve gait outcomes made with current treatment. This systematic review was designed to evaluate current research on the use of rhythmic auditory cues and music therapy in the physical rehabilitation of patients with PD stage I-IV on the Hoehn and Yahr (H&Y) scale.

Methods
CINAHL complete, Cochrane, MEDLINE, and SportsDiscus databases were searched through EBSCOhost. Studies were accepted if they were randomized controlled trials (RCTs), investigated the effects of external rhythmic cues on gait and balance, were published within 15 years and scored 7 or above on the PEDro scale. After duplicates, non-RCTs, and articles unrelated to RACs or Parkinson’s were removed, 7 articles were assessed for eligibility using the PEDro scale. One RCT did not receive a 7 out of 10 rating on the PEDro scale and was excluded, leaving 6 studies for review.

Results
Six RCTs were reviewed that investigated the effects of auditory cueing on gait and balance in patients with Parkinson’s disease. Walking speed was measured in 5 of the RCTs. Outcome measures used included the 10-meter walk test, 6-meter walk test, Dynamic Gait index (DGI), Rapid Step-Up Test, Force Plate Analysis, and the Posturo-Locomotion Manual Method (PLM). Balance was measured in 4 of RCTs. Outcome measures used consisted of the Berg Balance test, the Push and Release test, MiniBest, Smart Equitest, Timed Up-and-Go (TUG), Functional Gait Assessment (FGA) and the Tinetti balance assessment too. Rhythmic Auditory Cues were found to improve dynamic balance, motor function, and gait.

Discussion and Conclusion
Applying RAC along with physical therapy should be considered in patients just as any other intervention or modality. Current research is mostly limited with weak study designs, inconsistent intervention patterns, and small sample sizes. Future research on RAC for patients with Parkinson’s disease should use a strong research design and evaluate carryover to functional independence and the effect on participation. The studies suggested that gait and balance training should be started early, as falls occur clinically when the patient has already exhausted all compensatory resources used by the nervous system. Based on the research, there seems to be sufficient evidence for the use of RAC in the clinical setting for retraining gait and balance in patients with Parkinson’s disease. However, more research on the intervention is needed.

Summary of Studies

<table>
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<tr>
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<th>PEDro Scores</th>
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<td>Da Costa Capato</td>
<td>8/10</td>
<td>Idiopathic PD, Stage II or III on H&amp;Y scale, Mini Mental Status</td>
<td>Examination score &gt; 24, presented with fall history in the past month, able to ambulate independently indoors without aid.</td>
<td>An exercise program aimed at improving balance for 5 weeks with two sessions a week, 45 min per session, consisting of general physical therapy exercises, Sessions divided into 3 parts: 5 minute warm up, 30 minute motor training, and a 10 minute cool down. RAC group received cues via a metronome.</td>
<td>Berg Balance Scale, postural stress test, push and release test, MiniBest, TUG Freezing of Gait Questionnaire, UPDRS, FES-I. RAC significantly decreased the fear of falling in older adults better than a wellness education program (p&lt;0.001 at 6 months) and (p&lt;0.001 at the end of the study)</td>
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<td>Harro</td>
<td>7/10</td>
<td>19-89 years old, diagnosis of idiopathic PD, stage III on the H&amp;Y scale, ability to walk continuously with or without physical assistance for five minutes with or without an assistive device, stable PD medication schedule and dosing over the past month. As reported by the participants neurologist, and functional vision and hearing sufficient to perceive cues with or without aids/dissagles</td>
<td>Auditory-cued over-ground locomotor training on an indoor track while listening to a personalized music playlist set at subject-specific beats per minute (bpm). Three, 30 minute training sessions per week for 6 weeks.</td>
<td>CGS, FGS based on the 10-meter walk test, MMWT, FGA, Rapid Step-Up Test, Berg Balance Scale, Standardized measures on the SMART EquiTest System (Limits of Stability and Control, and Sensory Organization Tests)</td>
<td>Within-group training effects showed significant gains in CGS, MMWT, and FGA for the RAC group. Retention effects found at 3 month follow-up for all gait measures in RAC group. No statistically significant differences in gait measures were found between groups</td>
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<td>Kadover</td>
<td>7/10</td>
<td>Idiopathic PD stage II-IV on H&amp;Y, stable drug use, independent in stance and walk without assistive device and able to differentiate auditory cues</td>
<td>Subjects performed external cued stepping from RAC at various speeds. All participants trained 1 week/week for 45-60 minutes for 6 weeks following recommendations to enhance motor control and progression.</td>
<td>DGI, UPDRS, Tinetti, TUG, FOOG.</td>
<td>Significant improvements in DGI, TUG, Tinetti, and FOG in the RAC group. Maintained improvements 4 weeks post study. Control group showed significant improvement in the TUG</td>
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Key: H&Y = Hoehn and Yahr scale, BBG = Berg Balance Scale, TUG = Timed up and go, UPDRS = unified Parkinson’s disease rating scale, FES-I = Falls Efficacy Scale International, CGS = Comfortable gait speed, MMWT = 6 minute walk test, FGA = functional gait assessment, DGI = Dynamic gait index, FOGG = Freezing of Gait Questionnaire, FOG = Fast Gait Speed

References

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