

Evidence Table

Vestibular and Balance Rehab for People with Multiple Sclerosis

PICO Question: For individuals with Multiple Sclerosis are vestibular interventions more effective than balance exercises at improving scores on balance functional assessments?

MS = Multiple Sclerosis, PT = Physical Therapist, HEP = Home Exercise Program, S-M=sensory and motor retraining, M=motor retraining, AD = assistive device, TUG = Timed Up and Go, BBS = Berg Balance Scale, DGI = Dynamic Gait Index, DHI = Dizziness Handicap Inventory, RR = Relapsing Remitting MS, PP = Primary Progressive MS, SP = Secondary Progressive MS,

Author, Year, Journal, Title	Purpose of Study, Study Design	Subjects	Intervention	Outcome Measures Time Frame	Results (p<0.05)	Application to PICO	Comments
Badke et al. 2005 <i>The Annals of Otolaryngology, Rhinology, and Laryngology</i> Effects of Vestibular and Balance Rehabilitation on Sensory Organization and Dizziness Handicap	To assess balance recovery after vestibular and balance interventions and to determine patient's perception of dizziness handicap after discharge <u>Study Design</u> Retrospective case series	<u>Peripheral Dysfunction</u> n=12 Age: 49.1±5.16 Sex: males (4), females (8) SSx duration: 0-5 mo (7), >6 mo (5) <u>Central/Mixed</u> n=20 Age: 58.4±3.98 Sex: males (10), females (10) SSx duration: 0-5 mo (12), >6 mo (8)	<u>All participants:</u> -Vestibular rehab from PT and customized HEP (gaze stabilization, balance and gait training, habituation exercises) -Supervised 1 hour sessions -Reevaluation of progress each session	<u>Posturography (Neurocom Smart Balance Master System) - Equitest Sensory Organization software package,</u> evaluates 6 different sensory conditions (initial evaluation, discharge) <u>Dizziness Handicap Inventory</u> (initial evaluation, discharge, 8-12 months after discharge)	<u>Statistically significant differences:</u> -Vestibular scores before and after rehab in both groups -Visual scores before and after rehab in CNS group only -Mean DHI and total DHI score before and after rehab for CNS group only	Vestibular and balance rehabilitation therapy resulted in improved vestibular and composite posturography scores in patients with peripheral and central vestibular disorders	<u>Limitations</u> -Small study size -No control group -Retrospective design Considerations: -Vestibular screening important for pts with dizziness/disequilibrium

<p>Cattaneo et al. 2007 <i>Clinical Rehabilitation</i></p> <p>Effects of Balance Exercises on People with Multiple Sclerosis: a pilot study</p>	<p>Evaluate effects of balance retraining on people with multiple sclerosis using motor and sensory-motor retraining methods</p> <p><u>Study Design</u> Randomized Controlled Trial</p>	<p><u>S-M Group (1)</u> n=23 age: 44.8±11.2 onset (yrs): 13.2±10.1 AD (%): 35 Male (%): 15</p> <p><u>M Group (2)</u> n=12 age: 47.7±8.7 onset (yrs): 15±4.4 AD (%): 36.4 Male (%): 36.4</p> <p><u>Control Group (3)</u>, n=15 age: 46.5±10.7 onset (yrs): 13.3±8.7 AD (%): 30.8 Male (%): 46.2</p>	<p><u>All groups:</u> -10-12 sessions over 3 weeks -45 minute sessions</p> <p><u>S-M Group (1)</u> -Tailored interventions in motor strategies with static and dynamic standing, sensory strategies for vestibular/somatosensory systems</p> <p><u>M Group (2)</u> -Only motor strategies described above</p> <p><u>Control Group (3)</u> -Conventional therapy, exercises aimed at improving balance deficits</p>	<p><u>Assessments</u> -Berg Balance Scale (BBS) -Dynamic Gait Index (DGI) -Dizziness Handicap Inventory (DHI) -Activities-specific Balance Confidence Scale</p> <p><u>Assessments taken:</u> -Initial assessment -After completion of program -3 weeks after completion</p>	<p><u>Statistically Significant Findings:</u> -Berg Balance scores between groups 1 & 3, and 2 & 3 -DGI scores between groups 1 & 3, and 2 & 3 -No significant differences in DHI or Activities-Specific Balance Confidence Scale -No significant differences between groups 1 and 2</p>	<p>Even though there were not statistically significant differences between groups 1 and 2, integrating balance rehabilitation interventions with both motor and sensory strategies is important for patients with MS.</p>	<p><u>Limitations</u> -Dropouts, led to lower sample size -Power not addressed -Possible ceiling effect of Berg Balance Scale -Only 10-12 treatment sessions</p> <p><u>Considerations</u> -Perform a good balance assessment to determine components contributing to impairments, so that you can treat specific problems and observe better results</p>
<p>Freeman et al. 2010 <i>Multiple Sclerosis</i></p> <p>The Effect of Core Stability Training on Balance and Mobility in Ambulant Individuals with Multiple Sclerosis: a multi-centre series of single case studies</p>	<p>Evaluate the effect of core stability training on balance and mobility in ambulant patients with MS.</p> <p><u>Study Design</u> Multi-centre</p>	<p>8 participants ages: 32-58 sex: males (6), females (2) MS type: RR (3), PP (5) AD: 75%</p>	<p><u>Intervention Phase (8 weeks)</u> -16 individualized core stability exercises -30 minute sessions, 2x/week -Individualized 15 minute HEP</p>	<p><u>Assessments:</u> -10-meter timed walk -TUG -MS Walking Scale-12 -Activities-Specific Balance Confidence Scale -Timed Single Leg</p>	<p><u>Statistically Significant Findings:</u> -Improvement from baseline after intervention phase for timed walk, MS Walking Scale,</p>	<p>I think that provided the data obtained from this study that core stability training can be a beneficial intervention for people with MS</p>	<p><u>Limitations</u> -Small sample size, case series design -Only ambulant participants were studied</p> <p><u>Considerations</u> - If trunk</p>

	series of 8 single case studies			Stance -Visual Analog Scale <u>Assessments Taken:</u> -Prior to intervention on a weekly basis for 4 weeks (baseline) -Weekly during 8 week intervention phase -Weekly during 4 week withdrawal phase	Forward and Lateral Functional Reach -Improvement from baseline through withdrawal phase on TUG	to improve balance and mobility. A randomized controlled trial is required to confirm the results of this study, but it is a good start.	strength could be assessed in the quadruped and tall kneel position that would be beneficial. -I would use core stability training in conjunction with other balance training using motor and sensory strategies as well.
Jackson et al. 1995 <i>American Journal of Otology</i> Abnormalities in Posturography and estimations of visual vertical and horizontal in multiple sclerosis	Evaluate if standard test procedure of dynamic posturography demonstrated a pattern of responses that could assist in differential diagnosis of patients with MS with dysequilibrium <u>Study Design</u> Cross Sectional Study	<u>Only Data on Sample</u> -25 participants tested -All had previously been diagnosed with MS. -Subjects had to be able to stand 5 minutes with no support and walk 20 feet with no aid.	<u>All Participants</u> -Tested on NeuroCom Equitest, batteries carried out: sensory organization, subjective vertical and horizontal -Visual test also performed by 35 normal volunteers with no CNS disease of symptoms of dysequilibrium	<u>Assessment</u> -NeuroCom Dynamic Posturography <u>Assessment taken:</u> -Once during study	<u>No P values discussed</u> -No patient with MS produced both normal values for latency and adaptation. -3 of the 25 subjects tested produced values within normal limits for the visual alignment tests in the 3 different positions.	Study demonstrates importance of physical therapists developing treatment interventions that address all aspects contributing to their dysequilibrium -Testing should be done to determine which components are a problem	<u>Limitations</u> -Very vague study in terms of sample and study characteristics -No statistical significant discussed <u>Considerations:</u> -Study shows high prevalence of impairments in various aspects of balance for people with MS, emphasizing a need for rehab.

<p>Herbert et al. 2011 <i>Physical Therapy</i></p> <p>Effects of Vestibular Rehabilitation on Multiple Sclerosis=Related Fatigue an Upright Postural Control: a randomized controlled trial</p>	<p>To investigate the benefits of a vestibular rehab program for decreasing fatigue and improving balance for people with MS</p> <p><u>Study Design</u> Randomized Controlled Trial</p>	<p><u>Experimental Group</u> -age: 46.8±10.5 -sex: males (3) females (9) -MS type: RR (11), SP (1) -MS duration: 6.5±5.6</p> <p><u>Exercise Control Group</u> - age: 42.6±10.4 -sex: males (2) females (11) -MS type: RR (11), SP (2) -MS duration: 5.1±3.2</p> <p><u>Waitlisted Control Group</u> -age: 50.2±9.2 -sex: males (2) females (11) -MS type: RR (12), SP (1) -MS duration: 9.1±7.3</p>	<p><u>Experimental Group</u> -Standardized vestibular rehab program of upright postural control and eye movement exercises -Exercises performed for 1-2 minutes -Session 55 minutes -HEP assigned -5 minute fatigue management info</p> <p><u>Exercise Control Group</u> -Endurance exercise (bike) and stretching for gastroc/soleus, quads, rectus femoris, hamstrings, gluteus maximus and iliopsoas -Daily HEP assigned -5 minute fatigue management info</p>	<p><u>Assessments</u> Primary -Modified Fatigue Impact Scale -Balance Master Posturography Secondary -6 minute walk test Secondary -DHI -Beck Depression Index</p> <p><u>Assessments Taken:</u> -Modified Fatigue Impact Scale, DHI, and Beck Depression Index: weeks 1,2,3,6,8,10,12 -Posturography and 6 minute walk tests: weeks 1,4,10,14</p>	<p><u>Statistically Significant Findings:</u> -Modified Fatigue Impact Scale scores between all groups (experimental group with most improvement) -Experimental group improvement on sensory organization test on Balance Master and DHI -Experimental group findings were maintained at follow up</p>	<p>The study shows that vestibular rehabilitation can be very beneficial and should be incorporated into treatment interventions for people with MS that have balance deficits</p>	<p><u>Limitation</u> -Same fatigue management information to both groups</p> <p><u>Considerations</u> - When working with patients with MS I will definitely screen them for balance deficits in each of the 3 areas (vision, somatosensory and vestibular) and provide interventions for as many components as necessary.</p>
<p>Soyuer et al. 2006 <i>Neurological Research</i></p> <p>Balance Performance in</p>	<p>Compare balance performance between patients with different</p>	<p><u>PP, n=30</u> -age: 40.1±4.61 -males (%):</p>	<p>Administration of functional outcome measures to all</p>	<p><u>Assessments</u> -Tinetti gait Timed 10 m walk Static stance (eyes</p>	<p><u>Statistically Significant Findings:</u> -Between PP and</p>	<p>Balance is a common problem in the MS population</p>	<p><u>Limitations</u> -Organization of study -Sample size</p>

<p>Three Forms of Multiple Sclerosis</p>	<p>forms of multiple sclerosis as well as compared to healthy control subjects</p> <p><u>Study Design</u> Cross Sectional</p>	<p>42.8 -duration(yrs): 2-8 <u>SP, n=34</u> -age: 40±13.14 -males (%): 35.3 -duration(yrs): 3-25 <u>RR, n=62</u> -age: 35.69±10.42 -males (%): 35.5 -duration(yrs): 1-7 <u>Control, n=31</u> -age: 35.03±11.62 -males (%): 48.4</p>	<p>patients</p>	<p>open/closed and bare feet) Dynamic Balance (functional reach test, arm raise and step test)</p> <p><u>Assessments Taken:</u> -Baseline to compare</p>	<p>SP on feet apart with eyes closed -Between PP and RR in all tests except right and left arm raised, feet apart eyes closed, and feet together eyes open -Between SP and RR in all tests except raising right and left arm tests</p>	<p>and this study highlights the increased severity of balance deficits and risk for falls in the progressive forms. RRMS demonstrated more visual problems whereas the progressive forms demonstrated more somatosensory and vestibular dysfunctions so treatment programs will need to be tailored to the specific deficits that the patient is having which relates to their form of MS.</p>	<p><u>Considerations</u> - I would consider using some of the measures outlined in the study to assess patients with MS, and may use some of the components as interventions/exercises to improve deficits</p>
<p>Learmonth et al. 2011 <i>Clinical Rehabilitation</i></p> <p>The Effects of a 12-week Leisure Centre-Based, Group Exercise Intervention for People</p>	<p>To evaluate a 12-week group exercise intervention on MS symptoms for people with MS that are</p>	<p><u>Intervention Group, n=20</u> -age: 51.4±8.06 -sex: males (5) females (15) -EDSS:</p>	<p><u>Intervention Group</u> -Leisure centre-based exercise class 2x/week for 12 weeks -10 minute warm</p>	<p><u>Assessments</u> Primary -Timed 25 foot walk Secondary -6-minute walk test</p>	<p><u>Statistically Significant Findings:</u> -Improvement on 25 foot walk test in intervention</p>	<p>There was evidence from the study though, that this combined exercise program could</p>	<p><u>Limitations</u> -Small sample size -Participant compliance with program</p>

<p>Moderately Affected with Multiple Sclerosis: a randomized controlled pilot study</p>	<p>moderately affected</p> <p><u>Study Design</u> Randomized Controlled Pilot Study</p>	<p>6.14±.36 <u>Control Group</u> --age: 51.8±8.0 -sex: males (4) females (8) -EDSS: 5.82±0.51</p>	<p>up -30-40 minutes of circuit exercises (endurance, strength and balance) -5-10 minute cool down -Exercise circuit (8-12 different exercises, for 1 minute each) <u>Control Group</u> -advised to continue usual activity, but to avoid starting new exercise program during 12 week intervention phase</p>	<p>-BBS -TUG -Break Test for quadriceps -Phone FITT questionnaire -Activities Balance Confidence Scale -Fatigue Severity Scale -Hospital Anxiety and Depression Scale -Goal Attainment Scale <u>Assessments Taken:</u> -Baseline -After 8 weeks of intervention -After 12 weeks of intervention</p>	<p>group -No significant improvements on TUG -Phone FITT, Activities Balance Confidence Scale showed significant improvement in the intervention group</p>	<p>be beneficial for patients in improving activity levels, balance and strength.</p>	<p><u>Considerations</u> - I would consider each patient's specific deficits and try to incorporate all 3 types of exercise into a home exercise or wellness program for them.</p>
<p>Prosperini et al. 2010 <i>Multiple Sclerosis</i></p> <p>Visio=proprioceptive training reduces risk of falls in patients with multiple sclerosis</p>	<p>Investigate effectiveness of visio-proprioceptive feedback training in ameliorating balance and reducing risk of falls in people with MS</p> <p><u>Study Design</u> Cross Sectional</p>	<p>n=40 age: 40.3±11.7 sex: males (16) females (24) MS type: RR (26), SP (14), PP (1) EDSS: 1.5-5.5, mean 3.5</p>	<p>-12 session (2x/week) of visio-proprioceptive rehab -Sessions were 45 minutes -Static and dynamic exercises in various stances, progressed as appropriate, measured visual trace during</p>	<p><u>Assessments</u> -Timed 25 foot walk -DHI -Fatigue Severity Scale -MS Quality of Life-54 -Delos Postural Proprioceptive System -Stabliometric Test (normal stance eyes open</p>	<p><u>Statistically Significant Findings:</u> -Significant improvement in timed 25 foot walk test and the DHI -No significant changes in EDSS, fatigue severity scale, or MS Quality of Life-54</p>	<p>The study shows that visio-proceptive training can be effective in improving balance in MS and thus reducing risk of falls</p>	<p><u>Limitations</u> -Small sample size -No follow up <u>Considerations</u> - A lot of the exercises described are very high level and I would consider their safety and perform exercises with a</p>

			<p>exercises</p>	<p>and closed, Romberg stance with eyes open and closed -Single leg stance <u>Assessments</u> <u>Taken:</u> -Baseline -After 6-week period without intervention, -After 6-week training protocol</p>			<p>gait belt and in parallel bars, especially if on a tilt board or something like that. I would also want to consider and evaluate for sensation abnormalities in the lower extremities which could alter intervention effectiveness.</p>
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