

Title: **Pusher Syndrome Post-Stroke: Background Information, Patient Presentation, and Evidence-Based Intervention Strategies**

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Search Conducted: 9/13/16-2/11/16

Databases Searched: PubMed, Web of Science, CINAHL

The following evidence table includes research that assessed specific Pusher Syndrome (PS) interventions post-stroke. Given the scant availability of research regarding PS, the original search was broadened to include the general stroke population. A complete list of evidence from the search strategy can be found in the Clinically Appraised Topic (CAT).

| Author, Year | Study Design/Purpose | Intervention | | Outcome Measure(s) | Findings | Comments |
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| | | Experimental | Control | | | |
| Yang Y-R, et al., 2015 ¹ | Pilot Randomized Controlled Trial <u>Purpose:</u> To compare the effectiveness of two different visual feedback interventions to reduce pushing behavior post-stroke | Experimental group (EG) received 20 minutes of computer-generated interactive visual feedback training using a Nintendo Wii balance system, assisted by a physical therapist. The intervention was followed by 20 minutes of traditional physical therapy (PT). The intervention occurred 3x/week for 3 weeks. | Control group (CG) received 20 minutes of visual feedback therapy via a full-body mirror, performed by a physical therapist. The intervention was followed by 20 minutes of traditional PT. The intervention occurred 3x/week for 3 weeks. | <ul style="list-style-type: none"> Scale for Contraversive Pushing (SCP) Berg Balance Scale (BBS) Fugl-Meyer Assessment scale (FMA) Upper Extremity (UE) and Lower Extremity (LE) | EG showed significant improvement on the SCP, BBS, and FMA LE following the trial. CG showed significant improvement in mean scores on the SCP, BBS, and FMA LE following the trial. The effect sizes for the SCP and the BBS are both statistically significant in favor of the experimental group. | Computer-generated interactive visual feedback is more effective in improving balance and reducing pushing behavior. The technology of the Wii balance system may be too costly for some clinics. The mirror therapy is still proven to be effective for patients with PS. |
| Krewer C, et al., 2013 ² | Randomized Cross-over Study <u>Purpose:</u> To evaluate the immediate results of various interventions on patients with PS | <i>Stroke patients with PS</i> EG received all three interventions in pseudo-random order over the course of 1 week: - PT utilizing visual | <i>Stroke patients without PS</i> CG received same intervention as EG. | <ul style="list-style-type: none"> SCP Burke Lateropulsion Scale (BLS) | - EG showed statistically significant improvement on the BLS following DGO. - No statistically significant differences in the BLS for the GVS or PT-vf interventions for EG. | - The BLS is more sensitive to change in pushing behavior compared to the SCP. - Applying the DGO Lokomat intervention with |

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| | | <p>feedback (PT-vf)</p> <ul style="list-style-type: none"> - Galvanic vestibular stimulation (GVS) - Gait training (DGO) using the Lokomat machine | | | <p>-There were no statistically significant differences in SCP between interventions for EG. -CG demonstrated no change.</p> | <p>patients demonstrating PS is more effective in the short-term to reduce pushing behavior than GVS and PT-vf interventions.</p> |
| <p>Gandolfi M, et al., 2016³</p> | <p>Pilot Randomized Controlled Trial</p> <p><u>Purpose:</u> To compare the effects of postural orientation training (POT) with traditional PT for patients presenting with PS post-stroke.</p> | <p>EG received POT incorporating use of somatosensory and visual cueing. Patients received 10 minutes of traditional PT PROM, following by 40 minutes of POT. POT included exercises in sitting and standing with repeated use of external visual cues to promote upright posture.</p> <p>Treatment occurred 5 day/week for 4 weeks.</p> | <p>CG received 40 minutes of traditional PT exercises, in addition to 10 minutes of passive mobilization of the involved extremity. Traditional interventions included sitting, standing, and supine exercises.</p> <p>Treatment occurred 5 day/week for 4 weeks.</p> | <ul style="list-style-type: none"> • SCP • European Stroke Scale (ESS) • Postural Assessment for Stroke Scale (PASS) | <p>Both the EG and the CG demonstrated improvement on all outcome measures.</p> <p>The differences between the EG and the CG were not significant. However, the effect size calculations favor the EG intervention.</p> | <p>Both traditional treatment and POT significantly improve pushing behavior. POT should be included in plan of care for patients with PS given the effect size calculations.</p> |
| <p>Fujino Y, et al., 2016⁴</p> | <p>Case Series</p> <p><u>Purpose:</u> To evaluate the effects of prone positioning relaxation on 3 patients with severe PS.</p> | <p>Three patients with severe PS received “relaxation therapy” while positioned in prone for 10 minutes/day for 2 days.</p> <p>Patients continued to receive</p> | <p>N/A</p> | <ul style="list-style-type: none"> • SCP • Trunk Control Test (TCT) • Patient report regarding use of uninvolved extremities • Patient report regarding sense of vertical | <p>- All patients demonstrated improvement on the SCP and TCT following the intervention; improvements persisted through follow-up.</p> <p>- All patients continued to report</p> | <p>Prone positioning relaxation may reduce the excessive motor output demonstrated in PS. However, prone positioning does not impact the incorrect</p> |

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| | | traditional PT. | | | incorrectly perceived sense of vertical. | vertical alignment. |
| Broetz D, Johannsen L, Karnath H-O, 2004 ⁵ | Case Report <u>Purpose:</u> To evaluate the effectiveness of a visual feedback training program to realign vertical in patients with PS. | Eight patients with PS were treated in the inpatient environment utilizing visual cues and reaching to correct posture. Physical therapists allowed to patient to fall while sitting in bed to demonstrate the vertical misperception. Treatments occurred 30 minutes/day, 6 days per week. | N/A | <ul style="list-style-type: none"> • SCP | Following 24 days of treatment, all patients showed significant improvement in SCP. At day 18 s/p stroke, all participants were able to achieve supported standing with physical therapist support. | This case report demonstrates that patients may require over 3 weeks to reduce signs of PS if presentation is severe upon evaluation. Intensive PT that integrates external visual cues can reduce PS and improve functional performance. |
| Paci M, Nannetti L, 2004 ⁶ | Case Report <u>Purpose:</u> To evaluate the effectiveness of visual, auditory, and somatosensory stimuli on the presence of pushing behavior. | The interventions included pelvic tilts, standing or sitting with pushing with extremities against a wall or table, standing in front of full-length mirror, weight shifting, and stepping. Treatments occurred 2 hours/day, 5 days/week, and 2 hour/day on Saturdays. The trial period was 3 weeks. | N/A | <ul style="list-style-type: none"> • SCP • FMA • Lindmark (motor component) • Barthel Index • Modified Ashworth Scale | Patient improved in outcome measures, but none of the improvements reached statistical significance. Patient was able to ambulate independently with quad cane following 2 weeks of intervention. Treatment sessions utilizing visual and auditory feedback demonstrated strong immediate effects, but no carry-over to future sessions. | Auditory and visual cues should be integrated into PT plan of care for patients with PS. These activities may be included to improve patient prognosis and potential for independent ambulation. |

References

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5. Broetz D, Johannsen L, Karnath H-O. Time course of “pusher syndrome” under visual feedback treatment. *Physiother Res Int*. 2004;9(3):138-143. <http://www.ncbi.nlm.nih.gov/pubmed/15560671>. Accessed October 10, 2016.
6. Paci M, Nannetti L. Physiotherapy for pusher behaviour in a patient with post-stroke hemiplegia. *J Rehabil Med*. 2004;36(4):183-185. doi:10.1080/16501970410029762.