

ORIGINAL ARTICLE

# Effects of Cervical Spine Manual Therapy on Range of Motion, Head Repositioning, and Balance in Participants With Cervicogenic Dizziness: A Randomized Controlled Trial



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## Abstract

**Objective:** To evaluate and compare the effects of 2 manual therapy interventions on cervical spine range of motion (ROM), head repositioning accuracy, and balance in patients with chronic cervicogenic dizziness.

**Design:** Randomized controlled trial with 12-week follow-up using blinded outcome assessment.

**Setting:** University School of Health Sciences.

**Participants:** Participants (N=86; mean age  $\pm$  SD, 62.0 $\pm$ 12.7y; 50% women) with chronic cervicogenic dizziness.

**Interventions:** Participants were randomly assigned to 1 of 3 groups: sustained natural apophyseal glides (SNAGs) with self-SNAG exercises, passive joint mobilization (PJM) with ROM exercises, or a placebo. Participants each received 2 to 6 treatments over 6 weeks.

**Main Outcome Measures:** Cervical ROM, head repositioning accuracy, and balance.

**Results:** SNAG therapy resulted in improved ( $P\leq.05$ ) cervical spine ROM in all 6 physiological cervical spine movement directions immediately posttreatment and at 12 weeks. Treatment with PJM resulted in improvement in 1 of the 6 cervical movement directions posttreatment and 1 movement direction at 12 weeks. There was a greater improvement ( $P<.01$ ) after SNAGs than PJM in extension (mean difference,  $-7.5^\circ$ ; 95% confidence interval [CI],  $-13^\circ$  to  $-2.0^\circ$ ) and right rotation (mean difference,  $-6.8^\circ$ ; 95% CI,  $-11.5^\circ$  to  $-2.1^\circ$ ) posttreatment. Manual therapy had no effect on balance or head repositioning accuracy.

**Conclusions:** SNAG treatment improved cervical ROM, and the effects were maintained for 12 weeks after treatment. PJM had very limited impact on cervical ROM. There was no conclusive effect of SNAGs or PJMs on joint repositioning accuracy or balance in people with cervicogenic dizziness.

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Cervicogenic dizziness is described as a sensation of unsteadiness or disequilibrium that occurs together with pain and/or stiffness of the cervical spine and is triggered by neck movements or positions. Dizziness is a common symptom in people with cervical spine dysfunction.<sup>1-5</sup> Management of this condition is challenging

because the source of symptoms is difficult to identify. However, there is moderate (level 2) evidence that cervical spine manual therapy is effective in reducing cervicogenic dizziness.<sup>1,5-11</sup> A recent randomized controlled trial<sup>12</sup> by the authors found that 2 common forms of manual therapy, Mulligan sustained natural apophyseal glides (SNAGs) and Maitland low-velocity passive joint mobilization (PJM), reduced both the intensity and frequency of dizziness at 12 weeks compared with a placebo (all  $P<.05$ ).

Previous studies<sup>13-15</sup> have reported that patients with cervical spine dysfunction have reduced cervical range of motion (ROM),

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greater head repositioning errors,<sup>2,13,16-19</sup> and deficits in their balance<sup>3,20-24</sup> compared with healthy controls.<sup>13-15,25</sup> Most of these studies, however, were of patients with whiplash-associated disorder who often report dizziness. In contrast, 1 study<sup>5</sup> of 22 patients (mean age, 37y) with cervicogenic dizziness found that patients had a normal or larger ROM than age- and sex-matched controls.

Although there is evidence that manual therapy reduces self-reported dizziness in patients with cervicogenic dizziness, there is limited evidence for the effect of manual therapy on cervical ROM, balance, and sensorimotor dysfunction in this population.<sup>1,6-9,11,26,27</sup> Cervical ROM has been shown to improve in people with cervicogenic dizziness after treatment with SNAGs, high-velocity thrust manipulation, and using a multimodal approach.<sup>5,7,26,28</sup> Balance has been shown to improve after SNAGs.<sup>1</sup> Additionally, manipulation has been shown to improve head repositioning in this population.<sup>26,27</sup> There have been no randomized controlled trials assessing the effect of PJM on cervicogenic dizziness in spite of PJM's being a commonly used manual therapy technique for cervical dysfunction and pain.<sup>29-31</sup>

The aim of this study was to determine whether Mulligan SNAGs (with self-SNAGs) or Maitland PJMs (with ROM exercises) improves cervical ROM, head repositioning accuracy, and/or balance in people with chronic cervicogenic dizziness, and whether one of these manual therapy approaches was more effective than the other. This current article is a secondary report on the effects of manual therapy on physical measures of participants with cervicogenic dizziness.<sup>12</sup>

## Methods

### Study design

This study was a double-blind, randomized controlled trial in which participants with cervicogenic dizziness were randomly assigned to receive cervical spine SNAGs, PJM, or a placebo. Each participant was provided with 2 to 6 treatments over 6 weeks, with the number of treatments for each individual determined by the clinical judgment of the treating clinician based on the individual participant's apparent response to treatment. Detailed methods for this study have been previously reported.<sup>12,32</sup> The outcome measures were cervical ROM, head repositioning accuracy, and balance. Measurements were taken at baseline, immediately posttreatment, and at 12 weeks after the intervention. The University of Newcastle Human Research Ethics Committee approved this study (No H-2009-0377), and all participants provided written informed consent.

### Participants

Volunteers aged 18 to 90 years with cervicogenic dizziness for 3 months or longer were recruited from April 2010 to December 2011 via media releases and letters to general practitioners and neurologists in the Hunter region of New South Wales, Australia.

#### *List of abbreviations:*

CI	confidence interval
CROM	Cervical Range of Motion
NHP	neutral head position
PJM	passive joint mobilization
ROM	range of motion
SNAG	sustained natural apophyseal glide

Those who responded to this call for participants were first screened via a telephone interview to determine whether they had symptoms consistent with cervicogenic dizziness and not symptoms indicating other forms of dizziness such as vertigo. To be included in the study, participants had to report (1) non-rotatory dizziness that was described as imbalance or unsteadiness, and was triggered by neck movements or positions; and (2) a stiff or painful neck, or both. Potential participants who passed this telephone screening then underwent a series of clinical tests with a physical therapist who assessed cervical spine ROM, palpated the cervical muscles, performed passive accessory intervertebral movements to the cervical spine joints, and performed the Dix-Hallpike maneuver (to identify and exclude those with benign paroxysmal positional vertigo). If not excluded, the potential participant was then examined by an otoneurologist and underwent vestibular function testing to diagnose cervicogenic dizziness and exclude other causes of dizziness. This process has been described in more detail previously.<sup>32</sup> Potential participants were also excluded if they were receiving workers' compensation, were pregnant, were unable to read English, or had conditions for which manual therapy was contraindicated, such as inflammatory diseases, spinal cord pathology, and cervical spine cancer.

### Randomization

Participants who met the inclusion criteria were randomly allocated to 1 of 3 intervention groups. The randomization sequence was created by an independent statistician and concealed in sequentially numbered envelopes. The randomization sequence contained equal numbers in each group but was otherwise unrestricted.

### Blinding

Data collection and data entry were conducted by research assistants who were blinded to treatment allocation. Throughout the study, participants were blinded as to whether they received a placebo or active intervention. It was not possible to blind the physical therapist administering the interventions.

### Interventions

All the interventions were performed by an experienced Australian-licensed physical therapist with formal postprofessional training in both the Maitland and Mulligan manual therapy approaches.

### Sustained natural apophyseal guides

One group of participants received SNAGs as described by Mulligan.<sup>33</sup> As participants moved their head in the direction that produced dizziness, the physical therapist gently applied a glide to the C1 or C2 vertebra anteriorly and sustained the glide through the movement. This procedure was repeated 6 times at the first treatment session as recommended by Mulligan.<sup>33</sup> During the application of the procedure, the participant should be entirely symptom-free. At the second treatment session, manual therapy was repeated, and the participant was advised how to self-SNAG using a strap placed on the cervical spine, as a home exercise to be performed as 6 repetitions once daily.<sup>33</sup> The participant was asked to perform these exercises for 12 weeks and record compliance in a diary.

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