Effectiveness of Chiropractic Care to Improve Sensorimotor Function Associated With Falls Risk in Older People: A Randomized Controlled Trial

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Abstract

Objective: This study assessed whether 12 weeks of chiropractic care was effective in improving sensorimotor function associated with fall risk, compared with no intervention, in community-dwelling older adults living in Auckland, New Zealand.

Methods: Sixty community-dwelling adults older than 65 years were enrolled in the study. Outcome measures were assessed at baseline, 4 weeks, and 12 weeks and included proprioception (ankle joint position sense), postural stability (static posturography), sensorimotor function (choice stepping reaction time), multisensory integration (sound-induced flash illusion), and health-related quality of life (SF-36).

Results: Over 12 weeks, the chiropractic group improved compared with the control group in choice stepping reaction time (119 milliseconds; 95% confidence interval [CI], 26-212 milliseconds; $P = .01$) and sound-induced flash illusion (13.5%; 95% CI, 2.9%-24.0%; $P = .01$). Ankle joint position sense improved across the 4- and 12-week assessments (0.20°; 95% CI, 0.01°-0.39°; $P = .049$). Improvements were also seen between weeks 4 and 12 in the SF-36 physical component of quality of life (2.4; 95% CI, 0.04-4.8; $P = .04$) compared with control.

Conclusion: Sensorimotor function and multisensory integration associated with fall risk and the physical component of quality of life improved in older adults receiving chiropractic care compared with control. Future research is needed to investigate the mechanisms of action that contributed to the observed changes in this study and whether chiropractic care has an impact on actual falls risk in older adults. (J Manipulative Physiol Ther 2016;xx:1-13)

Key Indexing Terms: *Chiropractic; Feedback, Sensory; Aged; Postural Balance; Proprioception; Quality of Life; Accidental Falls*

Falls are a significant cause of death, injury, and loss of quality of life in older adults.[1] Falls account for more than 80% of injury-related hospital admissions in people older than 65 years, and they are the leading cause of injury-related death in older adults.[2,3] Approximately 30%-40% of community-dwelling older adults suffer from at least 1 fall per year.[4,5] This incidence rate rises dramatically with increasing age or when a variety of risk factors are present.[5] Compared with healthy community-dwelling older adults, the risk of falling increases in those experiencing lower limb muscle weakness (odds ratio [OR] = 4.4), gait deficits (OR = 2.9), or balance deficits (OR = 2.9); in those with a recent history of falling (OR = 3.0); and in individuals older than 80 years compared with those younger than 80 years (OR = 1.7).[6] Many of these risk factors are influenced by the general deterioration in the function of sensorimotor systems that regularly occur with normal aging.[7] Falls are often multifactorial in their origin, with no specific single cause being identified.[6] The most common causes of falls reported in the literature are accident and environment-related causes (31%), followed by gait and balance disorders (17%), and dizziness and vertigo (13%).[6]

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The role that chiropractors and other manual therapists may play in preventing falls in their patients is currently unclear. To date, few controlled trials have investigated how chiropractors and other manual therapists may influence falls risk.[8] There is however a growing body of basic science evidence that suggests that chiropractic care may influence sensory and motor systems that potentially have an impact on some of the neuromuscular risk factors associated with falling.[9] The extent of this potential impact, if any, is currently unknown. This study aimed to investigate this potential relationship by assessing whether usual chiropractic care had an impact on measures of sensorimotor function associated with falls risk in older adults over a 12-week period.

Methods

This single-blind, parallel-group, randomized controlled trial was conducted in Auckland, New Zealand, from May 2012 to June 2013.

Inclusion/Exclusion Criteria

Chiropractic practices were enrolled based on convenience and geographical location. Chiropractors were eligible to participate if they were registered with the New Zealand Chiropractic Board, had a permanent practice, and were available to see new patients.

Eligible study participants were community-dwelling adults 65 years or older, living in Auckland, who could understand the study information and consent process and wanted to receive chiropractic care. Volunteers were ineligible if they were wheel-chair bound, if they were unable to remain standing unassisted for a minimum of 1 minute, if they had received spinal manipulation within the previous 6 months, or if they were considered to be at risk of suffering an adverse event due to chiropractic care based on their clinical history. A convenience sampling frame was used to recruit participants through local advertisements at participating chiropractic practices, social media, and word of mouth.

Interventions

Participants were randomized to 12 weeks of chiropractic care or a usual care "control." Chiropractic care was provided by 12 chiropractic practices from across Auckland in their usual practice setting. Chiropractors were asked to care for study participants like any other patient presenting to their practice, apart from providing care at no charge. The type of care provided varied based on the chiropractors preferred technique approach and the participant's case history and examination findings. Techniques used included high-velocity, low-amplitude; table-assisted; and instrument-assisted adjustment approaches. Chiropractors were asked to summarize the nature of the care they provided by indicating which of these technique approaches were used with each participant. Control participants continued with any usual health care they required, or wished to engage in, during the course of the study.

Trial Outcomes

Outcomes included measures of sensorimotor function and quality of life. The primary outcome was joint position sense.[10] Secondary outcomes were choice stepping reaction time (CSRT),[11] postural stability, multisensory processing,[12] and health-related quality of life using the SF-36 version 2.0 short-form health survey.[13]

Joint Position Sense. Joint position sense error was measured at the ankle using an active/active method based on previously published protocols.[10] Participants stood with 1 foot on a swiveling platform and 1 foot on a stable base. They were then able to actively rotate the platform in order to place their ankle into plantar/dorsiflexion or inversion/eversion. Participants started in a neutral ankle position and were then asked to select a specific target ankle joint angle that was within their comfortable functional range. They were then instructed to return their ankle to the neutral position, before being asked to reproduce or match the target position. Continuous goniometric measurements of ankle angle were collected based on the angle of the platform using potentiometers that had a recording capability of 0.01°. Computation of ankle joint position sense error was obtained using the average absolute constant error between the target and actual angle across 20 trials (5 trials each for inversion, eversion, plantar flexion, and dorsiflexion angle presented in a random order).

Choice Stepping Reaction Time. Choice stepping reaction time involves an individual standing on a platform with 2 panels in front of them, 1 in front of each foot and 1 panel beside each foot. These panels can be individually illuminated, and the study participant is asked to place their corresponding foot on the illuminated panel as quickly as possible. The time taken from the panel illuminating until the foot is planted on the panel is called the *choice stepping reaction time*. This device was based on similar instruments used in a number of previous studies.[11,14,15] Choice stepping reaction time provides a broad composite measure for the neuropsychological and sensorimotor factors that are important when formulating and initiating appropriate compensatory steps.[11] Each assessment involved 20 trials, with 5 trials per panel. Panels were illuminated in a random order to eliminate anticipatory movements. The average time taken during the 20 trials was used in the analysis.

Postural Stability. A computerized balance platform (CAPs Lite Computerized Posturography System by Vestibular Technologies, Cheyenne, WY) was used to measure postural stability. The participants were assessed using an "eyes closed on an unstable foam surface" testing condition as the primary assessment of postural stability. We intended to use the "stability score" as the outcome for this assessment, which compares the amount of the participant's sway throughout the duration of the test to