

# Case Study

## Improvement in Sensorimotor Function, Postural Stability, Joint Position Sense and Reaction Time in an Asymptomatic 74-year-old Male Receiving Chiropractic Care

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### Abstract

**Objective:** To describe and discuss improvements in sensorimotor function in a 74-year-old male receiving chiropractic care.

**Clinical Features:** A 74-year-old male patient presented for chiropractic care as a participant in a chiropractic clinical trial.

**Intervention and Outcome:** The patient received Torque Release Technique Chiropractic Care for three months. After the three months of care, significant improvements were observed in postural stability, joint position sense and reaction time.

**Conclusion:** This case report documents the improvement in sensorimotor function in a 74-year-old male receiving chiropractic care. Further research is required to determine the role chiropractors may play in improving sensorimotor function in older people.

**Keywords:** Chiropractic, vertebral subluxation, adjustment, Geriatrics, Sensorimotor Function, Torque Release Technique, Postural Stability, Joint Position Sense, Reaction Time

### Introduction

Sensory processing involves combining information from multiple sensory modalities in the brain to effectively process information from the environment.<sup>1</sup> For sensory processing to be most efficient both central and peripheral sensory organs must be functioning appropriately.<sup>2,3</sup> Sensorimotor function is how the body uses that sensory information to form an appropriate motor response.<sup>4</sup>

As one gets older the ability to process sensorimotor information declines.<sup>5</sup> This may include a reduction in postural stability, joint position sense, vibration perception and touch thresholds;<sup>6</sup> and decreased simple and complex reaction times.<sup>7</sup>

It has been suggested that chiropractic adjustments could result in changes to sensorimotor function within the central nervous system.<sup>4</sup> There is a growing body of evidence that suggests that sensorimotor function involves properties linked to adaptation and homeostasis, and that chiropractic

adjustments influence many of these integrative neural processes such as proprioception, somatosensory processing and feed forward activation.<sup>8-10</sup>

The purpose of this case report is to document the objective improvement in sensorimotor function observed in a 74-year-old male receiving chiropractic care.

### Case History and Examination

A 74-year-old male asymptomatic patient presented for chiropractic care as a part of a chiropractic research trial. Joint position sense, reaction time and postural stability were measured prior to chiropractic care. These measurements were taken due to their association with both sensorimotor function and falls risk.

Joint position sense was measured using computer analysis {A custom-made Macroderma Proprioception Test Platform

MTP-2 system (Macroderma, Ingelwood, South Australia, Australia)}. Participants started with their ankle in a neutral position then were asked to select a specific target ankle position. They were then instructed to return their ankle to the neutral position before being asked to reproduce or match the target position they had previously performed. When averaged over 20 trials the patient's initial ankle joint position sense error was 2.26°.

Reaction time was measured using a custom-built Macroderma Reaction Platform MP-3 device (Macroderma, Ingelwood, South Australia, Australia) Multiple light panels were located in front of and to the side of both feet. When a light panel illuminated, the participant placed their full foot on the lit panel as quickly as possible. Initially the patient's average choice stepping reaction time was 1151ms across 20 trials.

Postural stability was measured using a computerized balance platform. (CAPS™ Lite Computerized Posturography System by Vestibular Technologies, Cheyenne, Wyoming, USA). Computerized posturography provides a measure of vertical force and the center of pressure of an individual while quietly standing on a perturbing foam cushion (to reduce proprioceptive information) with their eyes closed. By standing on a foam cushion, the individual is forced to rely on the vestibular system more heavily to maintain balance. Initially the patient was unable maintain his balance for 20 seconds with his eyes closed on a foam surface.

### **Chiropractic Care**

The patient was adjusted using Torque Release Technique (TRT). This consisted of a series of adjustments using the Torque Release Technique (TRT), developed by Jay Holder, D.C. The use of an adjusting device called an Integrator is used for the correction of vertebral subluxations. It features a pre-cocking, pressure sensitive tip with an automatic release mechanism that includes a torque and recoil component.<sup>11</sup>

The patient was adjusted at each visit based on clinical indicators of subluxation after examining all areas of the spine. He started on a plan of two visits per week for eight weeks with a progress visit after six weeks. He was then seen weekly until the end of his three-month involvement in the research trial. Common areas adjusted throughout the spine were atlas, occiput and the sacrum. While receiving chiropractic care the patient frequently participated in yachting, gardening and walking for exercise.

### **Outcomes**

Over the course of three months of care the patient showed significant improvement in joint position sense, postural stability, and reaction time. Initially the patient's attempt was 2.26° different to its target ankle joint angle. After four weeks of care the patient's ankle joint position sense error improved from 2.26° to 1.34°. After 12 weeks of care the patient's ankle joint position was 1.58°, a 30% improvement compared to the initial evaluation.

Initially the patient's choice stepping reaction time was 1151ms. After 4 weeks of care his reaction time improved to

1007ms, and after 12 weeks of care it improved further to 984ms which represents a 15% improvement.

Initially the patient was unable to keep his balance with his eyes closed during the postural stability test. After four weeks and then 12 weeks, the patient could keep his balance with his eyes closed on the perturbing foam cushion.

### **Discussion**

This case study is of interest because it documents the improvement in sensorimotor function of an older adult receiving chiropractic care, even though he was asymptomatic when he initially presented for care. It is possible that elderly patients suffering from known or unknown sensorimotor deficits may improve after chiropractic adjustments that may have a significant impact on their ability to perform activities of daily living and remain living independently. Postural stability, joint position sense and reaction time are all complex tasks in which appropriate sensorimotor function is required.

It must be acknowledged that the inherent limitations of the case study design mean the improvement in sensorimotor function observed in this patient could simply be due to the patient learning how to perform the tests more effectively. It should however be noted that the improvements observed in this patient were greater than any potential learning effects reported in the control group in the randomized controlled trial in which he was participating.<sup>12</sup> It is interesting that the patient had considerable sensorimotor deficits, which exceeded the average baseline values in most outcomes for the overall trial group, despite presenting without any complaints. This highlights the possibility that older adults who are asymptomatic may still benefit from chiropractic care as they may have subclinical issues affecting their sensorimotor function. Further research is required to better understand the potential mechanisms of action that could be responsible for the improvements in sensorimotor function observed in this patient and to investigate the role chiropractors may play in enhancing sensorimotor function in older people.

### **Conclusion**

This case report documents significant improvements in sensorimotor function in an asymptomatic 74-year-old male receiving chiropractic care. This suggests that chiropractors may have a role to play in caring for older people even if they are asymptomatic. Further research is required to better understand the role chiropractors may play in caring for older people.

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