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# Immediate effects of lower cervical spine manipulation on handgrip strength and free-throw accuracy of asymptomatic basketball players: a pilot study

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## Abstract

**Objective:** The purpose of this pilot study was to collect preliminary information for a study to determine the immediate effects of a single unilateral chiropractic manipulation to the lower cervical spine on handgrip strength and free-throw accuracy in asymptomatic male recreational basketball players.

**Methods:** For this study, 24 asymptomatic male recreational right-handed basketball players (age =  $26.3 \pm 9.2$  years, height =  $1.81 \pm 0.07$  m, body mass =  $82.6 \pm 10.4$  kg [mean  $\pm$  SD]) underwent baseline dominant handgrip isometric strength and free-throw accuracy testing in an indoor basketball court. They were then equally randomized to receive either (1) diversified left lower cervical spine chiropractic manipulative therapy (CMT) at C5/C6 or (2) placebo CMT at C5/C6 using an Activator adjusting instrument on zero force setting. Participants then underwent posttesting of isometric handgrip strength and free-throw accuracy. A paired-samples *t* test was used to make within-group pre to post comparisons and between-group pre to post comparisons.

**Results:** No statistically significant difference was shown between either of the 2 basketball performance variables measured in either group. Isometric handgrip strength marginally

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improved by 0.7 kg (mean) in the CMT group ( $P = .710$ ). Free-throw accuracy increased by 13.2% in the CMT group ( $P = .058$ ). The placebo CMT group performed the same or more poorly during their second test session.

**Conclusions:** The results of this preliminary study showed that a single lower cervical spine manipulation did not significantly impact basketball performance for this group of healthy asymptomatic participants. A slight increase in free-throw percentage was seen, which deserves further investigation. This pilot study demonstrates that a larger study to evaluate if CMT affects handgrip strength and free-throw accuracy is feasible.

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## Introduction

In the competitive world of sports, there continues to be an interest in methods for improving athletic performance, especially treatment methods that avoid drugs or surgery. Many doctors of chiropractic work with athletes and are poised to impact their health and training.<sup>1-4</sup> Preliminarily, studies have suggested that chiropractic manipulation may improve the performance of football players,<sup>5</sup> runners,<sup>6</sup> and golfers.<sup>7</sup> However, the true impact chiropractic manipulative therapy (CMT) has on exercise performance has been poorly studied and warrants further investigation.<sup>8-13</sup>

Some CMT studies have shown that manipulation may transiently increase volitional strength.<sup>14-16</sup> If CMT has some capacity to make muscles stronger transiently, it could have a positive impact on sport performance, particularly with sports that require strong handgrip strength. Basketball is one such sport that requires handgrip strength for players to dunk, rebound, and engage in many other on-court tasks.

Research is suggestive that spinal manipulation may augment motor control. Preliminary research suggests maladaptive changes secondary to spinal dysfunction can result in reduced joint position sense.<sup>17</sup> There are studies that show evidence that corrective spinal manipulation improves joint position sense<sup>17-19</sup> and theories that corrective manipulation may help improve learning during motor tasks.<sup>18</sup> If manipulation can improve an athlete's motor control capabilities, even transiently, then it may positively impact specific activities, such as free-throw performance among basketball players.

Spinal manipulation appears to induce muscle relaxation and diminish skeletal muscle reflexes transiently. Research has shown that, after spinal manipulation, there is a reduction in localized muscle tone and resting electromyography pattern<sup>20,21</sup> and inhibitory effects on spinal reflexes.<sup>22,23</sup> Performing free throws involves some measure of spring-loading during the backswing phase that would stimulate the

muscle spindle's reflexive activity. Any impact on the muscle spindle-associated reflex induced by CMT may have implications on the backswing component of attempting free throws.

There is some evidence that cervical manipulation has an effect on cortical function and cerebral glucose metabolism.<sup>18,24</sup> Spinal manipulation has also been found to have an effect on primary afferents and invoke high-frequency discharges from "several types of dynamically-sensitive, mechanosensitive paraspinal primary afferent neurons."<sup>25</sup> Although these effects are not fully understood, it can be theorized that they may help to modulate muscle activity in terms of improvement in coordination and voluntary motor control.

Enhancing our understanding of how spinal manipulation can impact motor control patterns and skeletal muscle physiology is vital to determining if CMT is a viable ergogenic for athletes. Therefore, the purpose of this pilot study is to evaluate the feasibility of a study to measure the immediate effects of a single unilateral CMT to the lower cervical spine on handgrip strength and free-throw accuracy in asymptomatic recreational basketball players.

## Methods

This study was approved by the Texas Chiropractic College Institutional Review Board. This study was not registered as a clinical trial given its status as a pilot study. Future randomized controlled trials following this pilot study will be registered in a clinical trial registry prior to their initiation.

### Study design and setting

This was a pilot study of the immediate impact cervical spine CMT had on basketball performance. The study was designed to ensure the participants were blinded and randomly assigned to each treatment group (Fig 1). Twenty-four asymptomatic male recreational

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