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Effect of Chiropractic Treatment on Muscle Strength in Athletes: An Evidence-Based Evaluation

Kayropraktik Tedavinin Sporcularda Kas Kuvvetine Etkisi: Kanıta Dayalı Bir Değerlendirme

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ABSTRACT

Chiropractic treatment is a form of manual therapy that targets the regulation of the nervous system and the functional balance of the musculoskeletal system through manipulations applied to the spine and surrounding structures. The primary aim of this review is to evaluate the effects of chiropractic treatment on muscle strength in athletes in light of current literature, to synthesize evidence from methodologically robust studies, and to provide a conceptual framework that explains the underlying neurophysiological mechanisms of these effects. The included studies assessed a range of parameters, from acute increases in muscle strength to neuromuscular coordination, improvements in proprioception, and the impact of spinal manipulation on athletic performance. While the findings indicate that spinal manipulation may produce significant effects in certain subgroups, they also highlight the need for further research to obtain generalizable and long-term conclusions.

Keywords: Chiropractic Treatment, Spinal Manipulation, Muscle Strength, Athlete Health, Performance Enhancement

ÖZET

Kayropraktik tedavi, omurga ve çevre yapılar üzerinde yapılan manipülasyonlarla, sinir sistemi regülasyonu ve kas-iskelet sisteminin fonksiyonel dengesini hedefleyen manuel terapi yöntemlerinden biridir. Bu derlemenin temel amacı, güncel literatür doğrultusunda kayropraktik tedavinin sporcularda kas kuvveti üzerindeki etkilerini değerlendirmek, metodolojik açıdan yüksek nitelik taşıyan çalışmaları bir araya getirerek mevcut kanıtları bütüncül bir biçimde ortaya koymak ve söz konusu etkilerin altında yatan nörofizyolojik mekanizmaları açıklayan kavramsal bir çerçeve sunmaktır. Dahil edilen çalışmalar, spinal manipülasyonun akut kas kuvveti artışından nöromusküler koordinasyona, proprioseptif iyileşmeden sportif performans üzerine etkilerine kadar birçok parametreyi değerlendirmiştir. Bulgular, manipülasyonun bazı alt gruplarda anlamlı etkiler gösterdiğini ortaya koymakla birlikte, genelleştirilebilir ve uzun vadeli sonuçlar için daha fazla çalışmaya ihtiyaç olduğunu vurgulamaktadır.

Anahtar Kelimeler: Kayropraktik Tedavi, Spinal Manipülasyon, Kas Kuvveti, Sporcu Sağlığı, Performans Artırımı

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INTRODUCTION

Enhancing athletic performance is not solely dependent on cardiovascular capacity or endurance, but is also closely linked to neuromuscular efficiency, muscular strength, and coordination. Accordingly, the significance of complementary treatment approaches in athlete care has grown substantially. In this context, interventions such as physiotherapy, massage, and chiropractic care have become integral components of sports rehabilitation.

Chiropractic treatment involves manual interventions aimed at correcting the functional alignment of the vertebrae, with the objective of pain inhibition and regulation of neuromuscular efficiency. In recent years, however, there has been growing interest in the potential of chiropractic care not only to manage pain but also to influence key performance parameters vital to athletic success. The establishment of the International Federation of Sports Chiropractic (FICS) in 1987, in collaboration with numerous international sports and chiropractic organizations, reflects this increasing recognition (ICSC, 2021). FICS includes national sports chiropractic councils from around the world, and over the past three decades has expanded to encompass various healthcare professionals such as physicians, physiotherapists, sports scientists, and nutritionists (Miners & Degraauw, 2010; Pollard et al., 2007; Thompson et al., 2004). While chiropractic services were once rarely provided even to amateur athletes, today, chiropractic care is increasingly preferred by professional and Olympic-level sports teams. Its growth is largely driven by demand from athletes themselves, who view chiropractic care as an essential part of injury management (Corso et al., 2019; Nook & Nook, 2011; Nook et al., 2016). Data indicate that 25% of Canadian Royal College of Chiropractic Sports Sciences members treat athletes in their practice, and approximately 49.5% of Australian chiropractors report frequently treating athletes (Adams et al., 2018; Miners & Degraauw, 2010). Sports chiropractors have also served in Olympic Village Polyclinics at major international events, including the 2010 Vancouver Winter Olympics, the 2016 Rio Summer Olympics, and the 2020 Tokyo Summer Olympics, providing care to athletes, staff, and officials (Nelson et al., 2021).

Even slight changes in performance variables can have significant consequences for elite athletes. For instance, the time difference between first and third place in the 100-meter sprint at the 2016 Rio Olympics was merely 0.1 seconds (Corso et al., 2019). Some athletes, despite not presenting musculoskeletal symptoms, insist on receiving chiropractic treatment prior to

competitions to optimize performance, with 94% reporting immediate improvements (Nook et al., 2016).

Nonetheless, ambiguity remains regarding the exact nature of the performance enhancements associated with chiropractic care (Miners & Degraauw, 2010). It is still unclear whether chiropractic interventions aim primarily to enhance individual performance or to provide efficient rehabilitation that accelerates return-to-play timelines following injury. Furthermore, limited attention has been paid to whether specific techniques produce measurable gains in specific aspects of performance. Despite these uncertainties, it is not uncommon to encounter evidence in chiropractic literature suggesting positive effects on athletic performance, even though these effects are rarely the primary focus of published studies (Bugg, 2004; Jeffels & Abelson, 2004; McCoy, 2004; Panter, 2001; Spencer, 2004). A systematic review even reported potential performance-related benefits of spinal manipulation in non-athlete populations (Adams et al., 2018).

The principles and techniques employed in chiropractic treatment for athletes primarily focus on assessing and addressing neuromuscular dysfunctions and their overall impact on athletic function (Lin, Chu, et al., 2023; Lin, Cunliffe, et al., 2023). A foundational concept of chiropractic care is that the health and functionality of the nervous and musculoskeletal systems are closely tied to the proper alignment of the vertebral column (Chu & Lee, 2021). Therefore, various spinal mobilization and manipulation techniques are used to correct biomechanical dysfunctions and improve athletic performance (Chu & Lin, 2022; Hoskins & Pollard, 2005). Common conditions treated in this context include low back pain, tendinopathies, nerve compressions, sprains, and strains (Stump & Redwood, 2002). These techniques aim to improve joint mobility, muscle elasticity, and neuromuscular capacity, which in turn contribute to biomechanical efficiency and enhanced performance outcomes (Hoskins & Pollard, 2005; Stump & Redwood, 2002).

Chiropractic manipulation is typically defined as a high-velocity, low-amplitude thrust applied passively within anatomical limits to spinal joints (Hidalgo et al., 2017). Several theories have been proposed to explain the underlying mechanisms of spinal manipulation, many of which converge on the idea that biomechanical dysfunctions between adjacent vertebrae may negatively impact neural integration. Misalignment and microtrauma of vertebral structures may trigger neuronal inflammation, leading to heightened central sensitization and continuous afferent firing (Stump & Redwood, 2002). This process can alter

sensory-motor integration and affect alpha and beta motor neuron activity, potentially creating a feedback loop that also influences emotional processing and motor control (Botelho & Andrade, 2012; Haavik et al., 2021). Chiropractic adjustments may modulate this maladaptive cycle by restoring biomechanical integrity and regulating the influx of afferent signals to the spinal cord, thus supporting improved neural integration.

To fully understand the neurophysiological changes following chiropractic care, it is useful to assess reflex responses such as the H-reflex and V-wave. The H-reflex provides information on presynaptic inhibition and motor neuron excitability, while the V-wave reflects changes in supraspinal input to the motor neuron pool. Even a single chiropractic session has been shown to influence H-reflex pathways and reduce fatigue during repeated maximal voluntary contractions. Notably, alterations in V-wave responses known to reflect increased cortical excitability have been linked to supraspinal neuroplastic changes, suggesting a mechanism through which chiropractic treatment may enhance athletic performance. For example, a study on judo athletes reported significant improvements in grip strength following cervical spine manipulation, highlighting the performance-enhancing potential of chiropractic care in athletic populations (Botelho & Andrade, 2012).

The purpose of this review is to evaluate the effects of chiropractic treatment on muscle strength in athletes, based on the existing literature, to bring together methodologically sound findings, and to provide an explanatory framework for neurophysiological mechanisms. The literature specifically addresses changes in muscle activation, motor control adaptations, and increases in muscle force output after acute manipulation.

METHOD

A literature review was conducted in light of current knowledge to investigate the relationship between chiropractic treatment and improvements in athletic performance parameters. In determining the studies to be included in the review, the following keywords were used in both English and Turkish, in accordance with Medical Subject Headings (MeSH): chiropractic, chiropractic care, chiropractic therapy, chiropractic trust, performance, sports performance, and athlete performance. The search covered the years 2004 to 2024 and was carried out using databases such as PubMed, Google Scholar, Web of Science, DergiPark, and Scopus. The studies included in this review primarily focused on evaluating the effectiveness of chiropractic treatment techniques in relation to variables such as athletic performance, muscle strength, functionality, lower and upper extremity strength, grip strength, and

mechanical spinal pain. Additionally, the reference lists of the cited studies were manually reviewed to identify further relevant sources. This review aims to contribute to both clinical practice and academic research by providing a comprehensive overview of the current literature on the subject.

DISCUSSION

Numerous studies have demonstrated the effectiveness of chiropractic care in managing sports-related injuries and enhancing athletic performance. These investigations indicate that chiropractic treatment in athletes leads to improvements in musculoskeletal function, reductions in pain, and accelerated recovery processes (Hoskins & Pollard, 2005; Maffulli et al., 2015). Chiropractic treatment is not merely a symptomatic intervention; it is also a therapeutic approach that positively influences biomechanical balance and neuromotor control (Vining et al., 2020). Numerous randomized controlled trials have shown that spinal manipulation enhances proprioceptive sensory input, modulates reflex responses, and leads to short-term increases in motor unit activation capacity. These effects of chiropractic treatment not only influence acute performance parameters but also play a supportive role in reducing injury risk an essential component of athlete health.

In a study conducted by Haavik and Murphy, the effects of spinal manipulation on corticospinal pathways were measured using EEG, revealing increased motor cortex excitability. This increase was associated with more efficient and safer execution of sport-specific movements. Furthermore, it was noted that enhanced proprioceptive input, along with improved coordination of motor units and reflex modulation, may contribute to a protective effect in preventing sports injuries (Haavik et al., 2016).

A randomized controlled trial conducted by Vining et al. involved 110 active-duty military personnel. The study reported that the group receiving regular chiropractic care exhibited statistically significant improvements in strength, balance, and endurance scores compared to the control group. Additionally, participants in the chiropractic group experienced reductions in the intensity of low back pain and a lower incidence of injury recurrence (Vining et al., 2020).

In a randomized controlled trial conducted by Christiansen et al., the acute effects of a single session of chiropractic treatment on elite taekwondo athletes were evaluated. A total of 11 elite taekwondo athletes participated in the study. The H-reflex and V-waves elicited from the

soleus muscle, as well as the maximal voluntary contraction values of the plantar flexor muscles, were compared. The results demonstrated that a single spinal manipulation could enhance muscle strength for up to 30 minutes and increase corticospinal excitability for up to 60 minutes in elite athletes. These findings suggest that even a single spinal manipulation applied prior to competition may significantly contribute to performance, particularly in explosive movements such as vertical jumps or sprints (Christiansen et al., 2018).

In a study conducted by Zhang et al. involving elite basketball players aged 16 to 19, the group that received cervical chiropractic care once a week in conjunction with a three-month strength and conditioning program showed significantly greater improvements in endurance, strength, and speed test outcomes compared to the control group. The findings indicated that regular chiropractic treatment can be beneficial for adolescent athlete development. It was recommended that chiropractic care be integrated into strength and conditioning programs to enhance physical performance and minimize the risk of injury (Zhang et al., 2024).

In a pilot study conducted by Williams et al., the effects of spinal manipulation on pain management, recovery, range of motion (ROM), technique, and strength were evaluated in 69 strength athletes aged between 21 and 55. A total of 95% of participants reported that spinal manipulation reduced pain, increased ROM and strength, and improved both recovery and technique. The study demonstrated a link between performance and the optimization of pain management and ROM achieved through spinal manipulation (Williams et al., 2023).

In a study conducted by Botelho and Andrade on judo athletes, cervical spinal manipulation was found to produce a significant increase in grip strength. This finding emphasized that the effects of chiropractic treatment are not limited to faster recovery from injuries, but also play a role in optimizing athletic performance (Botelho & Andrade, 2012).

In another study by Stump and Redwood, the role of sports chiropractors and chiropractic treatment was examined across 36 professional teams in the U.S. National Football League (NFL). The findings highlighted the beneficial impact of chiropractic care on post-injury recovery management and overall athlete health (Stump & Redwood, 2002).

In a randomized controlled trial conducted by Sandell et al. on 17 healthy male athletes aged 17 to 20, the effects of sacroiliac (SI) joint chiropractic manipulation on hip extension capacity and running speed were evaluated. The group that received SI chiropractic treatment demonstrated a significantly greater hip extension angle. However, although improvements in

30-meter sprint times were observed in the chiropractic group, the differences were not statistically significant when compared to the control group (Sandell et al., 2008).

In a single-blind randomized controlled trial conducted by Navid et al., 29 patients with chronic stroke were included to investigate the effects of chiropractic spinal manipulation on cortical excitability of lower extremity muscles. The study demonstrated that chiropractic treatment significantly increased the excitability of ankle dorsiflexor muscles compared to the control group. Although a direct effect on muscle strength or the ability to achieve functional ambulation was not established, the findings suggest that chiropractic care can be effective not only in healthy individuals but also in patients with chronic stroke. This effect is attributed to changes in neural plasticity and motor recovery (Navid et al., 2022).

In a study conducted by Howitt et al., the access to and outcomes of chiropractic care among 198 Canadian national team athletes were examined. The findings revealed that 67% of the athletes sought chiropractic treatment primarily for rapid recovery from back and neck pain. Although chiropractic care was mainly preferred for pain relief and improved range of motion rather than performance enhancement, the accelerated recovery associated with it suggests that it may also be indirectly favored for performance-related purposes (Howitt et al., 2023).

CONCLUSION AND RECOMMENDATIONS

Chiropractic treatment is an increasingly recognized complementary intervention in sports medicine, with the potential to enhance athletic performance, support overall health, and improve well-being. Particularly through the correction of biomechanical imbalances and the enhancement of neuromuscular system functionality, chiropractic care contributes not only to short-term performance improvements but also, although to a more limited extent, to long-term health outcomes. Chiropractic interventions facilitate more efficient motor unit function by reducing pain and increasing joint range of motion. While this may not directly result in increased muscle strength, it enables athletes to perform movements with greater control and efficiency. Moreover, an increase in cortical excitability, whether observed in healthy individuals or in those with serious neurological conditions, can support neuromuscular interactions and thereby enhance overall motor performance. However, to ensure that these effects extend beyond short-term outcomes, there is a need for multicenter and interdisciplinary studies that explore the long-term effects of chiropractic care and its integration into comprehensive healthcare systems.

Planning chiropractic interventions based on individual differences and sport-specific demands, and ensuring they are delivered exclusively by qualified healthcare professionals, is critically important for maximizing their effectiveness. In doing so, chiropractic treatment can be more solidly grounded in scientific evidence within the field of sports medicine, thereby contributing to more comprehensive health outcomes.

CLINICAL CONTRIBUTION

This study demonstrates that chiropractic treatment in athletes constitutes a holistic approach that goes beyond pain management, with the potential to enhance muscle strength and functional capacity. It further reveals that such interventions not only accelerate the recovery process but also play a supportive role in improving performance and preventing injuries. The effects of spinal manipulations on neuromotor control, proprioceptive responses, and motor unit activation contribute to a better understanding of the neurophysiological processes underlying athletic performance. Accordingly, the study emphasizes that these interventions should be planned based on individual differences and the specific demands of each sport, and should be administered exclusively by qualified healthcare professionals. In this context, the study makes an original contribution to the literature by informing both clinical practice and evidence-based interdisciplinary approaches.

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