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Reşat Coşkun[1] · Bülent Aksoy[2] · Kerem Alptekin[3] · Jülide Öncü Alptekin[4]

[1] Department of Physiotherapy and Rehabilitation, Medipol University, İstanbul, Turkey
[2] Department of Physiotherapy and Rehabilitation, Bahçeşehir University, İstanbul, Turkey
[3] Health Sciences Institute, Kuzey Kampüsü, Bahçeşehir University, Gayrettepe, Beşiktaş, İstanbul, Turkey
[4] Physical Medicine and Rehabilitation Department, Şişli Etfal Education and Research Hospital, İstanbul, Turkey

Efficiency of high velocity low amplitude (HVLA) lumbosacral manipulation on running time and jumping distance

Comparison with sham manipulation in amateur soccer players

Introduction

The performance dimension of sports has recently gained increasing importance. Many subdisciplines have been established and numerous studies on the subject have been conducted in different fields of science. The aim of such studies is to maximize the efficiency of athletes especially during competitions. It has become almost imperative to develop an athlete's biomotor properties, such as a rapid increase in strength, fast running and jumping ability for better results in many sports fields. Numerous scientific studies have shown that biomotor properties improve jumping and sprinting performance [1].

Soccer is one of the sports branches receiving the most scientific interest, and is also, as in many countries of the world, among the most popular sports in Turkey. Most of the physical activities in soccer are based on locomotor activities, such as running, jumping, and sprinting. These functions require the use of the main joint extensor and flexor muscles and mechanisms of the knee, hip, and ankle. Therefore, soccer requires good aerobic and anaerobic capacity, strength, endurance, muscular strength, and good biomechanics [2]. One of the most important parameters in soccer is undoubtedly jumping. Jumping can be defined as the act of staying in the air for a short time after leaving the ground on the vertical or horizontal axis by pushing the support surface of the player. The jumping movement is a skill that includes a large number of complex motion sequences, such as explosive force, good pelvic biomechanics, flexibility of the muscles involved in jumping, and the technique of jumping [3]. The first contact with the ground and the next contact with the other step form the half-running cycle. The speed of running is determined by the distance between steps and the frequency of steps. In short-distance sprints, the main factors in running speed are the optimum fit between the length and frequency of the steps. The better the harmony between the length and frequency, the higher the running speed. Accordingly, an increase in one of these factors will increase the speed as long as no other factor causes a similar or greater reduction simultaneously and proportionally [4].

The basic biomechanics for running speed are the combination of step frequency and step length; however, the relationship between these two parameters is still under discussion. For this reason, not only these two parameters but also other factors, such as the angles of the joints and muscles in relation to one another should be taken into consideration when determining the running speed [5]. There are many factors that affect running performance. When athletes freely determine the length of steps during running, the running speed reaches its highest values. Short hip flexor muscles with decreased hip extension, reduced elasticity of tendons and ligaments, and limitations of the lumbosacral and sacroiliac joints are found to lower running performance by leading to an increase in the anterior pelvic tilt [6].

Chiropractic manipulation is defined as instant pushing or pulling maneuvers with high velocity and low amplitude to correct joint defects that are beyond the normal range of motion. With chiropractic therapy, the effect of the correction of restrictive joint dysfunctions makes it possible to maximize mobility and jumping performance during running as a result of an increase in step length, regulation of joint angles, and improvements in the arthrokinematic chain [7, 8].

The aim of this study was to increase the performance of amateur soccer players by eliminating the negative effects of asymptomatic sacroiliac biomechanical dysfunctions by applying high velocity low amplitude (HVLA) lumbosacral and sacroiliac manipulations specific to the chiropractic profession.

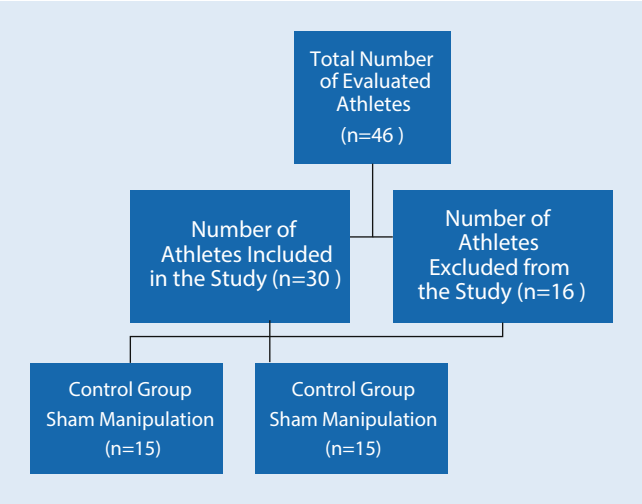

Fig. 1 ◀ Sample group of the study

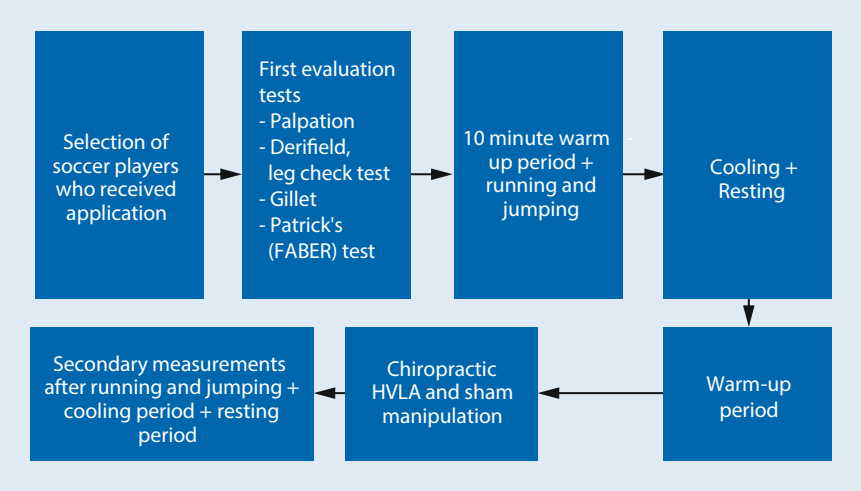

Fig. 2 ▲ Design of the study

Application

A sampling based quantitative research method was used in this study, conducted with amateur soccer players in the Istanbul Trabzonspor Club. Applications were made on healthy individuals diagnosed with mechanical problems via sacroiliac tests and were made on the lumbosacral and sacroiliac joints. Data were collected from athletes whose age range was 18–25 years. Detailed physical examinations and tests were performed before the patients were included in the study and study participants were divided into two groups. In the application stage, one group underwent sham manipulation and the other group underwent chiropractic HVLA lumbosacral and sacroiliac manipulation to correct impaired biomechanics. The differences between the groups were determined in terms of jumping distance and running time. The 30 patients (100% male) were aged between 18–25 years. The mean age of the sham manipulation group was 18.9 years, the mean height was 180.86 cm, body weight 69.6 kg, and body mass index 19.90 kg/m^2. The mean age of the participants in the chiropractic HVLA manipulation group was 19.86 years, the mean height was 178.4 cm, mean body weight 71.06 kg, and body mass index 22.42 kg/m^2. The soccer players included in the study met the criteria enumerated below, while those who did not were excluded from the sampling (**Fig. 1**).

Inclusion criteria:

a. Athletes aged between 18–25 years
b. Soccer players
c. Sacroiliac and lumbosacral asymptomatic dysfunctions determined via tests
d. Thomson leg check (leg length inequality)

Patients with the following findings were not included in the sample:

a. Not aged between 18–25 years
b. History of fractures
c. Lumbar disc herniations, spondylosis, spondylolisthesis
d. History of tumors
e. Sensitivity and pain in the pelvis and lumbar region

Material and methods

Evaluations and applications were made after collecting data via patient follow-up forms. The study was designed as a randomized controlled trial. Data collected in patient follow-up forms included athletes' age, name, surname, gender, body weight, body mass index, height, medications used, pain history, dominant foot, jumping distance on horizontal ground, straight sprint and obstacle course racing time. (**Fig. 2**).

The asymptomatic dysfunction of the sacroiliac joint was verified with palpation, the Derifield leg check test, Gillet and Patrick's (FABER) tests. It has been determined that the Gaenslen, FABER, and POSH tests have clinical reliability exceeding 80%. In the validity studies, on the other hand, only the POSH test has a specificity and sensitivity more than 80%; therefore, it is superior to other clinical SIJ tests. Many clinical SIJ tests have limited validity and reliability. For the diagnosis of SIJ, a combination of various tests are recommended. In a study by Soleimanifar et al. [9], 50 patients within the age range of 20–50 years with a prediagnosis of sacroiliac joint dysfunction (SIJD) were compared with motion palpation (Gillet, Vorlauf, Yeoman, sitting flexion) and pain provocation (FABER, POSH, resistive abduction) tests, in diagnostic terms. No significant differences between the groups were detected. In conclusion, motion palpation tests are equally effec-

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R. Coşkun · B. Aksoy · K. Alptekin · J. Ö. Alptekin

Efficiency of high velocity low amplitude (HVLA) lumbosacral manipulation on running time and jumping distance. Comparison with sham manipulation in amateur soccer players

Abstract

The aim of this study was to investigate the effects of chiropractic high velocity low amplitude (HVLA) sacroiliac and lumbosacral manipulation on the sprint, jump racing and jumping performance of amateur soccer players with asymptomatic dysfunction of the sacroiliac and lumbosacral joints. The 20-m sprint, 20-m jump racing and horizontal jumping distance of the soccer players analyzed in this study were measured before and after the applications. Sprint and obstacle course racing time were measured by stopwatch and video recordings. In total, 30 patients were included in the study. The participants were divided into 2 groups each with 15 members and were randomly selected. A sham manipulation was applied to the control group and chiropractic HVLA lumbosacral and sacroiliac manipulation was applied to the experimental group. The 20-m sprint time of the control group decreased from 3.49 s to 3.46 s. In the experimental group the 20-m sprint time decreased from 3.44 s to 3.22 s. The sprint values of the experimental group were statistically significantly faster than the control group ($p < 0.05$). In the control group the 20-m obstacle course time decreased from 3.87 s to 3.79 s. In the experimental group the 20-m obstacle course racing time decreased from 3.75 to 3.60 s. There was no statistically significant difference between the two groups ($p > 0.05$). In the control group the horizontal jump distance increased from 266.93 cm to 268.80 cm. This score increased from 261.13 cm to 267.80 cm in the experimental group. Comparison of the horizontal jumping distance revealed that the experimental group had a statistically significant better performance than the control group ($p < 0.05$).

Keywords

Chiropractic · Manipulation · Jump · Sacroiliac · Soccer player

Wirksamkeit der lumbosakralen Manipulation mit „high velocity low amplitude" (HVLA) auf Laufzeit und Sprungweite. Vergleich mit der Scheinmanipulation bei Amateurfußballspielern

Zusammenfassung

Ziel dieser Studie war es, die Auswirkungen der chiropraktischen Iliosakral- und Lumbosakralmanipulation mit hoher Geschwindigkeit und niedriger Amplitude (HVLA) auf die Sprint-, Sprungrenn- und Sprungleistung von Amateurfußballspielern mit asymptomatischer Dysfunktion der Iliosakral- und Lumbosakralgelenke zu untersuchen. Die in dieser Studie analysierten 20-m-Sprint, 20-m-Sprungrennen und die horizontale Sprungweite der Fußballspieler wurden vor und nach den Anwendungen gemessen. Die Zeiten der Sprint- und Sprungrennen wurden mittels Stoppuhr und Videoaufnahmen gemessen. Insgesamt wurden 30 Patienten in die Studie eingeschlossen. Die Teilnehmer wurden in 2 Gruppen mit je 15 Mitgliedern aufgeteilt und nach dem Zufallsprinzip ausgewählt. In der Kontrollgruppe wurde eine Scheinmanipulation und in der Versuchsgruppe eine chiropraktische lumbosakrale und sakroiliakale Manipulation mit „high velocity low amplitude" (HVLA) angewendet. Die 20-m-Sprintzeit der Kontrollgruppe verringerte sich von 3,49 auf 3,46 s. In der Versuchsgruppe sank die 20-m-Sprintzeit von 3,44 auf 3,22 s. Die Sprintzeiten der Versuchsgruppe waren statistisch signifikant schneller als die der Kontrollgruppe ($p<0,05$). In der Kontrollgruppe sanken die 20-m-Hindernislaufzeiten von 3,87 auf 3,79 s. In der Experimentalgruppe sank der 20-m-Sprintwert von 3,75 auf 3,60 s. Es gab keinen statistisch signifikanten Unterschied zwischen den beiden Gruppen ($p>0,05$). In der Kontrollgruppe erhöhte sich die horizontale Sprungweite von 266,93 auf 268,80 cm. In der Versuchsgruppe stieg dieser Wert von 261,13 auf 267,80 cm. Der Vergleich der horizontalen Sprungwerte ergab, dass die Versuchsgruppe eine statistisch signifikant bessere Leistung als die Kontrollgruppe aufwies ($p<0,05$).

Schlüsselwörter

Chiropraktik · Manipulation · Sprung · Sakroiliakal · Fußballspieler

tive as pain provocation tests in diagnosing SIJD by showing motion limitations as they specifically reveal the incline of pain in SIJ [9–11]. The patient with SIJ involvement typically demonstrates leg length inequality in the prone position. A common assessment procedure is to use the Derifield prone leg check. With a positive Derifield (+D) test, the doctor observes a reactive (shorter) leg in the prone extended position that crosses over and becomes longer when the knees are flexed to 90°. If the shorter leg remains short when the knees are flexed, the test indicates a negative Derifield test [12].

The data collected by the follow-up forms were evaluated using stopwatches, video recordings, and the international length system. Jumping is defined as leaping on the vertical or horizontal axis by pushing the supporting surface and staying in the air for a short time [13].

In this study, the selected soccer players' jumping distance on the horizontal axis was measured. First, the distance the soccer players travelled on the horizontal axis without manipulation was measured. Later, the jumping distance on the horizontal axis after sham and chiropractic HVLA lumbosacral and sacroiliac manipulations was measured. Finally, the values between the first and final measurements were compared both within and between groups. Each soccer player was first asked to place one foot on a line and mark the exact end of the calcaneus, and to then jump horizontally. They were instructed to make the first contact on the ground after the jump with their feet parallel to each other. After this point, the

Table 1 *T*-test results in dependent groups for comparison of first and last measurements of sprint time, jump racing and horizontal jumping in the control group

		N	Mean	Standard deviation	*p*-value
Sprint time	First	15	3.49 s	0.36 s	0.011*
	Last	15	3.46 s	0.37 s	
Obstacle course racing time	First	15	3.87 s	0.37 s	0.043*
	Last	15	3.79 s	0.39 s	
Jumping distance	First	15	266.93 cm	10.67 cm	0.002*
	Last	15	268.80 cm	9.56 cm	

* Statistically significant level ($p < 0,05$)

Table 2 *T*-test results in dependent groups for comparison of the first and last measurements of sprint time, jump racing, and horizontal jumping in the experimental group

		N	Mean	Standard deviation	*p*-value
Sprint time	First	15	3.44s	0.29s	0.005
	Last	15	3.22s	0.32s	
Obstacle course racing time	First	15	3.75s	0.38s	0.001*
	Last	15	3.60s	0.35s	
Jumping distance	First	15	261.13cm	9.18cm	0.001*
	Last	15	267.80cm	10.86cm	

* Statistically significant level ($p < 0,05$)

Table 3 Comparison of differences in sprint time, jump racing, and horizontal jumping in the control and experimental group

		N	Mean	Standard deviation	*p*-value
Difference in sprint times	Control	15	–0.04	0.05	0.011*
	Experimental	15	–0.22	0.26	
Difference in obstacle course racing time	Control	15	–0.08	0.16	0.227
	Experimental	15	–0.15	0.13	
Difference in jumping distances	Control	15	1.87	1.88	0.008*
	Experimental	15	6.67	6.25	

*Statistically significant level ($p < 0,05$)

distance between the heels was marked and measured.

Evaluation of sprint time

Acceleration is defined as the speed that the entire body or parts of the body achieve when making a movement or the ability to move the body or a body part at high speed. Sprinting is directly dependent on strength and proper biomechanics. With no intervention after the 10 min warm-up period, the 20-m sprint time of the athletes was measured. The calcaneus of the athletes was placed on a line and they were asked to sprint a distance of 20 m. The time after they sprinted, they jumped and the distance was recorded. Measurements were made with video recordings and a stopwatch. The participants were divided into two groups: the control group (sham) and experimental group (chiropractic HVLA lumbosacral and sacroiliac manipulation) [14].

The most important component of sprinting performance is to change direction in running technique. Acceleration occurs by tilting forward and running down the center of gravity while running, and the opposite is done to slow down. Here, the adequacy of balance is related to the low center of gravity which can be changed via effective pelvic biomechanics. Since direction changing movements are very fast, players slow down and take the center of gravity downwards.

After a warm-up period of 10 min, applications were started without manipulation. A total of 4 obstacles, each 150 cm in length, were placed over a distance of 20 m with 4 m between each and the athletes were asked to run with maximum effort to zig zag between the obstacles. After the initial data were recorded, sham and chiropractic HVLA manipulations were performed after 5 min of relaxation. Measurements were made with video recordings and stopwatch.

Results

The significance level of the difference between the measurements of the variables in the statistical analysis is expressed as the *p*-value. In other words, the *p*-value shows the level of significance of the difference between two mean values that are compared. Statistical measurements are based on a hypothesis and the resulting *p*-value is the main criterion that determines the acceptance or rejection of the tested hypothesis. The *p*-value is taken from a certain range in measurements and whether the hypothesis is accepted or rejected is determined depending on whether the obtained value is in this range or not. **Table 1** shows the mean values of the first and last sprint, obstacle course racing time, and jumping distance recorded by the sham manipulation group, in addition to the *t*-test results of the dependent groups, which indicate whether the differences between these mean values are significant.

According to **Table 1**, it can be seen that there is a significant difference among the mean values of the first and last sprint, obstacle course racing time, and jumping distance. Running and obstacle course racing times decreased significantly, while jumping distance showed a significant increase. A statistically significant improvement was observed in all three parameters in the control group. A low level of significance was observed only in jump racing. (**Fig. 3 and 4**).

Table 2 shows the mean values of the first and last measurements of running, jump racing, and jump distance in the chiropractic HVLA lumbosacral and sacroiliac manipulation (experimen-

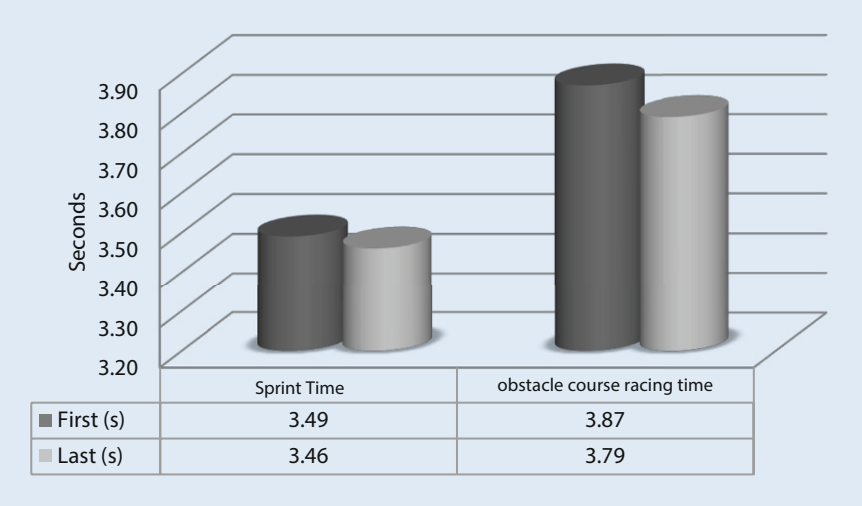

Fig. 3 ▲ Change in the sprint and obstacle course racing times of the control group

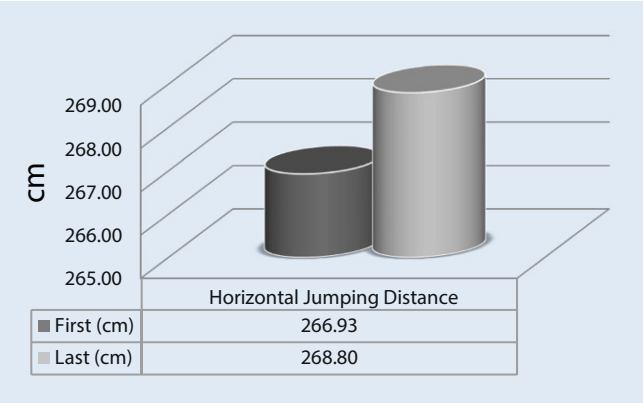

Fig. 4 ◄ Change in the horizontal jumping distance of the control group

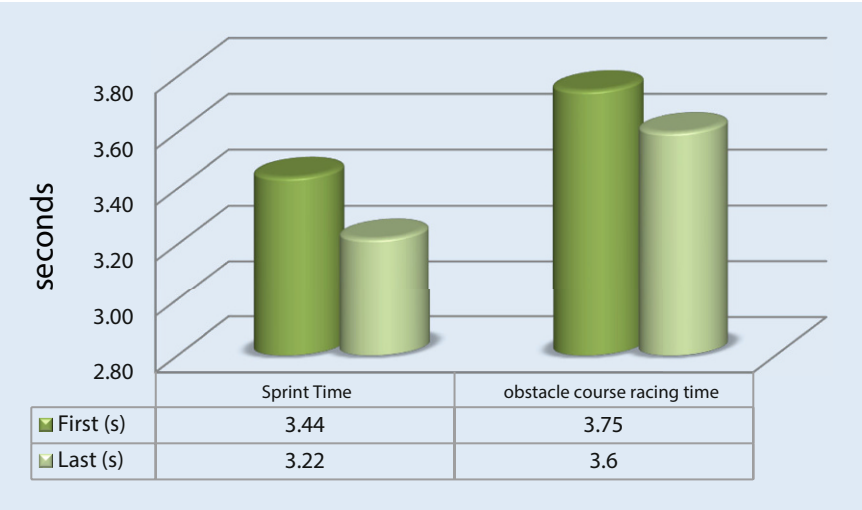

Fig. 5 ▲ Change in the sprint and obstacle course racing times of the experimental group

tal) group in addition to the t-test results of the dependent groups, demonstrating whether the differences between these values are significant or not.*Statistically significant level ($p < 0{,}05$)

As displayed in **Table 2**, there was a significant difference among the mean values of the first and last sprint time, jump racing, and horizontal jumping distance. While the running and obstacle course racing time decreased significantly, jumping distance increased significantly. Measurements in the experimental group showed a statistically significant improvement in all three parameters. (**Fig. 5 and 6**).

The t-test results of the dependent groups determining whether the difference between the first and last measurement mean values of the groups are given in **Table 3**.

As shown in **Table 3**, running time and jumping distance changes were significantly different between the experimental and control groups ($p < 0.05$), while the difference in obstacle course racing time was not significant. The change in the running time was significantly lower in the experimental group, while the jumping distance was significantly higher in the experimental group. An analysis of the data obtained from the measurements revealed that the changes in the running time and jumping distance parameters were statistically and significantly more positive in the experimental group than in the control group. (**Fig. 7 and 8**).

Discussion

Many treatment methods are used for the correction of sacroiliac and lumbosacral joint dysfunctions. Chiropractic HVLA manipulation is one such method and has been widely used in recent years. In addition to the correction of asymptomatic sacroiliac and lumbosacral joint dysfunctions in amateur soccer players as analyzed in this study, chiropractic manipulations are also used to treat pain, increase muscle strength, eliminate postural disorders, correct spinal and extremity pathologies observed in other sports branches, and increase body functions. Numerous studies in the litera-

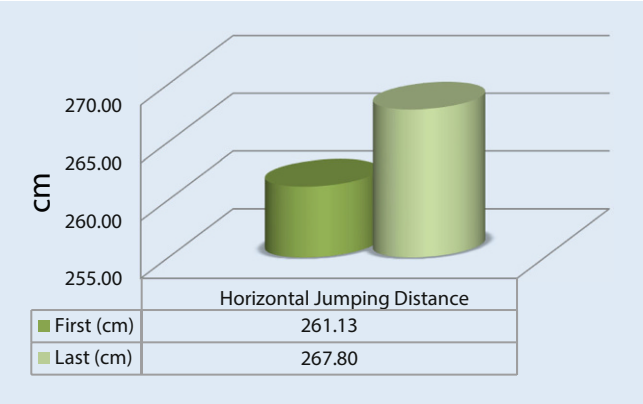

Fig. 6 ◀ Change in the horizontal jumping distance of the experimental group

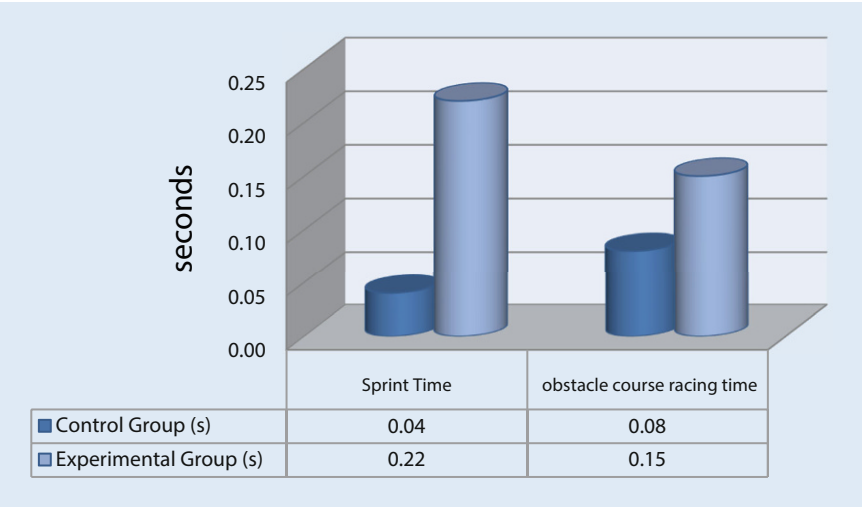

Fig. 7 ▲ Change of data in the sprint and obstacle course racing times of the control and experimental groups

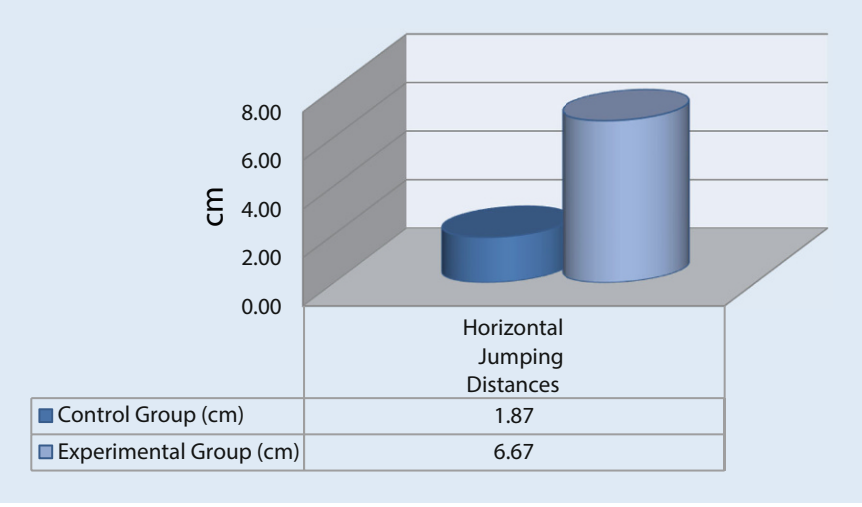

Fig. 8 ▲ Change of data in the horizontal jumping distances of the control and experimental groups

ture have confirmed its widespread use. The present study measured the effectiveness of chiropractic HVLA lumbosacral and sacroiliac joint manipulations in the treatment of asymptomatic dysfunctions in amateur soccer players, and its findings largely correspond to the findings of the studies in the literature [15].

The randomly selected amateur players were divided into two groups: control and experimental. Initially, the 20-m sprint, 20-m jump running, and horizontal jumping distance measurements were made of the control and experimental groups without any intervention. The 20-m sprint, 20-m jump running, and horizontal jumping distance were measured after sham and chiropractic HVLA lumbosacral and sacroiliac manipulations and the changes in groups were recorded and compared both within and between the groups. The findings and their evaluation are given in comparison with the findings of similar studies in the literature [16]. Ward et al. designed the research on the hypothesis that mid-segment lumbar spinal manipulation may have an impact on the sprint performance and hip flexibility of asymptomatic cyclists. The design of this study was based on the hypothesis that chiropractic HVLA lumbosacral and sacroiliac manipulations have a positive effect on parameters such as sprinting, jump racing and jumping [17]. Ruhe et al. reported that lumbosacral and sacroiliac joint complaints due to falls are quite common. The observational study on ice skating athletes evaluated approximately 34 athletes over 1 year, incorporating the participants' past visits to chiropractic clinics into the analysis. They concluded that 40% of the athletes visited clinics for lumbosacral joint complaints, while 44% visited clinics for sacroiliac joint complaints. The current study evaluated 69 athletes and found similar problems in 33 of them [18]. Sandell et al. designed their work on this subject as a prospective, randomized controlled experimental trial and 17 male middle-distance runners aged between 18–20 years were evaluated in this study. Similarly, the present study was designed as a prospective, randomized controlled study and all the participants were male. The only difference

is that this study included a higher number of participants (more than 30 people). The age range in the present study was determined as 18–25 years [19]. Sandell et al. set the warm-up period both before and after first and last measurements at 15 min. After the first measurements 12 min was allocated for a period of relaxation and preparation for manipulation. The present study set the warm-up period to 10 min and the preparation and relaxation period to 8 min. These periods could have been longer as provided for in the literature [19].

Hillermann et al. studied 20 randomly selected individuals and divided them into 2 groups, the tibiofibular joint manipulation group and ipsilateral sacroiliac joint manipulation group, in order to evaluate muscle strength before and after manipulation. Although there was no increase in the quadriceps muscle strength in the tibiofibular joint manipulation group, a significant increase in the quadriceps muscle strength was observed in the sacroiliac joint manipulation group, as was also the case in this study [20].

Kamali and Shokri randomly divided 32 women with sacroiliac joint (SIJ) syndrome into 2 groups each consisting of 16 subjects. Of the groups one underwent high velocity low amplitude (HVLA) manipulation of SIJ and the other group received a one-off HVLA manipulation to both the SIJ and the lumbar spine. Similarly, the present study applied both sacroiliac and lumbosacral HVLA manipulation to 30 soccer players. As a result, there was a positive improvement in the parameters in both studies [21]. Bergmann conducted numerous studies evaluating the specific effects of spinal manipulative therapies on electromyography (EMG) activity in muscles, finding that chiropractic HVLA spinal manipulative therapy techniques increased such EMG activity [22].

Haavik et al. [23] reported that an F wave is one of the late responses induced by the stimulation of alpha motor neurons and emerges after supramaximal electrical stimulation of the peripheral motor nerves. They concluded that spinal manipulation causes changes in motor control and F-waves, which are indicative of maximal muscle contraction. Haavik et al. showed that HVLA manipulations performed by a chiropractic practitioner with 12 years of experience were effective in increasing the F-response and maximum voluntary muscle contraction. Therefore, HVLA manipulations were performed by a chiropractor with 17 years of experience in order to obtain more accurate data in the present study [23].

Conclusion

The findings demonstrate a significant decrease in the sprint time of the soccer players in the sham manipulation (control) group. Furthermore, there was a significant decrease in the sprint time of the chiropractic HVLA lumbosacral and sacroiliac manipulation group, the sprint time was statistically significant. A comparison of the changes in sprint times in the sham manipulation and chiropractic HVLA lumbosacral and sacroiliac manipulation groups revealed that the experimental group had a statistically significant advantage in decreasing sprint time compared to the control group. The 20-msprint score decreased from 3.49 s to 3.46 s in the sham manipulation group for a total change of 0.03 s. Sprint scores thus decreased in both groups; however, the decrease in the chiropractic HVLA lumbosacral and sacroiliac manipulation group was approximately 11 times higher than the sham group. A comparison of the sprint values after sham manipulation and chiropractic HVLA lumbosacral and sacroiliac manipulation revealed that the experimental group had a statistically significant advantage over the control group. Obstacle course racing times decreased in both the HVLA lumbosacral and sacroiliac manipulation and sham manipulation groups. The 20-m obstacle course score decreased from 3.87 s to 3.79 s in the sham manipulation group for a total change of 0.08 s. The 20-m jumping race score decreased from 3.75 s to 3.60 s in the chiropractic HVLA manipulation group for a total change of 0.15 s. The decrease in obstacle course racing time in both groups was statistically significant but no significant difference was found between the jump racing scores of the two groups. The two types of manipulation had no superiority to each other in improving jump running performance.

On the other hand, chiropractic HVLA lumbosacral and sacroiliac manipulation was shown to increase jumping distance. The distance of the control group increased from 266.93 cm to 268.80 cm. For athletes shorter than 180 cm, the increase was 2.1 cm, whereas for those who were taller than 180 cm, the increase was 1.32 cm. In the chiropractic HVLA manipulation group, the distance increased from 261.13 cm to 267.80 cm. For athletes shorter than 180 cm, the increase was 10.75 cm, whereas for those who were taller than 180 cm, the increase was 4.3 cm.

In conclusion, chiropractic HVLA sacroiliac and lumbosacral manipulations are effective in correcting dysfunctions and increasing performance in soccer players.

Corresponding address

Assoc Prof Kerem Alptekin, MD
Health Sciences Institute, Kuzey Kampüsü, Bahçeşehir University
Ihlamur Yıldız Caddesi, No: 10, 34353 Gayrettepe, Beşiktaş, İstanbul, Turkey
kalptekin79@hotmail.com

Compliance with ethical guidelines

Conflict of interest. R. Coşkun, B. Aksoy, K. Alptekin and J.Ö. Alptekin declare that they have no competing interests.

Ethical standards. All procedures performed in studies involving human participants or on human tissue were in accordance with the ethical standards of the institutional and/or national research committee and with the 1975 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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Bestmögliche Versorgung von Rheumapatienten mit COVID-19

EULAR schaltet Forschungs-Datenbank live

Die Europäische Liga gegen Rheuma (EULAR) hat soeben eine europäische Forschungs-Datenbank eingerichtet. Ziel ist die Überwachung und Meldung von COVID-19-Fällen bei Kindern- und Erwachsenen mit rheumatischen und muskuloskelettalen Erkrankungen.

EULAR ermutigt Rheumatologen aus ganz Europa, alle ihnen bekannten Fälle von COVID-19 bei Patienten mit rheumatischen Erkrankungen, unabhängig vom Schweregrad (einschließlich asymptomatischer Patienten, die durch Vorsorgeuntersuchungen im öffentlichen Gesundheitswesen entdeckt wurden), auf der Plattform zu melden.
Das Verstehen weniger schwerer oder sogar leichter Fälle wird dazu beitragen können, das Verständnis für diejenigen, die die schwerste Form der Erkrankung entwickeln, zu verbessern.

Es handelt sich um ein europäisches Projekt, das eng mit der Globalen Allianz für Rheumatologie COVID-19 zusammenarbeitet.

Die Datenbank kann über die Webseite aufgerufen werden:
https://www.eular.org

Besuchen Sie die Datenbank der Globalen Rheumatologie-Allianz hier:
https://rheum-covid.org

EULAR hat zudem ein Statement veröffentlicht:
https://www.eular.org/policy_statement_on_covid_19.cfm
Darin fordern Experten eine besondere Anleitung und Unterstützung von Patienten mit einer rheumatologischen Erkrankung während der laufenden COVID-19-Pandemie ein.

Quelle: EULAR