

THE EFFECT OF FRENCH CONTRAST EXERCISES APPLIED FOR SIX WEEKS ON SPRINT AND VERTICAL JUMP PERFORMANCE IN FOOTBALL PLAYERS

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ABSTRACT

The aim of this study was to investigate the effects of French Contrast training method applied for six weeks on sprint and vertical jump performance in football players. The research was conducted in experimental research model. A total of 20 people, 10 in the experimental group and 10 in the control group, voluntarily participated in the study. French Contrast training method exercises were applied to the experimental group twice a week for six weeks with 72 hours intervals. Limited rest (10 seconds) was given between exercises and four-five minutes rest was given between each set. The 30 m. sprint test and vertical jump tests were performed before and 6 weeks after the programme. SPSS 25.0 for Windows statistical package programme was used for the analysis of the data obtained. Wilcoxon signed-rank test, one of the non-parametric tests, was applied to look at the difference between the pre-test and post-test and the significance level was tested with $p < .05$. There is a statistically significant difference between 30 m. sprint pre-test and post-test for the experimental group ($p = .00$). Again, there is a statistically significant difference between vertical jump pre-test and post-test for the experimental group ($p = .00$). For the control group, there was no statistically significant difference in both 30 m. sprint performance ($p = .57$) and vertical jump performance ($p = .64$). A positive effect was observed in the sprint and vertical jump performances of football players as a result of the French Contrast training method applied two days a week for six weeks.

Key words: Football. Sprint. Vertical Jump. Post Activation Potentiation. French Contrast.

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RESUMO

O efeito dos exercícios de contraste francês aplicados por seis semanas no desempenho de sprint e salto vertical em jogadores de futebol

O objetivo deste estudo foi investigar os efeitos do método de treinamento French Contrast aplicado durante seis semanas no desempenho de sprint e salto vertical em jogadores de futebol. A pesquisa foi realizada em um modelo de pesquisa experimental. Um total de 20 pessoas, 10 no grupo experimental e 10 no grupo de controle, participaram voluntariamente do estudo. Os exercícios do método de treinamento French Contrast foram aplicados ao grupo experimental duas vezes por semana durante seis semanas, com intervalos de 72 horas. Foi dado um descanso limitado (10 segundos) entre os exercícios e quatro a cinco minutos de descanso entre cada série. O teste de sprint de 30 m e os testes de salto vertical foram realizados antes e seis semanas após o programa. O pacote estatístico SPSS 25.0 para Windows foi usado para a análise dos dados obtidos. O teste Wilcoxon signed-rank, um dos testes não paramétricos, foi aplicado para verificar a diferença entre o pré-teste e o pós-teste, e o nível de significância foi testado com $p < .05$. Há uma diferença estatisticamente significativa entre o pré-teste e o pós-teste de corrida de 30 m. para o grupo experimental ($p = .00$). Novamente, há uma diferença estatisticamente significativa entre o pré-teste e o pós-teste do salto vertical para o grupo experimental ($p = .00$). Para o grupo de controle, não houve diferença estatisticamente significativa no desempenho do sprint de 30 m ($p = .57$) e no desempenho do salto vertical ($p = .64$). Foi observado um efeito positivo nos desempenhos de corrida e salto vertical dos jogadores de futebol como resultado do método de treinamento French Contrast aplicado dois dias por semana durante seis semanas.

Palavras-chave: Futebol. Corrida. Salto vertical. Potenciação pós-ativação. Contraste francês.

INTRODUCTION

Football, recognized as one of the most popular sports globally, demands high levels of physical performance from its players.

The game encompasses intermittent physical activities, including sprinting, running, jumping, kicking, and heading, with two teams of 11 players competing for 90 minutes on a field measuring 90-120 meters in length and 45-90 meters in width (Ishida et al., 2021).

The sport is characterized by an intermittent activity profile that relies on both aerobic and anaerobic metabolic systems (Coratella et al., 2016; Rampinini et al., 2007). Within this framework, the development of various physical attributes—such as strength, speed, agility, and balance—plays a pivotal role in enhancing players' on-field performance.

The dynamic nature of football highlights its distinctiveness as a sport involving varied distances, directions, and intensities of running, where technical, tactical, and skillful execution significantly influences team success (Al-Hazzaa, 2001).

Movements such as short sprints, changes in direction, sudden stops, header strikes, jumps, and ball kicks are associated with anaerobic energy production that occurs in brief, high-intensity bursts (Günay, Yüce, 2008).

Contemporary football is characterized by a continuous interplay of short sprints, accelerations, decelerations, and jumps (Haycraft et al., 2017).

Speed is a critical component in football, with the majority of sprints during a match being less than 30 meters, and 49% measuring 10 meters or less (Stolen et al., 2005).

While speed can be enhanced through muscle fiber structure and targeted training programs, strength training is equally vital for optimizing speed performance (Muratlı, 1997).

In recent years, complex and contrast training techniques have gained attention as effective methods for optimizing physical qualities in football players.

These innovative training approaches aim to simultaneously improve both maximal power and movement speed through targeted strength and explosive power development (Türkarslan, Deliceoğlu, 2024; Alves et al., 2010).

Contrast training typically involves a heavy load exercise followed by an explosive exercise. Research has indicated significant improvements in performance parameters, including vertical jump, sprint speed, and balance, among football players undergoing this training regimen (Korkmaz, Uysal, 2021; García-Pinillos et al., 2014).

This training model enhances contraction rates and power generation by accelerating adaptations within the central nervous system (Salam, Sherif, 2020).

Notably, studies focusing on young footballers have demonstrated that contrast and complex training result in significant performance enhancements in the short term (Barra-Moura et al., 2024; Erol, 2022).

Vertical jump is defined as the difference between the height that a person can reach by standing and the height that a person can reach by jumping and it shows the explosive power ability of the lower extremity (Günay et al., 2006).

Plyometric training involves a rapid muscle stretch (eccentric movement) immediately followed by a concentric contraction of the same muscle and associated connective tissues (Pardos-Mainer et al., 2021; Häkkinen et al., 1985).

Accelerations and decelerations in football require substantial strength and power to facilitate intense muscle contractions associated with activities such as maximal sprints (30-40 times), directional changes (>700 times), tackles, and jumps (30-40 times). Vertical jump performance is a widely utilized metric for assessing both isometric and dynamic strength (Bongiovanni et al., 2019).

French Contrast exercises are linked to enhanced rates of force development (RFD) through voluntary and electrically stimulated muscle contractions (Hanson et al., 2007).

The increase in neural activity resulting from maximal and near-maximal contractions, coupled with the activation and synchronization of additional motor units, is a key factor contributing to the efficacy of French Contrast exercises in enhancing physical performance (Baker, 2001). Post-exercise performance may be adversely affected by fatigue or positively influenced by post-activation potentiation. Consequently, it is hypothesized that performance is maximized once fatigue-related effects have subsided, during a period when

strength gains remain active (Hodgson et al., 2005).

Literature indicates that contrast training positively influences not only physical performance but also complex skills and overall game performance in football players (Thapa et al., 2022).

Thus, the present study aims to investigate the short- and long-term effects of contrast and complex training methodologies on football players.

The literature has discussed the acute effects of the French Contrast method (Hernandez-Preciado et al., 2019).

Our hypothesis in this study is that the application of the French Contrast method over a six-week period will lead to significant improvements in both sprint and vertical jump performance.

MATERIALS AND METHODS

Participants

The experimental and control groups comprised 20 football players (see Table 1) from the Alanya Belediye sports amateur men's football team in Alanya district, Antalya province. Initial measurements were conducted in March 2022, with final measurements recorded in May 2022.

Data Collection Tools

Length of Height Measurement

The heights of the experimental and control groups were measured while standing in anatomical posture, barefoot, heels together, holding the deep breath, with the head in the frontal plane, after the overhead table was positioned at the vertex point, and the values were recorded in centimetres and transferred to the computer environment (Yapıcı, 2011).

Body Weight Measurement

A scale with a sensitivity of 0.1 kilogram was used for body weight measurements of the experimental and control groups. Measurements were taken in bare feet and anatomical posture position with only jersey and shorts on the subjects. Weighing results were read and recorded on the display and

transferred to the computer environment (Yapıcı, 2011).

30 m. Sprint Test

The measurement was made with a Seven brand photocell stopwatch installed between 0-30 m in Alanya Municipality sports facilities and the time of the athletes to run this distance was measured and the best of three trials was recorded. A 2-minute rest was given between each trial (Taşkın et al., 2015).

Vertical Jump Test

My Jump 2 App (Bogataj et al., 2020), an iPhone phone application, was used in the vertical jump test of the athletes. In the squat jump test, in which the explosive strength of the leg muscles is measured depending on the maximal strength, it was applied as a full jump upwards in the squat position with knees flexed 90 degrees and hands on the waist. Each measurement was repeated 3 times and the best value was recorded (Açıkada, (2008), as cited in Taşkın et al., 2015). A 2-minute rest was given between trials.

French Contrast Method Study Protocol

Both the experimental and control groups followed traditional football training in their weekly programs. The experimental group incorporated French Contrast training two days per week, with 72-hour intervals between sessions.

The experimental group engaged in a traditional warm-up (Foam Roller Work, Mobilization and Stabilization, Core Activation, Dynamic Flexibility Work) for 15 minutes prior to the French Contrast training. The exercise protocol for the French Contrast method was as follows (Elbadry et al., 2019):

- 1- Squat (Compound Exercise) 1-3 repetitions 80-90% intensity
- 2- Box Jump (Plyometric) 3-5 repetitions, reactive
- 3- Dumbbell Jump (Reactive Jump) 3-5 repetitions 40% intensity
- 4- Assist band Jump (Acceleration Plyometrics) 4-6 repetitions, reactive

Each of the four exercises was conducted in four sets, with breaks of 4-5 minutes between sets.

Data Analysis

Data analysis was performed using the SPSS 25.0 statistical package. Normality tests, including kurtosis and skewness, were examined to determine appropriate statistical techniques. Due to the small sample size, non-parametric tests were employed. The Wilcoxon signed-rank test was utilized to assess differences between pre-test and post-test measurements, with statistical significance set at $p < .05$.

Ethical Considerations

Ethical approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee at the University of Alanya Alaaddin Keykubat (Decision Number-2024/01-05-20-14/05/2024).

RESULTS

Table 1 - Age, Height and Body Weight Values of the Research Group.

		n	Min.	Max.	Mean	Std. Error	Std. Dev.
Groups							
Experimental Group	Age	10	17.00	18.00	17.4000	.16330	.51640
	Height	10	165.00	182.00	176.3000	1.70652	5.39650
	Body Weight	10	50.00	74.00	63.3000	2.50799	7.93095
	n	10					
Control Group	Age	10	17.00	18.00	17.2000	.13333	.42164
	Height	10	168.00	187.00	175.4000	2.02868	6.41526
	Body Weight	10	53.00	79.00	62.8000	2.55517	8.08015
	n	10					

Table 1 presents the mean age, height, and body weight of the participants in the study.

Table 2 - Descriptive Statistics of the Experimental and Control Groups.

Descriptive Statistics											
		n	Min.	Max.	Mean	Standart Dev.	Skewness	Kurtosis			
							Statistic	Std. Error	Statistic	Std. Error	
Groups	Experimental	30m1	10	4.34	5.45	4.8168	.32392	.741	.687	.583	1.334
	Goups	30m2	10	4.09	4.60	4.2734	.18139	1.284	.687	.413	1.334
		vertical1	10	11.50	24.10	19.0900	4.51281	-.912	.687	-.357	1.334
		vertical2	10	14.80	25.90	21.4700	3.72739	-.708	.687	-.598	1.334
		n	10								
Control Groups	30m1	10	4.19	5.13	4.4853	.26903	1.671	.687	3.204	1.334	
	30m2	10	4.12	4.99	4.4716	.29205	.616	.687	-.848	1.334	
	vertical1	10	14.40	22.60	17.9600	3.18998	.301	.687	-1.648	1.334	
	vertical2	10	14.30	22.40	18.0300	3.21526	.342	.687	-1.810	1.334	
	n	10									

Analysis of Table 2 revealed that the kurtosis and skewness values for the experimental group ranged from -.912 to 1.284, while those for the control group ranged from -1.648 to 3.204.

According to the kurtosis skewness values, although it was observed that the data

were normally distributed in the experimental group and the data were not normally distributed in the control group, it was accepted that the data were not normally distributed due to the small sample size and non-parametric tests were preferred.

Table 3 - Wilcoxon Signed Ranks Test Results.

Wilcoxon Test Statistics ^a			
Groups		30m2 - 30m1	vertical2 - vertical1
Experimental Group	Z	-2.803 ^b	-2.807 ^c
	p	.005*	.005*
Control Group	Z	-.561 ^b	-.459 ^c
	p	.575	.646

b. Based on positive ranks

c. Based on negative ranks

Analysis of Table 3 indicates a statistically significant difference in the 30 m sprint performance between pre-test and post-test measurements for the experimental group ($p=.00$).

Additionally, a statistically significant difference was observed in vertical jump performance for the experimental group ($p=.00$). In contrast, the control group did not exhibit statistically significant differences in either the 30 m sprint performance ($p=.57$) or vertical jump performance ($p=.64$).

DISCUSSION

This study aims to contribute to the existing literature evaluating the effects of contrast and complex training methods in improving the physical performance of football players.

The findings show that these methods provide positive short and long-term effects, especially on sprint, vertical jump, agility and balance performances of footballers.

This study revealed that 6-week French Contrast training practices in male football players aged 17-18 years provided significant improvements in sprint and vertical jump performance.

In a similar study conducted by Turna et al., (2019), it was observed that PAP

applications provided more performance improvement compared to classical loading methods.

The stimulating effect of contrast training on the central nervous system appears to contribute to the development of explosive power, while complex training is suggested to enhance the maximal strength capacity of football players (Türkarslan, Deliceoğlu, 2024; Korkmaz, Uysal, 2021).

In a study conducted by Elbadry et al. (2019), it was shown that 8-week French Contrast training provided significant improvements in Sargent jump test, countermovement jump and seated medicine ball throw tests. In addition, in another study conducted by Welch et al., (2019), it was reported that 6-week French Contrast training improved maximum strength and jumping characteristics.

However, the frequency and continuity of the application of these training methods is also an important issue of debate.

Barra-Moura et al., (2024), when they examined the effects of training frequencies on the physical performance of footballers, found that the effects of higher frequency contrast training on performance were more pronounced. In addition, according to the results of the meta-analysis conducted by Pagaduan et al., (2019), contrast training was

shown to create a significant difference compared to traditional resistance training.

In the literature, contrast and complex training are also reported to positively affect overall game performance, particularly in relation to complex skills, endurance, and quick decision-making abilities in footballers (Thapa et al., 2022).

However, some studies have limited data on the long-term effects of these methods, and more research is needed in this field (Salam, Sherif, 2020).

Nevertheless, studies such as Alves et al., (2010) and Thapa et al., (2021) emphasise that complex and contrast training provide improving effects on the sprint, jump and change of direction abilities of footballers.

CONCLUSION AND RECOMMENDATIONS

This study demonstrates that contrast and complex training methods are effective in improving the physical performance of football players. Six-week French Contrast Exercises performed twice a week on 17-18 years old male football players provided significant improvements in jump and sprint performance ($p < .05$).

These findings emphasise the importance of training frequency and loading times. In addition, it is thought that it may be appropriate to apply French Contrast exercises in macro or meso plans of football training to obtain more efficient results in a shorter time.

Future studies should investigate the effects of these training methods across different age groups and football performance levels in greater detail.

Particularly, integrating French Contrast exercises into strength training could be advantageous for young football players to adapt to the training tempo of A teams or to enhance their performance.

However, further research is warranted to explore the long-term effects of these training methods.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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