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Original article

Impact of detraining process experienced during the COVID-19 pandemic on the selected physical and motor features of football players

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Abstract. *Study Objectives:* The purpose of this study was to examine the changes in the selected physical and physiological properties of football players in the long-term detraining stage during the pandemic period. *Methods:* In this study, 14 semi-professional football players (mean age: 22.21±3.29 years old and mean height: 177.86±5.35 cm) took part voluntarily. The participants had remained in detraining in the home environment for 89 days until the final measurements, following the decision of cessation of the leagues made by the Turkish Football Federation, except soft and irregular exercises they did with theirbody weight. The participants' body composition characteristics, anaerobic performance, flexibility, and speed performance were measured. The descriptive statistics for numeric variables were expressed as mean±standard deviation. Since parametric test assumptions were provided as a result of examining the data acquired from the experimental subjects via the Shapiro-Wilk test, the repetitive measurements were evaluated using the "Paired-Sample t-test". In addition, the mathematical differences between the two measurements were indicated with percentage. The results were evaluated at the confidence interval of 95% and the value $p<0.05$ was accepted to be significant. *Results:* Comparing the pretest-posttest results of the participants; the difference between the two measurements was statistically insignificant in terms of body weight, BMI, 30 m speed, and fatigue index properties, while the difference in terms of body muscle mass, fat mass, fat ratio, waist-hip ratio, peak power, average power, minimum power and flexibility properties was significant. *Conclusion:* A long-term detraining process significantly damages the physical and motor performance of football players.

Keywords: Athletic Performance, COVID-19, Detraining, Football

Introduction

Football is known to be a universal game liked by people in many parts of the world, regardless of their gender, age, race, or beliefs (1). It is a branch containing long-term races at varying intensities and highlighting motoric properties such as strategy and technical skill, agility, power, and endurance, in terms of game structure (2). For football players to successfully practice such heavy efforts, they need to have advanced levels of anaerobic performance properties (3). In addition, they need to have advanced levels of aerobic performance properties to repeat these motions successively at the same quality without developing fatigue (4).

Success in football depends on the development of many physical and physiological conditions. Physical needs, the first of these physical and physiological conditions, are associated with body structure. There is a close relationship between body structure and performance. It is because body structure is effective in revealing the physiological capacity (5). Excessiveness of body fat ratio may negatively affect motor performance and lead to an extra loss of energy in endurance sports (6). In general excessiveness of body fat ratio has a negative impact on the performance both mechanically and metabolically in sport branches containing motion series in which body weight is moved quickly and diversions occur (7,8).

One of the essential biomotor competences in sports is speed; namely the speciality of covering a distance and moving at maximum speed (9). In general, speed is one of the most important components of football-specific efficiency competence with its various sectional competences. Football players who play very well not only display top-level technical and tactical properties; they also possess very advanced speed properties (10). In addition one of the most important motoric properties needed for an effective sportive performance in football as in many other sport branches is flexibility. Flexibility is defined as a sporter's competence and property of practice in one joint or many joints with motions at a big oscillation width and on his own or under the supportive effect of external forces. Flexibility can be classified as general and special, active or passive, and dynamic or static (10).

Detraining is the occurrence of losses in sportive performance and physiological adaptations when the training is reduced or completely ceased (11). In most resources, detraining is defined as an inactivity period that appears following an intense training period (11,12). The impacts of the detraining period can be classified under two topics as physiological and physical. Physiological impacts are changes observed in the cardiovascular and respiratory systems. Physical impacts are declines in muscle force, muscular endurance, speed, flexibility, agility, and body composition (13). Detraining is examined in two periods in general. The first of these periods, short-term detraining connotes a detraining period of less than four weeks. On the other hand, a detraining period longer than four weeks is called long-term detraining (14).

In the light of these informations, the purpose of the study is to examine the changes in the selected physical and physiological properties of football players in the long-term detraining stage during the pandemic period.

Material and Method

Participants

In study 14 semi-professional football players (mean age: 22.21±3.29 years and mean height: 177.86±5.35 cm) took part voluntarily. The participants had remained in detraining in the home environment for 89 days until the final measurements, following the decision of cessation of the leagues made by the Turkish Football Federation, except soft and irregular exercises they did with their body weight.

Experimental Design

In the study, the quantitative research method (experimental technic) comparing the pretest-posttest values, was used to determine the impact of the detraining process faced by the experimental subjects during the pandemic period on the selected physical and motoric properties.

Determining Physical Properties: The participants' body composition was determined via the Inbody 270 (South Korea). As Mackenzie (15) indicates, the participants' body weight was measured in kilogram (kg) when they were in an anatomic position on condition that they wore shorts, t-shirt and no shoes. Also, their body muscle mass (kg), body fat mass (kg), body fat ratio (%), body mass index (kg/m^2), and waist-hip ratio were determined via the same device.

Anaerobic Power Test: Anaerobic performance was measured via the Monark branded 894E Wingate test system (Sweden). Wingate Anaerobic Power Test (WAnT) is one of the frequently used tests can provide information about both lactacid (average power) and alactacid (peak power) components of anaerobic performance and determine the anaerobic property. Most researchers have examined the test-retest reliability of the Wingate Anaerobic Power Test. In the studies conducted, the correlation coefficients range from 0.89 to 0.98. These results prove the reliability of the WanT (5).

Collection of Data

Flexibility Test

The flexibility values of the players who took part in the study were measured via the sit-and-reach flexibility test. The participants were asked to reach to the furthest point on a flexibility table in the sitting position without bending their knees. The best result was recorded after repeating the process twice (16,17).

30 m Speed Test: Speed values of the sporters who took part in the study were determined using photocell on a 30-meter track established. The sporters displayed performance by stepping on a line right behind the start photocell. Two opportunities were given to each sporter and the best test scores were recorded.

Statistical Analysis

The statistical evaluation was performed using the SPSS (Ver. 20.0) package program. The descriptive statistics for numeric variables were expressed as mean±standard deviation. Since parametric test assumptions were provided as a result of examining the data acquired from the experimental subjects via the Shapiro-Wilk test, the repetitive measurements were evaluated using the "Paired-Sample t-test". In addition, the mathematical differences between the two measurements were indicated with percentage. The results were evaluated at the confidence interval of 95% and the value $p<0.05$ was accepted to be significant.

Results

The mean age of the 14 male football players was found to be 22.21±3.29 years and their mean height 177.86±5.35 cm. Other mean values of the participants and the comparison results are demonstrated in tables.

Comparing the pretest-posttest results of the participants the difference between the two measurements was statistically insignificant in terms of body weight and BMI properties, while the difference in terms of body muscle mass, fat mass, fat ratio, and waist-hip ratio properties was significant.

Table 1. Pretest-Posttest Mean Values of the Participants' Selected Physical Properties and the Comparison Results (Paired Samples t-Test)

Parameters	Measurement	$\bar{X}$±S.D.	t	p
Body Weight (kg)	Pre-test	69.20±5.89	-0.138	0.893
	Post-test	69.30±6.76		
Body Muscle Mass (kg)	Pre-test	34.50±3.07	3.556	0.004*
	Post-test	33.35±2.56		
Body Fat Mass (kg)	Pre-test	8.67±2.14	-3.611	0.003*
	Post-test	10.58±3.22		
Body Fat Ratio (%)	Pre-test	12.49±2.81	-4.071	0.001*
	Post-test	15.02±3.50		
BMI (kg/m^2)	Pre-test	21.87±1.42	-0.230	0.821
	Post-test	21.92±1.78		
Waist-Hip Ratio	Pre-test	0.81±0.03	-6.021	0.000*
	Post-test	0.84±0.03		

Table 2. Pretest-Posttest Mean Values of the Participants' Selected Motoric Properties and the Comparison Results (Paired Samples t-Test)

Parameters	Measurement	x̄±S.D.	t	p
Flexibility (cm)	Pre-test	31.14±5.50	3.166	.007*
	Post-test	28.85±4.67		
30 m Speed (sec)	Pre-test	3.99±0.18	-0.161	.874
	Post-test	4.01±0.13		
Peak Power (W)	Pre-test	870.90±146.39	2.610	.022*
	Post-test	816.94±112.73		
Average Power (W)	Pre-test	596.38±66.80	3.064	.009*
	Post-test	557.85±49.12		
Minimum Power (W)	Pre-test	331.32±43.24	3.206	.007*
	Post-test	296.68±23.00		
Fatigue Index (%)	Pre-test	61.25±6.37	-1.902	.080
	Post-test	63.25±4.05		

Comparing the pretest-posttest results of the participants, the difference between the two measurements was statistically insignificant in terms of 30 m speed and fatigue index, while the difference in terms of flexibility, peak power, average power, and minimum power properties was significant.

There was a percental decline between the pretest and posttest only in terms of muscle mass, while there was an increase in all other physical properties compared to the pretest.

There was a percental decline in all motoric properties in the posttest compared to the pretest.

Table 3. Percentage Distributions between the Pretest-Posttest Results of Selected Physical Properties

Parameters	Mean % Difference
Body Weight	0.11
Body Muscle Mass	-3.19
Body Fat Mass	21.75
Body Fat Percentage	21.24
BMI	0.18
Waist-Hip Ratio	4.36

Discussion

Comparing the averages of the results acquired by the 14 football players who took part in the study from the pretest measurements with the relevant literature, it was observed that they were similar in general. For example, Aktas and Aslan (18) found the amateur football players' age to be 22.14 years, height 175.54 cm, body weight 69.00 kg, BMI 22.40 kg/m2, fat ratio 7.40%, and 30 m speed value 4.21 sec. Cerrah et al. (19) determined 30 m sprint values of the 89 amateur football players whom they separated into four groups

Table 4. Percentage Distributions between the Pretest-Posttest Results of Selected Motoric Properties

Parameters	Mean % Difference
30 m Speed	-0.26
Flexibility	-6.65
Peak Power	-5.54
Average Power	-5.98
Minimum Power	-9.244
Fatigue Index	-3.764

to be 4.31 sec, 4.17 sec, 4.25 sec, and 4.15 sec, respectively. Karakulak et al. (20) found body fat mass of the amateur football players whom they separated into two groups to be 4.32 kg and 6.32 kg; 30 m speed values 4.23 sec and 4.35 sec; flexibility values 27.28 cm and 29.06 cm. Koklu et al. (21) found the anaerobic power of the amateur football players to be 691.70 W and 712.60 W; anaerobic capacity 528.80 W and 549.90 W. Considering the results of similar studies in the literature; it is possible to state that the amateur football players in this study have similar properties with other samples in the target population.

Since the studies conducted in Turkey on detraining, particularly long-term detraining are not adequate in number, the discussion section has remained limited.

In the detraining period, which had lasted for 89 days due to the pandemic, there was a statistically significant increase in the 14 amateur football players' body weight and BMI, which are among physical properties. These increases were only 0.11% and 0.18%, respectively. There were significant increases in body fat mass, body fat percentage, and waist-hip ratio in the posttest compared to the pretest. These increases in the posttest were found to be 21.75%, 21.34%, and 4.36%, respectively compared to the pretest. There was a significant decline (3.19%) in body muscle mass. In the study conducted by Karakulak (22) on detraining with the amateur football players at the end of the football season, it was found that the players had a significant increase in their body weight at the end of the 45-days. However, there was no significant increase in their body fat ratio. Sotiropoulos et al. (23) determined that the football players not training regularly had a significant increase in their body weight and fat ratio at the end of four weeks. Also, Silva et al. (24) state that short-term detraining period has minor negative impacts on body composition, while long-term detraining period has moderate negative impacts. Requena et al. (25) found an increase in body composition values of the football players at the end of seven weeks, which they had spent passively. The results acquired in this study are in agreement with the literature in general. In the light of these results, it is possible to say that long-term detraining period has negative impacts on body composition, especially body muscle mass, body fat mass and fat ratio of football players.

Assessing the 30 m speed test results; although there were declines in performance values in the final measurements during the 89-day detraining period, these results were not statistically significant. However, the decline in speed feature which is an important performance parameter in football, was found to be 0.26% though not statistically significant. Karakulak (22) indicated that the 45-day detraining process had no statistically significant impact on 30 m speed performance of the football players. Requena et al. (25) found that there was no significant change in 30 m sprint performance at the end of the detraining process, compared to the mid-season and season-end. Mujika and Padilla (14) reported that short-term detraining period had no negative impact on sprint performance in the well-trained sporters. Amigo et al. (26) indicated that there were statistically significant dysfunctions in 30 m speed performance of the young amateur football players whose mean age was 15 years, at the end of eight weeks. The reason that the results acquired in this study regarding 30 m speed performance contradict with the study results of Amigo et al. (26), can be associated with lower mean age of the participants or difference in the league level. The results acquired in this study regarding 30 m speed performance comparisons are in agreement with the literature in general.

In our study, the declines in flexibility performance of the amateur football players during the 89-day detraining period were found to be different in a statistically significant way. These declines were 6.65%. Caldwell and Peters (27) reported that long-term detraining period in English football players reduced their flexibility capacity. Karakulak (22) reported that the decline in flexibility capacity in the amateur football players, whose mean age was 17 years at the end of the 45-day detraining process, was not statistically significant. The reason that the declines in flexibility performance during the detraining period in this study are in agreement with the study by Caldwell and Peters (27), while they contradict the study result of Karakulak (22), can be associated with the age gap between the participants. It is because anatomic and functional changes in joints during the adolescence period may affect flexibility. Flexibility is stable in males in the age range of 5-8 years. It decreases until the ages of 12-13 years. It is stable between the ages of 13-15 years and then naturally increases until the age of 18 years (28,29).

In our study, examining the impacts of long-term detraining period on the anaerobic performance outputs, it was found that the declines in peak power, average power, and minimum power values were statistically significant. These declines were 5.54%, 5.98%, and 9.24%, respectively. The decline in fatigue index value, which is yet another anaerobic performance parameter was not statistically significant. However, it was 3.76%. Karakulak (22) indicated that long-term detraining process reduced peak power, average power, and fatigue index values, which are among anaerobic performance parameters, in young football players; however, this decline was not statistically significant. In addition, most researchers in the literature reported declines in anaerobic performance parameters of the football players after detraining (30-32), while they reported no significant differences in fatigue index values (22,26,33), which is in agreement with this study.

Conclusion

Consequently, the long-term detraining process causes significant deteriorations in the physical and motoric performance of football players. Although such long detraining periods are not encountered much in football branches, trainers need to take precautions and plan training accordingly in order to minimize the negative impacts of this process on the physical and motoric performance in compulsory conditions like a pandemic.

Conflicts of Interest

The authors declare that there is no conflict of interest in this manuscript.

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