

Effects of the COVID-19 Lockdown on Neuromuscular Performance and Body Composition in Elite Futsal Players

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Abstract

Spyrou, K, Alcaraz, PE, Marín-Cascales, E, Herrero-Carrasco, R, Cohen, DD, Calleja-Gonzalez, J, Pereira, LA, Loturco, I, and Freitas, TT. Effects of the COVID-19 lockdown on neuromuscular performance and body composition in elite futsal players. *J Strength Cond Res* 35(8): 2309–2315, 2021—Recent world events (i.e., COVID-19 pandemic) led to an unparalleled situation in sports. Players were forced to stay at home for a prolonged period and not allowed to use their team's training facilities or even exercise outdoors. The main aim of this study was to examine the effects of the COVID-19 lockdown on neuromuscular performance and body composition in futsal players. Ten elite male players performed a 10-m sprint, horizontal and vertical jump, and body composition measurements before and after the quarantine (i.e., 70 days). Pre-post confinement differences in horizontal jump distance, countermovement jump variables, sprinting time, and body composition were analyzed by a paired sample *t*-test and effect sizes (ESs). A large and significant decline was observed in sprint ability ($p = 0.004$; $ES = 1.31$). Small and nonsignificant differences were found in horizontal jump performance ($p = 0.243$; $ES = -0.39$). Nonsignificant differences were observed in countermovement jump (CMJ) height ($p = 0.076$; $ES = -0.63$) but moderate-to-large significant declines were found in CMJ eccentric deceleration impulse, rate of force development, peak power, velocity, and landing peak force ($p \leq 0.05$; $ES = -0.52$ – 1.23). Finally, trivial and nonsignificant differences were obtained on body composition parameters. In summary, sprint performance and specific CMJ kinetic variables were significantly affected by long-term reduced training, whereas vertical jump height and horizontal jump distance and body composition were not. Practitioners are advised to implement efficient sprint-oriented and eccentric-oriented training strategies to optimize return to competition after prolonged detraining periods.

Key Words: five-a-side soccer, detraining, physical capacities

Introduction

Futsal is a high-intensity intermittent indoor sport, with high physical, technical, and tactical demands during match-play (1,3,5,6,27). In competitive scenarios, futsal players have been shown to cover an average of ~4,313 m during a single match, with high-intensity running corresponding to 13.7% and sprinting to 8.9% of the efforts performed (3). Moreover, players may complete ~30 sprints, in sequences of 2, 3, and 4 sprints, with 15–60-second rest intervals (5). These data highlight the importance of players having well-developed neuromuscular capabilities that enable them to successfully perform actions that require high-power outputs (e.g., sprints, jumps, and rapid changes of direction) and cope with the high-intensity demands of competition. In this regard, jumping and sprinting ability are commonly

used as monitoring tools to evaluate players' performance and fatigue levels throughout the season (7,10,18).

Regarding professional futsal, recent world events have resulted in an unparalleled situation with important implications for elite players. At the beginning of 2020 (January–March), sport leagues and tournaments worldwide (e.g., European soccer and futsal national leagues or the Olympic Games) were postponed or canceled because of a novel virus: SARS-CoV-2 (COVID-19). The uncontrolled spread of the virus caused thousands of cases of respiratory problems globally leading the World Health Organization to declare COVID-19 a pandemic (23). Most European countries imposed a mandatory confinement that, among other occupations, affected professional sports. As a consequence, athletes were forced to stay at home and were not allowed to use the team's training facilities. To face this unprecedented scenario during the in-season period, coaches and sports scientists provided several training recommendations in an attempt to minimize the detrimental effects caused by the lockdown on physical performance (15).

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Nevertheless, the actual effects of home confinement and long-term reduced training cannot be properly comprehended until players return to their normal activities.

According to Mujika and Padilla (20,21), detraining is defined as the total or partial loss of anatomical, neuromuscular, and physiological adaptations due to training reduction or cessation. Training cessation refers to the partial or complete pause of a precise training plan; reduced training consists on a non-progressive reduction of the training that may maintain or improve performance (20). On this topic, Koundorakis et al. (17) observed that after a long-term (i.e., 6 weeks) training cessation highly trained soccer players' neuromuscular responses (i.e., sprint and vertical jump) were negatively affected. Similarly, decreased eccentric knee extension force, electromyographic activity of the vastus lateralis during an isometric test, and changes in type II fiber areas were reported after 2 weeks of training cessation in power athletes (12). Moreover, fiber type transitions (i.e., from fast type II to slow type I fibers) have been shown to occur after detraining in several studies (16,22,30). Thus, it seems that sudden decreases in training load for an extended period may be detrimental to performance, particularly in highly trained individuals. However, a situation as the one caused by the COVID-19 (which resulted in professional athletes spending more than 60 days without adequate training, resources, and competition stimuli) is unprecedented, and therefore, its effects on athletic performance are unknown, particularly in futsal players. In fact, studies on this topic focused mainly on elite soccer. For example, an investigation with Brazilian players revealed significant decreases in countermovement jump (CMJ) and sprint (i.e., 10- and 20-m) performance after the quarantine (11). Similarly, another study (8) demonstrated that, although isolated resistance circuit and aerobic training was able to maintain CMJ height, reactive strength index, and peak concentric and eccentric power during the lockdown, other specific eccentric (i.e., downward) and landing phase kinetic variables were significantly altered in elite soccer players. As such, additional research in neuromuscular performance components is still needed to better understand the effects of long-term training cessation.

Body composition (i.e., body mass, fat percentage, and muscle mass) is another important aspect to consider in professional athletes as it plays a crucial role in competitive performance (29). A decrement on physical activity levels reduces energy expenditure that, in turn, may increase body fat (13). Previous research conducted with professional soccer players found that body fat and body mass were negatively affected after the transition phase of the season (17). However, to understand the effects of an unusual and prolonged home confinement on body composition in top-level athletes (e.g., elite futsal players), further investigation is warranted.

This study aimed to investigate the effects of a 70-day reduced training period forced by the COVID-19 quarantine on speed-power-related capacities (i.e., sprint acceleration, horizontal jump, and vertical jump) and body composition (i.e., body mass, body fat percentage, and muscle mass) of elite futsal players. Because of the prolonged period of specific reduced training, we hypothesized that athletic performance and body composition would be negatively affected by the lockdown period.

Methods

Experimental Approach to the Problem

This pre-post quasi-experimental study aimed to investigate the changes on speed-power-related performance and body

composition after the home confinement period caused by the COVID-19 pandemic. In Spain, the lockdown was announced on March 14, 2020. The prelockdown performance had been previously assessed on March 3, 2020, (as part of the physical testing procedures applied monthly to the futsal players during the in-season period) and the postlockdown evaluation was conducted on May 13, 2020 (i.e., 70 days later). The preconfinement body composition data were collected on March 2 and postconfinement assessments were conducted on May 12, 2020 (i.e., after 70 days). Pretest evaluations were completed for all players collectively, whereas, on posttest, players reported to the laboratory individually (3 players were assessed each hour, between 09:00 and 13:00 hours), according to the governmental guidelines. All players were familiarized with the testing procedures because of their regular routines in our facilities. Players completed the same standardized general warm-up protocol consisting of running-based activities, dynamic stretching, core and lower-body activation exercises, followed by a test-specific warm-up (i.e., submaximal attempts in all tested exercises). Tests were performed on the following order: vertical jump, horizontal jump, and sprint acceleration test. The 10-m sprint test was selected because futsal match activity profiles have shown that the average sprinting distance is ~10.5 m (27). Each trial was separated by a 1-minute rest interval, and 3 minutes were allowed between successive trials and tests.

During the lockdown, each player followed an individualized nutritional plan developed by the team's nutritionist and adjusted every 2 weeks. To keep prequarantine body composition parameters, players recorded their body mass twice per week and reported it to the team's nutritionist. The Harris-Benedict's equation (14) was used to measure energy expenditure and determine each player's energy intake (i.e., should be the same as the energy expenditure). In addition, all players completed a semi-structured maintenance training program (Table 1) comprising exercises using only the body mass as resistance (e.g., vertical and horizontal jumps, half and full squats, lunges, push-ups, etc.). Athletes were instructed to perform these exercises 2–3 times per week, completing 2 or 3 sets of 6–8 (jumps) and 10–12 (squats and lunges) repetitions. Importantly, and as shown in Table 1, despite completing the maintenance program, players experienced a considerable decline in all type of fast stretch-shortening cycle actions during the lockdown (i.e., due to the lower training intensity and frequency and to the lower exposure to jumping and other explosive actions characteristic of futsal training and match-play). All players confirmed that they did not seek any professional advice outside of the team's coaching staff nor did they follow any prescribed training by other practitioners. In this sense, during the quarantine period, athletes were considered to be on a long-term reduced training phase.

Subjects

Players from an elite futsal team (i.e., a 12-player squad) volunteered to take part in the study. Two athletes did not complete the last assessment prequarantine because of minor injuries and were not included in the analysis. Therefore, 10 elite male futsal players (mean $\pm$ SD; age: 26.7 $\pm$ 3.1 years old, body mass: 76.0 $\pm$ 6.6 kg, height: 1.78 $\pm$ 0.06 m) participated in this study. Futsal players competed in the Spanish National League (LNFS) and were qualified to play the UEFA Futsal Champions League Final. Therefore, the high level of the players in this study sample can be confirmed. All athletes involved were free of injury before the

Table 1**Models of the training structure during the competitive season and the lockdown period.***

Training strategy	Resistance training	RST	Plyometric
Competitive season			
Exercise type	Traditional and ballistic	Resisted sprints	VJ-HZ
Intensity	30–70% 1RM	High	High
Volume	2–3 sets 4–8 reps	10 m 5–8 reps	2–3 sets 8–10 reps
Frequency		2–3 sessions·wk ⁻¹	
Sport-specific training		5–6 sessions·wk ⁻¹	
Official matches		1–2 official matches·wk ⁻¹	
Lockdown period			
Exercise type	BM		VJ-HZ
Intensity	Low		Moderate
Volume	2–3 sets 10–12 reps		2–3 sets 6–8 reps
Frequency		2–3 sessions·wk ⁻¹	

*BW = body mass; HIIT = high-intensity interval training; HZ = horizontal jumps; Reps = repetitions; RST = resisted sprint training; VJ = vertical jumps; wk = week.

quarantine. By signing a professional contract with the club, all players provided individual written informed consent for data collection and study participation. All procedures were approved by the Catholic University of Murcia (UCAM) Ethics Committee and were conducted according to the Declaration of Helsinki.

Procedures

Sprint Acceleration Test. Two pairs of photocells (WITTY System, Microgate, Bolzano, Italy) were positioned at the starting line and at 10 m. Players started from a standing position, 0.3 m behind the starting line, and performed a maximal all-out linear sprint twice, with a 1-minute rest (intraclass correlation coefficient [ICC] = 0.82, coefficient of variation [CV] = 3.9%). Players started the test when ready, with no investigator's signal. Given the short distance (i.e., 10 m) assessed, the test could be considered to evaluate acceleration capabilities because players did not achieve maximum sprinting velocity. All athletes performed the test using the regular futsal shoes and on a wooden surface. The fastest time was retained for analysis.

Horizontal Jump Test. Athletes stood with their feet shoulder-width apart behind the starting line and the arms at the side of the body. They were instructed to jump as far as possible in the horizontal direction. A countermovement with arm swing was allowed. Players performed a maximal effort 3 times with a 1-minute rest (ICC = 0.91, CV = 3.7%). Athletes were required to land with both feet simultaneously, and in case they fell forward or backward, the trial was considered invalid and repeated. The distance between the starting point and the heel of the rear foot measured by a tape to the nearest 1 cm was considered. The longer distance was recorded for analysis.

Vertical Jump Test. Countermovement jump was used to determine the vertical jump ability. Athletes were required to perform a downward movement, followed by a complete, rapid extension of the lower limbs. The depth of the countermovement was self-selected to avoid changes in jumping coordination. The hands were placed on the hips throughout the whole movement, and athletes were directed to jump as high as possible and land close to the take-off point. They executed 3 maximal trials with 1-minute rest (ICC = 0.94, CV = 6.0%). The CMJ was performed on a Kistler 9286BA portable force platform (Kistler Group, Winterthur, Switzerland), and the data were exported and

analyzed with the software ForceDecks (Vald Performance, Brisbane, Australia) and processed using Python (v.3.8.3). Jump height and multiple kinetic variables (e.g., impulse, peak power, peak force, and velocity or rate of force development [RFD]) (8) from the best jump trial (according to highest jump height) were retained for analysis.

Body Composition. All the assessments were completed by the same experienced evaluator (nutritionist), who had ISAK certification, in accordance with ISAK's international standards (28). Players were required to be on a fasted state, to avoid caffeine and alcohol consumption for at least 8 hours before the procedure, and to wear only the team's training shorts. Body mass was assessed using a Tanita HD-313 scale (Tanita Corporation, Tokyo, Japan) with a 150 kg capacity and accuracy to the nearest 0.1 kg. Eight skinfold measurements were taken with a Harpenden caliper (Baty International, RH15 9LB, England; width of 80 mm and accuracy to 0.2 mm) from the following defined ISAK sites: triceps, subscapular, biceps, iliac crest, supraspinal, abdominal, frontal thigh, and medial calf. Percentage of body fat was estimated according to Yuhasz's equation (31) and muscle mass (kg) to Matiegka's equation (9).

Statistical Analyses

Data are presented as mean $\pm$ SD. Statistical analysis was performed using the Jamovi statistical package (2020; version 1.2). Normality was checked with the Shapiro-Wilk test. A paired sample *t*-test (parametric variables) or a Wilcoxon test (non-parametric variables) was used to detect differences between pre-post measurements. Cohen's effect sizes (ESs) with 95% confidence intervals (95% CIs) were computed to determine the magnitude of every paired comparison and classified as follows: trivial (<0.2), small (>0.2–0.6), moderate (>0.6–1.2), large (>1.2–2.0), and very large (>2.0–4.0) (4). Significance level was set at $p \leq 0.05$.

Results

Figures 1 and 2 display the group and individual data for sprint and horizontal jump performances, respectively. Considering sprint, a significant and large decrease in performance was observed ($p = 0.004$; ES = 1.31). By contrast, small and non-significant pre-post differences were found in horizontal jump ($p = 0.243$; ES = -0.39).

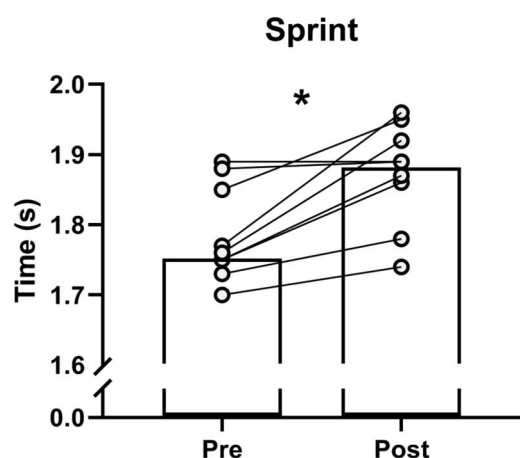


Figure 1. Prequarantine and postquarantine sprint time data. Bars represent mean values, and symbols and lines represent individual changes. * $p < 0.05$.

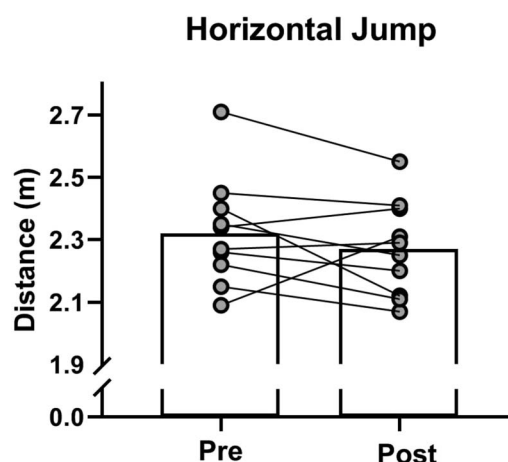


Figure 2. Prequarantine and postquarantine horizontal jump distance data. Bars represent mean values, and symbols and lines represent individual changes.

Figure 3 presents the group and individual data for vertical jump performance, and Table 2 depicts the data for selected CMJ kinetic variables. Moderate and nonsignificant pre-post differences were found in vertical jump height ($p = 0.076$; $ES = -0.63$). In the CMJ eccentric (“downward”) phase, significant decreases were observed in deceleration impulse ($p = 0.006$; $ES = -1.13$), RFD ($p = 0.041$; $ES = -0.75$), peak velocity ($p = 0.006$; $ES = 1.12$) and peak power ($p = 0.004$; $ES = 1.23$). Nonsignificant, trivial or small declines were detected in all concentric (“upward”) phase variables and landing RFD to peak force ($p = 0.129$; $ES = -0.52$). Moderate significant differences were found in peak force ($p = 0.050$; $ES = -0.70$) during the landing phase.

Table 3 depicts the data for the body composition variables pre-post confinement. Trivial and nonsignificant differences were obtained in total body mass ($p = 0.992$; $ES = 0.00$), fat mass ($p = 0.947$; $ES = -0.02$), and muscle mass ($p = 0.734$; $ES = -0.11$).

Discussion

To the best of our knowledge, this is the first study to investigate the effects of 70 days of reduced training caused by the COVID-19 on speed-power-related performance and body composition in elite futsal players. Notably, the main findings indicated that (a) a significant impairment in short sprint (i.e., acceleration) performance was found after the quarantine period; (b) vertical jump height was not significantly affected during home confinement but significant differences were observed in specific eccentric “downward” and landing phase kinetic variables; (c) horizontal jump performance was not significantly affected during lockdown; and (d) players experienced no significant changes in body composition. The present data indicate that long-term reduced training may have a negative effect on acceleration capabilities and alter aspects of neuromuscular performance identified by vertical jump kinetic analysis. Yet, vertical jumping height and horizontal distance can be maintained for prolonged periods (70 days) in professional futsal players by completing training routines based on exercises that can be performed at home, without thorough supervision or the need for additional training equipment.

Considering sprinting acceleration performance, it seems that long-term reduced training (>8 weeks) may affect sprint capabilities of elite futsal athletes. Importantly, in this unusual

scenario (i.e., 70 days of home confinement), players were unable to perform any type of high-intensity running actions due to the mandatory lockdown (i.e., spatial constraints), which may have contributed to the observed declines in acceleration ability. These results support previous findings showing impairments in sprint performance after long-term reduced training in soccer players (11,17,25). For example, Koundourakis et al. (17) observed that after a 6-week training cessation (i.e., 2 weeks abstained from any activity and 4 weeks performing only 20–30-minute slow running 3 times per week), the sprint velocity of elite soccer players decreased significantly. Potential factors explaining these adaptations include an insufficient sprinting stimulus (training volume and intensity), changes in muscle fiber type and in cross-sectional area of type II fibers, or alterations of anaerobic enzymatic activity (2,26). From an applied perspective, coaches should be aware that impairments in acceleration ability may be expected after long-term training cessation or reduced training in team-sport players. Thus, for these athletes, returning to training practices after prolonged periods of low volume of high-intensity running and sprint training should focus on progressively

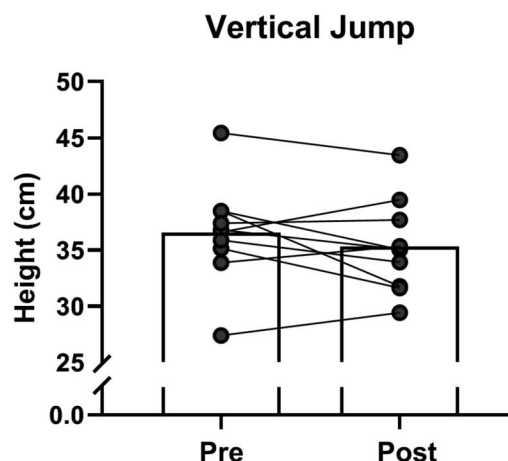


Figure 3. Prequarantine and postquarantine vertical jump height data. Bars represent mean values, and symbols and lines represent individual changes.

Table 2**Comparison of countermovement jump kinetic variables before and after the confinement.*†**

Variables	Units	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	<i>p</i>	Effect size (95% CI)
Jump height	cm	35.78 $\pm$ 4.58	34.10 $\pm$ 3.54	0.076	-0.63 (-1.30 to 0.06)
Eccentric ("downward") phase					
Decel impulse	N·s ⁻¹ ·kg ⁻¹	1.36 $\pm$ 0.14	1.19 $\pm$ 0.16	0.006‡	-1.13 (-1.91 to -0.30)
Peak velocity	m·s ⁻¹	-1.39 $\pm$ 0.14	-1.21 $\pm$ 0.17	0.006‡	1.12 (0.30 to 1.90)†
Peak power	W·kg ⁻¹	-20.85 $\pm$ 5.20	-16.40 $\pm$ 4.00	0.004‡	1.23 (0.38 to 2.05)†
RFD§	N·s ⁻¹ ·kg ⁻¹	77.39 $\pm$ 23.46	67.82 $\pm$ 24.68	0.041‡	-0.75 (-1.44 to -0.02)
Concentric ("upward") phase					
Impulse	N·kg ⁻¹	2.67 $\pm$ 0.17	2.61 $\pm$ 0.13	0.091	-0.59 (-1.26 to 0.09)
Peak velocity	m·s ⁻¹	2.78 $\pm$ 0.15	2.73 $\pm$ 0.13	0.096	-0.58 (-1.24 to 0.10)
Peak power	W·kg ⁻¹	53.27 $\pm$ 6.09	53.48 $\pm$ 6.67	0.911	0.03 (-0.58 to 0.65)
Landing phase					
Peak force	N·kg ⁻¹	97.06 $\pm$ 24.92	76.88 $\pm$ 18.47	0.050‡	-0.70 (-1.38 to 0.00)
RFD to peak force	N·s ⁻¹ ·kg ⁻¹	3,176 $\pm$ 2,965	1,948 $\pm$ 1,320	0.129	-0.52 (-1.18 to 0.14)

*CI = confidence interval; Decel = deceleration; RFD = rate of force development.

†As eccentric ("downward") phase velocity and power are negative values, the decrease in values for these variables manifests as a positive ES.

‡*p* < 0.05; significant pre-post differences analyzed by a paired sample *t*-test.§Eccentric RFD: average RFD (Δ force/ Δ time) calculated from the start of the eccentric yielding phase (minimum force [time 1]) to the end of eccentric ("downward") phase [time 2].

||RFD to peak force: average RFD calculated from landing [time 1] to landing peak force [time 2]. Impulse, force, RFD, and power variables are expressed relative to body mass.

developing the speed-related qualities, from the early acceleration to maximum velocity phases.

Of note, horizontal and vertical jumping distance and height, respectively, were not influenced by the quarantine, which is in line with previous studies investigating long-term training cessation (i.e., > 4 weeks) in team-sports (8,19). In a sample of high-level handball players, Marques et al. (19) reported that a period of 7 weeks of reduced training did not negatively affect CMJ height. By contrast, an investigation into elite soccer players revealed significant decreases in CMJ and squat jump after a transition period of 6 weeks (17). These results might be explained by possible changes in fiber type morphology (2) due to the complete absence of plyometric training during the period (note that in the study by Koundorakis et al. (17) players performed only slow-running activities for 20–30-minute, 2 to 3 times per week). Regarding our study, it is important to highlight that (a) futsal players performed a semistructured maintenance training program comprising vertical and horizontal jumps throughout the lockdown in an attempt to minimize potential declines in neuromuscular performance (15) and (b) individual responses differed among players (as seen in Figures 2 and 3), which suggests that tailored training strategies may be necessary. Nevertheless, in applied terms, jumping ability (i.e., as determined by jump height) seems to be maintained during prolonged periods of reduced training. Therefore, coaches are encouraged to prescribe different types of vertical and horizontal jump exercises during long-term reduced training periods, keeping in mind that individual responses may vary among players.

An interesting and novel finding in this study was that a thorough analysis of CMJ kinetics revealed that eccentric (i.e., deceleration impulse, peak velocity and power, and RFD) and landing variables (i.e., peak force) were significantly affected by the reduced training period, in line with a recent study conducted with professional soccer players (8). Specifically, Cohen et al. (8) found that a long-term reduced training (i.e., players completed an isolated resistance and aerobic interval training) during the quarantine was successful in maintaining jump height, peak concentric power, and several other kinetic variables, but not specific eccentric and landing force, RFD, and velocity metrics. This suggests potential alterations on stretch-shortening cycle mechanisms, muscle-tendon properties (8), or movement strategies used by the athletes that may impair, for instance, their ability to rapidly and efficiently decelerate (i.e., high eccentric loading). Noteworthy, another investigation (11) demonstrated a significant decrease in CMJ (i.e., an eccentric-concentric action) but not in squat jump (i.e., concentric-only movement) height after the quarantine in soccer players, which further supports that eccentric and landing qualities are more sensitive and harder to retain during extended periods of reduced training. Still, further studies are necessary to identify the precise mechanisms explaining this phenomenon and to allow providing more robust recommendations for returning to competition practices, after extended absences off-court.

Regarding body composition, it is well established that a reduction in physical activity levels diminishes energy expenditure (13). Therefore, decreasing energy intake may be necessary to

Table 3**Comparison of body composition variables before and after the confinement.***

Variables	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	Mean diff (%)	<i>p</i>	Effect size (95% CI)
Body composition					
Body mass (kg)	76.0 $\pm$ 6.6	76.0 $\pm$ 6.7	0.1 $\pm$ 4.2	0.992	0.00 (-0.61; 0.62)
Fat mass (%)	9.29 $\pm$ 1.46	9.28 $\pm$ 1.70	-0.3 $\pm$ 6.0	0.947	-0.02 (-0.64; 0.59)
Muscle mass (kg)	50.1 $\pm$ 1.56	50.0 $\pm$ 1.48	-0.1 $\pm$ 1.5	0.734	-0.11 (-0.73; 0.51)

*CI = confidence intervals.

avoid undesirable changes in body composition (e.g., increases in body fat). Remarkably, the mandatory confinement seemed not to affect players' body composition (i.e., total body mass, body fat percentage, and muscular mass). The results of this research are not supported by other studies investigating the effects of prolonged training cessation (11,17,24). In this context, Ormsbee et al. (24) noted that swimmers' body composition and metabolism were adversely affected after more than a month of training cessation that usually occurs after the last competition of the season. Our results may be explained by the fact that futsal players had continuous contact with the team's nutritionist, who prepared individualized dietary plans every 2 weeks according to player's needs, and the caloric intake was reduced during the lockdown when compared with the in-season. Furthermore, players were highly motivated to follow the nutritional guidelines imposed because shortly after the confinement they had to play the Spanish League Playoffs; thus, they were expected to be prepared to return to a decisive phase of the competition within few weeks after the lockdown. This contrasts with other studies (17,24) in which detraining comprised unstructured light-moderate physical exercise (mainly running-based activities, e.g., 20–30-minute jogging, 2–3 times per week), was part of the transition phase, and was followed by a specific pre-season period with limited competition demands.

This study is limited by its small sample size. Nevertheless, it is important to note that the futsal team (a UEFA Futsal Champions League finalist) was composed of only 12 athletes, from which 10 were tested prelockdown and postlockdown, representing more than 83% of the team's players. A second limitation is related to the difficulty of the strength and conditioning coaches to (remotely) control the training sessions during the lockdown that may have affected individual responses. Finally, more tests investigating players' neuromuscular performance (i.e., change of direction ability, unilateral/bilateral drop jumps, and maximal eccentric/concentric strength) could allow to better describe the effects of the COVID-19 home confinement on physical performance.

In summary, a detrimental effect of the lockdown was found for sprint performance and specific CMJ kinetic eccentric and landing phase variables in elite futsal athletes. Nevertheless, vertical jump height, horizontal jumping distance, and body composition were not affected. The inclusion of "regular" unloaded lower-body exercises performed at home, without thorough supervision may conceivably explain why athletes were able to maintain their concentric jump performance (but not acceleration ability and underlying neuromuscular qualities identified in the eccentric and landing phases of the CMJ) after the 70 days of reduced training. Coaches and sport scientists should consider the present findings when planning the specific training approaches after long-term reduced training periods.

Practical Applications

Long-term reduced training caused by home confinement had a large negative effect on the acceleration performance of elite futsal players, most probably due to the lack of an appropriate sprint training stimulus. By contrast, as players were able to perform jump-type exercises at home, horizontal jump distance and vertical jump height were not significantly impaired (although moderate ESs were found for the latter). Nevertheless, it is important to highlight that different variables,

specifically in the eccentric and landing phases, were found to be significantly affected by the prolonged reduced training period. This finding highlights that implementing a thorough analysis of players' CMJ jump-land kinetics may reveal detraining-related neuromuscular strategy changes that are not expressed in vertical jump height declines, an approach previously shown to be of value in detecting neuromuscular fatigue (7,10). In addition, no changes were found in body composition, emphasizing the importance of having players follow individual dietary plans during prolonged periods of decreased training loads. From an applied perspective, sprinting acceleration and deceleration (i.e., eccentric biased) training strategies should be prioritized when returning to regular training practices to counteract the negative effects caused by long-term reduced training. Moreover, considering players' individual responses, it seems that a low (but frequent) volume of jumping-based exercises (2–3 sets of 6–8 repetitions of vertical and horizontal, unilateral and bilateral jumps, 2 sessions per week) may be sufficient to avoid impairments in jumping capacity (i.e., as determined by jump height) during long-term reduced training periods (i.e., 70 days) in elite male futsal players. However, practitioners should take into account that, as suggested by the significant CMJ kinetic changes, important alterations may still have occurred, which could potentially influence other performance-related and injury-related aspects (e.g., deceleration ability or muscle-tendon properties).

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