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# Effects of four months of detraining on explosive performance in young amateur soccer players

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**Abstract**

This study aimed to determine the effects of four months of detraining after seven months of soccer training on explosive performance in young amateur soccer players. Nine players (mean±SD: age, 18.33±0.5 years; height, 177.11±5.51 cm; weight, 63.75±8.21) from an Algerian amateur team participated in this study. To determine the effects of detraining, 10-m and 20-m, Zig zag, and countermovement jump tests were used in this study. When comparing measurements before and after the 04 months of detraining, a significant decrease in 10-m ($p < 0.01$), 20-m ($p < 0.05$) sprint and zig zag ($p < 0.05$) tests were observed. There was no statistically significant in the CMJ test, but there is a trend of decrease in it (35.66 ± 4.76 vs 33.77 ± 2.94). Researchers concluded that a four-month detraining reduces the explosive performance of young soccer players. Therefore, players must remain active through carefully suggested training programs if the off-period of the season is prolonged for any reason.

## 1. Introduction

Soccer is a high-intensity intermittent sport characterized by the repetition of explosive actions such as acceleration, deceleration, change of direction (COD), jumping, and shooting to defend and score goals (Stølen et al., 2005; Campillo et al., 2013). It has been shown that most soccer goals are preceded by an explosive action, either by the scorer or by the assister (Faude et al., 2012). All of these actions require a high level of explosive strength, which is one of the most important fitness components that must be developed in soccer.

Explosive performance requires good and regular physical training throughout the season, where explosive strength is developed during the preparation phase and maintained in the competition phase, followed by the transition phase for 3 to 4 weeks in which players stay active in order not to completely lose the fitness gained during the season (Turner & Stewart, 2014). These periods have been affected during the last two years from 2020 to 2022 and this is due to the Covid-19 pandemic, in which many soccer teams around the world have been forced to stop training and playing soccer games or to play and train with specific conditions. Covid-19 has led to a change in training periods and times for both professional and amateur soccer teams. This change can lead to decreased physical fitness levels, especially if this detraining continues for a long time (Dauty et al., 2020).

Detraining can define as “the partial or complete loss of training-induced adaptations, in response to an insufficient training stimulus. Detraining characteristics may be different depending on the duration of training cessation or insufficient training” (Mujika& Padilla, 2000, p.79). Where short-term detraining is less than 4-6 weeks, while long-term is more than 4-6 weeks (Toraman, 2005; García-Pallarés et al., 2009; Melchiorri et al., 2014).

There have been many studies conducted to determine the effects of short-term detraining on the fitness level of young soccer players. But concerning the long-term detraining, there were a few studies about its effects on explosive performance in senior and young soccer players, as Melchiorri et al. (2022), found that a 7-week detraining did not produce any significant changes in neuromuscular performance in young soccer players whose average age was 14.5 years, and thus the researchers advise that coaches should not focus their attention on off-season neuromuscular efficiency maintenance exercises. Also, Yüksel et al. (2020) have shown that after 80 days of detraining due to Covid-19 the explosive and endurance

performance levels of young amateur soccer players whose average age was 19 years deteriorated significantly during the pandemic.

Therefore, the main aim of the study was to investigate the effects of four months of detraining after seven months of soccer training on sprint, COD speed, and jumping ability in young amateur soccer players.

**Research Hypotheses**

The research hypotheses were as follows:

- A four-month detraining will result in a decrease in sprint performance.
- A four-month detraining will result in a decrease in COD speed.
- A four-month detraining will result in a decrease in jumping ability.

## 2. Method and Materials

### 2.1. Participants

Nine (09) young Algerian amateur soccer players (U19) volunteered to participate in the study (mean±SD: age, 18.33±0.5 years; height, 177.11±5.51 cm; weight, 63.75±8.21). All players were members of an Algerian amateur team from Jijel state active in Constantine's second regional division (fifth division). After a detailed explanation, all subjects gave informed consent to participate in the study. Other players were not allowed to participate in the study because they were involved in regular physical activities or training with the first team which could affect the results of the experiment. The study was carried out following the Helsinki Declaration (World Medical Association, 2013).

### 2.2. Data collection

***- Countermovement jump (CMJ)***

This test aims to measure the jump height and lower extremity power. The player performs a countermovement down to a 90-degree angle to the knee, then jumps, with the hands placed on the hips to avoid their participation in the jumping process. In this test, the entire stretch-shortening cycle is used (Bosco, 1994). The test was selected by researchers after reviewing the study by Markovic et al. (2004), which proved that this test achieved the highest relationship with Power (r = 0.87) among other jump tests such as long jump, Sargent, Abalakov, and Squat jump. The test was performed using My jump 2 android application in this study, which is a valid and reliable application to measure countermovement jump (Gallardo-Fuentes et al., 2016; Bogataj et al., 2020). The researchers found a high validity (0.96) and high reliability (0.94) for this test by applying it on 06 players before starting the experiment. Two maximal attempts were performed with a 5-min rest between attempts. The best attempt was retained for analysis.

***- 20m sprint test***

This test aims to measure acceleration and it is an indicator of speed as well. Where the player travels a distance of 20 meters linearly from the beginning to the end, and it has been divided into two distances of 10 meters to know the player's level in 10 meters and at a distance of 20 meters. Altmann et al. (2019) showed through a systematic review that this test is valid and reliable. The researchers found a high validity (0.97), (0.92) and high reliability (0.94), (0.85) for the 10-m and 20-m sprint tests respectively. A 5-min rest interval was allowed between the two attempts and the fastest time was retained for the analysis.

***- Zig zag change of direction speed test***

The test aims to measure the change of direction speed, during which the player travels a distance of 20 meters in which he changes direction every 5 meters at an angle of 100 degrees at each turn (figure 2). The test requires agility elements, which are speed, deceleration, and balance control. The player has to decelerate and accelerate as fast as possible around each cone (Little & Williams, 2005). The test was selected based on the results of the study by Mirkov et al. (2008) which showed that it is highly reliable (r = 0.84). The researchers found a high validity (0.98) and high reliability (0.96) for this test. Two maximal attempts were performed with a 5-min rest between attempts. The fastest time was retained for further analysis.

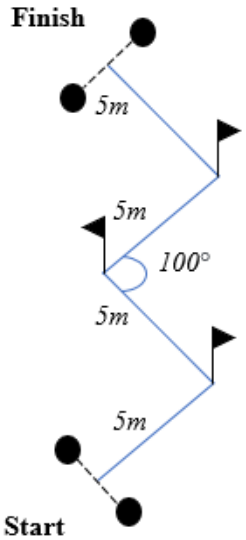


Figure 1. A schematic presentation of the Zig-zag COD speed test

## 2.3. Design and Procedure

After training for seven months, starting from September 2021 to April 2022, explosive performance tests were conducted, represented by the 20-m linear speed test, the Zig Zag test for COD speed, and the CMJ test to measure jumping ability and power, and this after three days of stopping training and the championship again due to Covid-19 because it has spread again in some states, and this is for the safety of young players. The championship was stopped twice or three times until it finally stopped in April by the decision of the regional football association. The championship includes 12 teams. Each team plays 22 games during the season, and it was scheduled to end in May 2022. But the team kept training and playing friendly games during those breaks until April. The team was trained four to six times a week in the preparation phase and three times in addition to the match in the competition phase. Training during the competition phase was focused on explosive strength, speed, aerobic conditioning, and SAQ drills (Speed, agility, and quickness), at the rate of one training session per week for all these qualities.

Previous tests were repeated after the players returned to training for the new sports season 2022/2023 in September 2022. The amateur Algerian youth teams usually stop for 6-8 weeks, but this time they stopped for a long period. Players who did not engage in any regular physical activities during this period were selected to participate in the study.

In this study, the independent variable was the four months of detraining, and the dependent variable was explosive performance (Sprint, change of direction speed, and jumping ability).

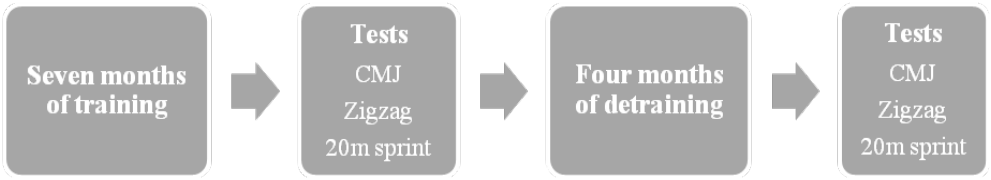


Figure 2. Experimental design

## 2.4. Statistical Analysis

All values in this study are reported as mean ± standard deviation (SD). The data were arranged in Microsoft Excel (Excel 2021, Microsoft, Washington, USA) before being transferred to SPSS (SPSS 26, IBM, Armonk, USA) for statistical analysis. Paired t-test was used for within-group comparison. The

percentage change score for each variable was calculated using the equation: [($mean_{post}$ – $mean_{pre}$) / $mean_{pre}$] ×100. Simple correlation coefficient (Karl Pearson) was used to investigate test reliability, and the square root of the reliability to infer test validity. The significance level of the tests was considered $p \leq 0.05$.

## 3. Results

### Sprint and COD speed tests

*Table 1.* ***Sprint and COD before and after four months of detraining period (n= 09)***

| Tests | Pre-test | Post-test | %Δ | p-value |
|---|---|---|---|---|
| | Mean ± SD | Mean ± SD | | |
| 10-m time (s) | 1.91 ± 0.09 | 1.97 ± 0.07 | 3.14% | 0.008** |
| 20-m time (s) | 3.29 ± 0.14 | 3.33 ± 0.13 | 1.21% | 0.012* |
| Zigzag time (s) | 5.52 ± 0.28 | 5.79 ± 0.14 | 4.89% | 0.024* |

Note: SD: standard deviation; %Δ: percentage change score between pre-test and post-test; S: Seconds; * P< 0.05, significantly different from Pre; ** P< 0.01, significantly different from Pre.

Table 1 shows that performances in the sprint 10-m (P=0.008, %Δ= 3.14), 20-m (P=0.012, %Δ= 1.21), and COD speed Zigzag (p=0.024, %Δ= 4.89) tests statistically decreased after 04 months of detraining.

### Counter Movement Jump test

*Table 2.* ***CMJ before and after four months of detraining period (n= 09)***

| Tests | Pre-test | Post-test | %Δ | p-value |
|---|---|---|---|---|
| | Mean ± SD | Mean ± SD | | |
| CMJ Height (cm) | 35.66 ± 4.76 | 33.77 ± 2.94 | -5.30% | 0.093 |
| CMJ Power (W) | 1673.77± 249.71 | 1570.25 ±199.12 | -6.18% | 0.099 |
| CMJ Force (N) | 1255.59± 143.56 | 1203.21 ±132.78 | -4.17% | 0.087 |

Note: SD: standard deviation; %Δ: percentage change score between pre-test and post-test; CMJ: Counter Movement Jump; Cm: Centimeters; W: Watt; N: Newton.

Table 2 shows that there was a decrease in jumping performance (CMJ height: 35.66 ± 4.76 vs 33.77 ± 2.94, %Δ= -5.30; CMJ power: 1673.77± 249.71 vs 1570.25 ±199.12, %Δ= -6.18; CMJ force: 1255.59± 143.56 vs 1203.21 ±132.78, %Δ= -4.17). But no statistically significant differences were observed after the detraining period for the CMJ test (P>0.05).

## 4. Discussion

The results obtained show that there is a decrease in the post-test in the 10-m, 20-m, and zigzag speed tests, after four months of detraining, but there were no significant differences in the CMJ test. However, its performance has decreased by (-5.30) % in the jump height, (-6.18) % in power, and (-4.17) % in force.

These results are consistent with previous findings where 63 days of detraining due to Covid-19 led to a significant decrease in 10 meters, 20 meters, and CMJ height performances in professional soccer players (Grazioli et al., 2020). Similarly, Hamrit and Megag (2021) found that 60 days of detraining decreased 10-m, 20m, 50m, and CMJ performances in

amateur Algerian soccer players. Yüksel et al. (2020) also found that 80 days of detraining during the Covid-19 pandemic led to a decrease in 30-m sprint, agility and CMJ performances in 19 years old Turkish amateur soccer players. Korkmaz et al. (2020) also found that 89 days of detraining led to a decrease in peak power in Turkish semi-professional soccer players. This indicates that long-term detraining leads to a decrease in explosive performance, whether for well-trained professional or amateur soccer players.

André et al. (2022) studied the effect of 08 months of detraining over three periods (after 04, 07, and 08 months) on Congolese professional soccer players with an average age of 24.5 years who have been selected to participate in the African Nations Championship 2021 (CHAN 2021). They concluded that there was a trend of decrease in the performance of the 30-m speed and CMJ performances at the second measurement after 04 months, and this was not statistically significant, but there were statistically significant differences in the 30-m speed test in the fourth measurement (after 08 months), and in the CMJ test after 07 months (third measure). And this supports the results of the current study regarding the performance of CMJ, as the researchers concluded that there is a trend of decrease in its performance.

In general, several factors determine the effects of detraining on performance such as maturation, training level, total training load before the detraining and duration of detraining (Mujika & Padilla, 2000; Faigenbaum et al., 2009), as Pereira et al. (2020) found that U-20 professional soccer players maintained their 10-meter sprint performance and recorded a significant increase in CMJ after 26 days (short-term) of detraining. On the contrary, Derradji and Aitlounis (2020) showed a decrease in explosive strength and maximal aerobic speed in Algerian soccer players after 03 weeks of detraining. As for the effects of maturation, Asimakidis et al. (2022) found that 08 months of detraining enhance 10-m, 20-m, change of direction and jumping performances in young soccer players whose average age was 13 years, this indicates that maturity improves performance even in absence of training.

Concerning the training level and duration before detraining, Hodikin (1982) indicated that the speed-strength will be better maintained if the training before stopping focused on improving explosive power, this confirms by Branquinho et al. (2019) who showed that four weeks of detraining (short-term) after a combination of soccer drills and specific power training are not

sufficient to cause significant losses in the explosive variables required to U18 soccer players. On the contrary, it was also concluded that after detraining for 3 weeks, the performance of the squat jump (SJ) and the maximal voluntary contraction was maintained after resistance training for 14 weeks, but it was returned to the baseline value after 5 weeks (Chtourou et al., 2015), Despite this, a decrease in CMJ performance has been reported after strength training and then a 12-week of detraining (Hakkinen et al., 1985). This confirms that the length of detraining leads to a decrease in the level of explosive performance, no matter how good or long the training was before stopping.

## 5. Conclusion

In summary, our results show that four months of detraining in young amateur soccer players did decrease sprint performance (10 and 20 m) and change of direction speed (Zigzag test), whereas, countermovement jump performance was reduced, but that was not statistically significant. These findings suggest that 04 months of detraining after seven months of soccer training reduce the explosive performance of amateur soccer players. Therefore, Players must remain active through carefully suggested training programs if the off-period of the season is prolonged for any reason.

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