PHYSICAL EDUCATION OF STUDENTS

ORIGINAL ARTICLE

The effect of the detraining period caused by the COVID-19 pandemic on the change of direction performance of fencers

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection.

Abstract

Background and Study Aim The COVID-19 pandemic has caused many athletes to interrupt their regular training programme. The change-of-direction performance is a highly critical parameter for fencing. This study aims to investigate the effects of the detraining process caused by the COVID-19 pandemic on the change-of-direction performance of fencers.

Material and Methods The study sample comprised 15 fencers (11 males, 4 females) who were competitors in the U17-20 age categories (mean age: 15.75±1.51 years; height: 170.30±7.68 cm; weight: 65.16±10.83 kg) in Turkey. All participants were high school students. Branch-specific change-of-direction tests (4-2-2-4-m shuttle and 7-m repeat lunge ability) were measured in the middle of the competition season and after the detraining period. The detraining period lasted 31 weeks due to the pandemic process.

Results The results showed that participants were slower in the post 7-m repeat lunge ability test (23.32±2.21 sec.) compared with the pre-test (22.38±1.58 sec.) and participants were slower in the post 4-2-2-4-m shuttle test (6.43±0.54 sec.) compared with the pre-test (5.84±0.33 sec.) ($p<0.05$).

Conclusions The present study showed that long-term detraining reduces fencer's change-of-direction performance. Basic exercise programs can be arranged to reduce the rate of adverse effects during long-term detraining process.

Keywords detraining, fencing, COVID-19, agility, branch-specific test.

Introduction

Detraining can be defined as the loss of physiologic and performance gains with an interrupted training process [1] or it can be explained as an inactivity period coming after a training process. It is quite natural and inevitable that there will be some losses in the coordinative and conditional motor characteristics during detraining periods. The rate of these losses varies according to the training status of the individuals, the content of the training, the length of the inactivity period, and features of motor characteristics [2]. In addition, whether individuals are physically active during the detraining process and even eating habits are important factors that can affect the recovery process when returning to training. A break of fewer than 4 weeks is defined as short-term detraining, and longer than 4 weeks as long-term detraining [1]. Resting made following the exercise load has a positive effect according to the principle of supercompensation. However, when this balance cannot be established or training is interrupted, the physiologic adaptation achieved by training regresses. The existing literature emphasizes that detraining negatively affects sports performance. For example, Nakamura et al. [3] found that both short-term and long-term detraining processes caused a decrease in aerobic endurance capacity. In another study, even short-term detraining led to reduced sprint performance [4]. Caldwell and Peters [5] stated that they found a decrease in agility and vertical jump performance in the beginning of preseason training of season 2 compared with the end of season 1 in semiprofessional male soccer players.

Fencing is an Olympic sport that includes three different branches, epee, foil, and sabre [6]. The offensive and defensive moves required to win the match are repeated intermittently throughout the match and include high-intensity activities. During the implementation of these movements, fencers aim to be effective on the opponent with back and forward fencing steps. Since being able to apply these movements fluently and quickly will lead the fencer to success, the speed of changing direction is very important in fencers. Fencing requires agility, strength, and accuracy of movements [7]. Fencers can change direction 200 times during direct elimination bouts [8]. Aquili et al. [9] found that male and female athletes changed their direction every 9-10 seconds on average in category A bouts organized by the International Fencing Federation. In light of these studies, the importance of the change-of-direction parameter on fencing competition performance is clearly seen. To develop the change-of-direction parameter, fencers from all branches focus on branch-specific exercises in their training programs.

A pandemic was declared by the World Health Organization (WHO) on March 11th, 2020, due to the COVID-19 [10]. The effects of this pandemic process caused the cancellation of many activities and sports organization all over the world. During this period, in line with the decisions of national authorities, athletes could not use the training halls for a certain period and were unable to train. This situation caused many athletes

doi:10.15561/20755279.2021.0101

to experience a long and important detraining period. In time, training halls were opened for use again in line with the decisions of the national authorities and then the clubs, and regular training started again for athletes. Accordingly, fencers also had to interrupt their training process for quite a long time.

The ongoing pandemic has presented significant challenges for athletes concerning training. Here it is sufficient to note the following:

– Found that confinement period affects both, training load and recovery process and that mood states and emotional intelligence could predict the training variables and performance of top-level football players [11].

– Coaches and performance staff should ensure athletes receive appropriate nutritional and training support whilst being aware of the unique demands the individuals may face [12].

– Elite athletes, especially those training for the upcoming Olympics, need to balance and reschedule their training regime to balance the risk of deconditioning versus the risk of infection [13].

– When elite sport re-builds post-COVID, there should be a greater awareness of the difficulties faced by sportswomen, and targeted action to tackle gender inequality in sport [14].

– Despite decreasing physical activity, the university athlete performed physical activity at home during confinement by COVID-19, harmonizing the time in the learning processes in their future profession [15].

– Indirect effects indicated that student-athletes' change in athletic identity mediated the effects of teammate social support on psychological well-being and depression symptoms [16].

– 30-d of restrictions equally affect females and males where the evident drop in MVPA (moderate-to-vigorous physical activity) is seen in both genders. However, active people decreased their physical activity level during lockdown and the opposite pattern was seen in non-active peers, where restrictions for them can represent an opportunity to change their behavior in a positive direction in order to gain better health status [17].

The aim of this study was to investigate the effects of the detraining process caused by the COVID-19 pandemic on the change-of-direction performance of fencers.

Material and Methods

Participants

Fifteen fencers (11 males, 4 females) who participated in the National Clubs Competition in the U17-20 age categories in Turkey participated in this study. All participants were high school students. Approval was obtained by the Local Ethics Committee (Decision number: 2020/26-60) for this study and the research procedures were conducted in accordance with the Helsinki Declaration's human research ethical standards. The participants were informed about the measurements on the day of the study and verbal and written consents of their parents and themselves were obtained.

Research Design

The height measurements and body mass indexes of the participants were determined. Participants' height was determined using a tape measure. Weight was measured in kilograms (kg) using a body composition monitor scale (Tanita BC-730; Tanita, Tokyo, Japan). The pre-tests were conducted in September 2019 (before the COVID-19 pandemic process) in the middle of the competition season. From the date of the measurements, fencers continued their weekly routine training (week/4 days). Then, with the emergence of the COVID-19–induced pandemic process on March 11th, 2020, they had to take a break from their regular training. The tests of the fencers, who started their training again on 19 October 2020, were performed on October 26th, 2020, after a 31-week detraining period. A standard warm-up protocol of 15 minutes was performed to the participants. The first five minutes of this protocol were conducted as a general warm-up, and the next 10 minutes included the fencing step they would perform in the study. After the warm-up, change-of-direction tests were performed on the participants. All testing was conducted on a metal competition piste to increase the validity of results.

4-2-2-4-m shuttle test: During the test, all the fencers' backward and forward moves were performed in the en-garde position. With the help of electronic photocells (Fusion Sport, Smart Speed Pro, Australia) located at the start and end of the test, the system was automatically activated when fencers passed through the photocells. The fencer moved forward from the start to the 4-m line, then moved backwards 2-m. Then the fencer went forward again 2-m to reach the 4-m line. Again the fencer moved back 4-m to return the 4-m line [19]. The test is illustrated in figure 1.

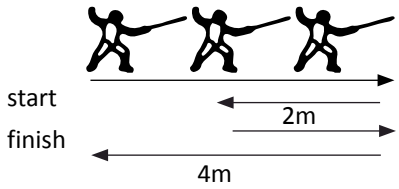


Figure 1. 4-2-2-4-m shuttle test

7-m Repeat Lunge Ability Test (7-m RLA): During the test, all the fencers' backward and forward moves were performed in the en-garde position. With the help of electronic photocells (Fusion Sport, Smart Speed Pro, Australia), as in the previous test, the system was automatically activated when the fencers passed through the photocells. The test started by going 7-m forward in the en-garde position and performing the specific lunge movement for fencing at the finish line. Afterwards, the fencers came back 4-m and then moved 4-m forward again, performing the lunge at the finish line. Fencers repeated this move until they made a total of five lunges. After making the fifth lunge to the target area, the fencers stepped back 7-m to the starting line [19]. The test illustrated in figure 2.

During the tests, the en-garde position, lunge, and the

appropriateness of foot movements of the participants were checked by an experienced trainer.

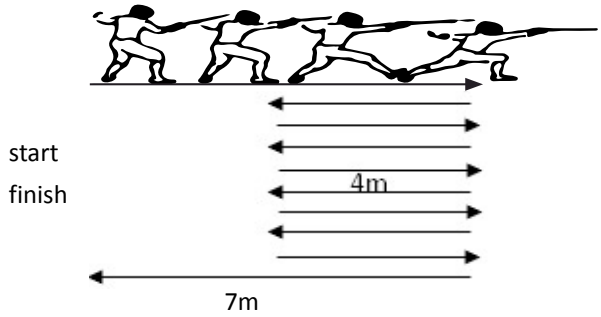


Figure 2. 7-m repeat lunge ability test

Statistical Analysis

Basic descriptive analyses were performed. Results were presented mean and standard deviation. The normality of the variables was studied using the Shapiro-Wilk test. The paired-samples t-test was used for normally distributed data (7-m RLA, mass, BMI), and the Wilcoxon test was used for data that did not show normal distribution (4-2-2-4-m shuttle, age, height). The value of p was considered to $p<0.05$. All analyses were performed using the IBM SPSS Statistics 20 program (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY).

Results

Descriptive data on the body composition of the fencers are presented as means and standard deviations in Table 1.

Figure 3 displays the experimental data from the 4-2-2-4-m shuttle and 7-m RLA tests.

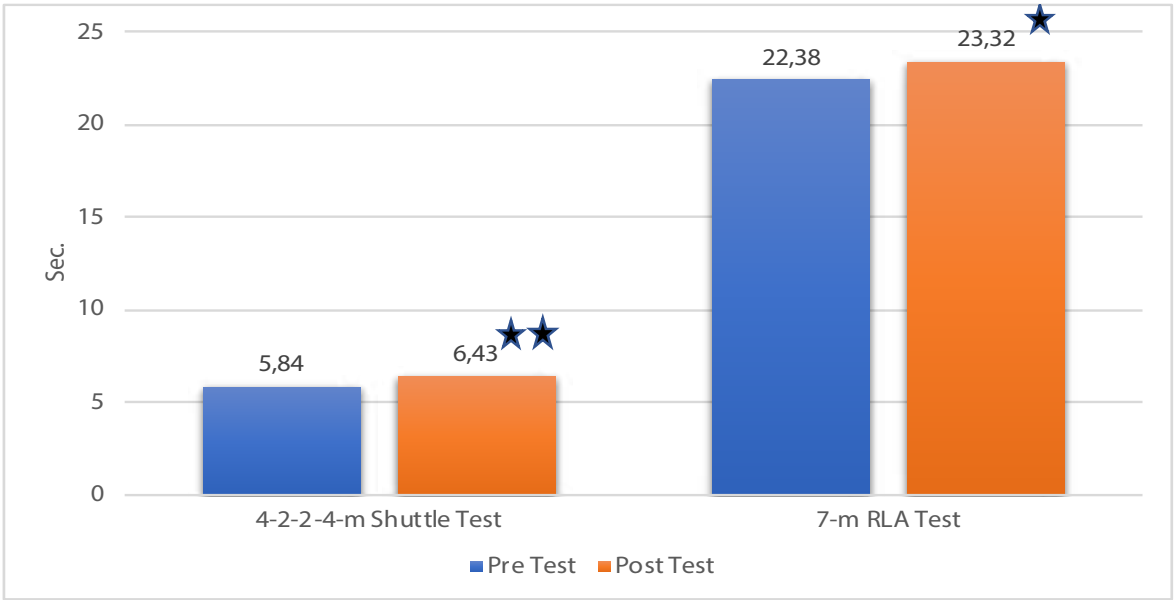
The Wilcoxon signed-rank test was used to determine whether there was a statistically significant mean difference between the 4-2-2-4-m shuttle pre and post-tests. The assumption of normality was violated as assessed using the Shapiro-Wilk test ($p =0.011$). The Wilcoxon signed-rank test showed that a detraining effect, a statistically significant change in the 4-2-2-4-m shuttle test ($z=-3.351$, $p=0.001$, $r=-0.865$). The result shows that the participants were slower in the post 4-2-2-4-m shuttle test (6.43±0.54 sec) compared with the pre-test (5.84±0.33 sec).

The paired-samples t-test was used to determine whether there was a statistically significant mean difference between the 7-m RLA pre and post-tests. Data are mean ± standard deviation unless otherwise stated. Two outliers were detected that were more than 1.5 box-lengths from the edge of the box in a boxplot. An inspection of their values revealed them not to be extreme

Table 1. Anthropometric Characteristics of the Fencers

Parameters	n	Pre-Test Mean±SD		Post-Test Mean±SD	p
Age (year)	15	14.60±1.51		15.75±1.51	**0.001***
Height (cm)	15	167.20±8.12		170.30±7.68	**0.001***
Weight (kg)	15	60.65±9.04	**Detraining**	65.16±10.83	**0.014***
Body mass index (kg/m²)	15	21.74±2.87		22.40±2.93	0.156

NOTE. **p≤0.001, *p<0.05



*** p≤0.001, *p<0.05*

Figure 3. 4-2-2-4-m and 7-m RLA test results

so they were kept in the analysis. The assumption of normality was not violated, as assessed using the Shapiro-Wilk test (p=0.651).

Participants were slower in the post 7-m RLA test (23.32±2.21 sec.) as compared with the pre-test (22.38±1.58 sec), a statistically significant performance decrease of -0.94 (95% CI: -1.58 to -0.30 sec), t(14)= -3.166, p=0.007, d=0.816.

Discussion

The present study was designed to investigate the effects of the long-term detraining period caused by the COVID-19 pandemic on fencers' change-of-direction performance. This study indicates that fencers' change-of-direction performance decreased after the long-term detraining period. These findings showed that interrupted training for 31 weeks led to a drop off in some training gains that developed in the competition season.

Previous studies provided important information about the negative effects of detraining periods on performance parameters [10-17]. For example, Morais et al. [19] investigated the effect of an 11-week detraining period on some athletic performance components of swimmers and they found impaired performance. In another study, the participants were semi-professional football players who experienced 89 days of detraining due to the COVID-19 pandemic. After detraining, there were significant decreases in body muscle mass, peak power, and average power [20]. Blocquiaux, et al. [21] found that the detraining period caused a loss of strength and power (5-15%) and a decrease in the number of satellite cells and cross-sectional area in type 2 fibrils. The detraining time in the current study was longer than in these studies. Therefore, the decreases of the branch-specific change-of-direction tests are not surprising. Nevertheless, it is an important finding that there were significant decreases in both tests, although there were differences in both time and fencing-specific movements in the two tests.

The 4-2-2-4-m shuttle test is related to the ability to change direction and in terms of total distance and movement pattern, it meets its energy requirement from adenosine triphosphate-creatine phosphate (ATP-CP) reserves. The 7-m RLA test includes the skills of speed endurance and agility. It also includes the application of the lunge movement, which is frequently used in fencing. Although there were differences in energy metabolism and load, negative results were seen in the results of both tests during the detraining period. The change-of-direction parameter directly affects fencing competition performance and is related to muscle strength and power. It is also a major factor for fencers in defensive action or who get into the required distance for offensive action to score (touche) against the opponent.

In a branch that requires strength and power in addition to techniques such as fencing, there is a need to keep agility-change of direction performance at a high level. And this study showed that fencers' branch-specific test performance was negatively affected by a long-term detraining period. Significant differences occurred in both sprint and agility performance in the period of detraining compared with the active period during the season. Ross and Leveritt [22] presented supportive results by finding that the detraining period caused a loss of speed and power at a distance of 10-20-m. These results may be explained by the lack of muscle activation during the untrained period.

There are also studies in the literature showing that the detraining period does not negatively affect performance parameters. For example, Pereira et al. [23] found higher countermovement jump performance and no significant changes for 10-m sprint velocity and 1RM leg press in soccer players after a 26-day detraining period. There are even studies in the literature claiming that a short-term detraining period can be beneficial for anaerobic performance improvement [24, 25]. However, it can be noted that for long-term detraining, the probability of unaffected performance decreases as the detraining time increases. Interruption of training can also affect the skeletal muscle's ability for maximal voluntary contraction. These effects can be explained by evaluating some variables such as muscle fiber type and muscle cross-sectional area together [26]. It was also shown that tendon structure and morphology were negatively affected by interrupted training loads [27]. Preserving joint structures can also be difficult with the effect of inactivity [28]. Due to all these possible effects, it will be beneficial for athletes who are exposed to long-term detraining to continue regular exercise to reduce the rate of losses.

Conclusion

Many athletes had to interrupt their training due to the COVID-19 pandemic. Many athletes could not fulfill the principle of regular progressive loading, which is one of the principles of training planning, and within the limits of the organism's ability to load. If this compulsory break passes 4 weeks, many skills acquired through training begin to be lost. It is recommended that trainers and conditioners prepare additional fitness training programs for the retraining season to eliminate the losses and return fencers to their previous performance. In addition, if similar compulsory breaks have to be experienced in the future, basic training programs should be created for fencers to perform these alone and in any place, such as at home.

Conflicts of Interest

The authors declare no conflicts of interest.

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Cite this article as:
Kosova S, Koca Kosova M. The effect of the detraining period caused by the COVID-19 pandemic on the change of direction performance of fencers. *Physical Education of Students*, 2021;25(1):4–9.
https://doi.org/10.15561/20755279.2021.0101

Received: 09.11.2020
Accepted: 27.12.2020; Published: 26.02.2021