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The Effects of in-Class Educational Games on Reaction and Agility Skills in Female Wrestling Athletes*

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Abstract

Aim: The aim of this study was to investigate the effects of educational games including perception, decision making and reaction skills on agility and reaction skills.

Methods: A total of 24 young female wrestling athletes who regularly train 5 times a week were included in the study (Training Group= age: 20.08±2.19 year, height: 1.60±5.33 cm, body weight: 59.50±10.38 kg, bmi: 22.94±3.19, Control Group= age: 17.83±0.93 year, height: 1.63±5.25 cm, body weight: 60.91±10.44 kg, bmi: 22.58±2.79). The training group was asked to play 8-week educational games involving perception, decision-making and reaction skills for 30 minutes in the classroom environment without much effort before routine wrestling training. Visual hand reaction (dominant, non-dominant and mixed hand), Y-Reactive and Speedcourt® agility tests were performed before and after the training sessions.

Results: Paired sample t test was used for intra-group comparison analyses and independent sample t test analyses were used for comparison statistics of data between 2 groups. The Y-Reactive agility of the training group was statistically significant ($p<0.05$) from the first test data after 8 weeks. In the post-test analyses between the two groups, a significant difference was found only in the Speedcourt® agility test ($p<0.05$). There was no statistical difference between Y-Reactive agility and hand reaction tests in the post-tests ($p>0.05$).

Conclusion: The 8-week, 30-minute educational games applied in the classroom environment have positive effects on agility skills. Teachers and coaches can contribute to the development of agility skills not only in the field environment but also in the classroom environment by playing logical and purposeful educational games.

Keywords

Reaction,
Agility,
Classroom educational games,
Wrestling.

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Sınıf İçi Eğitsel Oyunların Kadın Güreş Sporcularında Reaksiyon ve Çeviklik Becerilerine Etkileri

Özet

Amaç: Bu araştırmanın amacı da haftada 2 gün 30 dakika, 8 hafta boyunca uygulanan algılama, karar verme ve reaksiyon gösterme becerilerini içeren eğitsel oyunların çeviklik ve reaksiyon becerisi üzerine etkilerini incelemektir.

Yöntem: Araştırmaya haftada 5 kez düzenli antrenman yapan toplam 24 genç kadın güreş sporcusu dahil edildi (Antrenman Grubu= yaş: 20,08±2,19 yıl, boy: 1,60±5,33 cm, vücut ağırlığı: 59,50±10,38 kg, vki: 22,94±3,19, Kontrol Grubu= yaş: 17,83±0,93 yıl, boy: 1,63±5,25 cm, vücut ağırlığı: 60,91±10,44 kg, vki: 22,58±2,79). Daha sonra deney grubuna rutin güreş antrenmanlarından önce sınıf ortamında fazla efor sarf etmeden, oturarak eğlenceli türde 30 dakika boyunca algılama, karar verme ve reaksiyon gösterme becerileri içeren eğitsel oyunlar oynatıldı. Antrenmanlar öncesi ve sonrasında sporculara görsel el reaksiyon (dominant-non dominant ve karışık el) Y-Reaktif çeviklik ve Speedcourt® çeviklik testleri uygulandı.

Bulgular: Grup içi karşılaştırma analizlerinde pair sample t testi, 2 grubun arasındaki verilerin karşılaştırma istatistiklerinde ise indepented sample t testi analizleri kullanıldı. Verilerin normal dağılım göstermedikleri verilerde ise wilcoxon işaretli sılaralar testi uygulandı. Antrenman grubuna ait Y-Reaktif çeviklik becerisi 8 hafta sonra ilk test verisinden istatistiksel olarak anlamlı çıkmıştır ($p<0,05$). İki grup arasındaki son test analizlerinde ise sadece Speedcourt® çeviklik testinde anlamlı fark olduğu ortaya çıkmıştır ($p<0,05$). 2 grup arasında son testlerde Y-Reaktif çeviklik ve el reaksiyon testleri arasında istatistiksel açıdan bir fark ortaya çıkmamıştır ($p>0,05$).

Sonuç: Sınıf ortamında uygulanan eğitsel oyunların çeviklik becerisi üzerine olumlu etkileri olduğu söylenebilir. Öğretmen ve antrenörlerin sadece saha ortamında değil aynı zamanda sınıf ortamında da mantıklı ve amaca yönelik eğitsel oyunlar oynatarak çeviklik becerilerinin geliştirilmesine katkıda bulunabilirler.

Anahtar Kelimeler

Reaksiyon,
Çeviklik,
Sınıf içi eğitsel oyunlar,
Güreş.

Yayın Bilgisi

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INTRODUCTION

In wrestling sport, many physical skills are very important in terms of competition performance. Muscle strength and endurance performances of wrestling athletes are considered as a measure of success and are frequently investigated (Roemmich and Frappier, 1993). However, to wait for the opponent's attack during the wrestling competition, to suddenly counterattack while defending, it is necessary to apply muscle strength and endurance skills at a well level, as well as to change of direction rapidly while applying these technical skills. At this point, researchers emphasise that wrestling athletes should have an agility (Mirzaei et al., 2011; Baić et al., 2007; Platonov and Nikitenko, 2019).

Agility skill can be defined as the ability of the whole body to change of direction rapidly in response to a certain stimulus. The ability to change of direction rapidly depends on both physical and psychological factors. Athletes exhibit the skills of acceleration, decelerations or sudden stopping and rapid acceleration by changing direction while practising direction change skills (Sheppard and Young, 2006). To apply these skills, physical fitness levels should be at the appropriate level. In studies examining the relationship between physical fitness levels and agility skills, it is seen that postural control (Gambetta, 1996), muscle strength (Spiteri et al., 2014) and core strength levels are associated with a well change of direction skill (Aksen et al.,2019). However, since this skill has a complex structure, it is not enough to have only physical skills. At this point, psychological factors should be organised by the athletes (Henry et al., 2013). Athletes act by perceiving the movements of their opponent during competition or training. It is very important to perceive quickly and act before the opponent to gain superiority and advantage over the opponent. In the studies conducted on this subject, it has been reported that especially decision-making skill is related with total agility time (Young and Willey, 2010), and psychological skills positively affect the agility skills of athletes (Scanlan et al., 2014). In the studies on the development of perception and decision-making, it is stated that athletes can apply agility skills better by training these skills (Gierczuk et al., 2023; Hassan et al., 2022; McNeil et al., 2021). In the literature, it has been demonstrated that visual reaction and agility skills of athletes improved after exercises against light systems (Gierczuk et al., 2023; Hassan et al., 2022). In another study, it was reported that wrestling-specific functional exercises had a positive effect on T-agility and selection and reaction time after 8 weeks of training (Güngör and Sevimli, 2022). In addition, there are studies showing that there are improvements in decision-making and agility skills of athletes after a certain period of imagery practice (McNeil et al., 2021; Majlesi et al., 2021). While there are studies on reaction and agility skills after exercises such as light systems and imagery, there is no research in the literature on the effects of the development of agility skills after the educational game applied with perception, decision-making and reaction skills.

In the study, it was thought that improvements in agility and reaction skills of athletes could be achieved after educational games, and it was aimed to investigate the effects of educational games on hand reaction and agility skills for 8 weeks, 2 days a week and 30 minutes without spending much effort sitting in the classroom.

METHOD

Model of the research

The study was carried out using the experimental method from quantitative research methods.

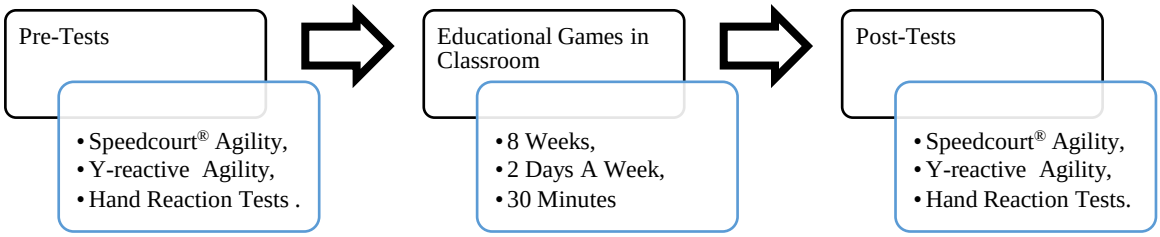


Figure 1. Research design

All athletes were first measured for height and weight. Afterwards, Speedcourt® agility test was applied to the athletes. One day after this test, Y-Reactive agility was applied and one day later, visual hand reaction tests were applied with right, left and both hands mixed. In the week immediately following

these tests, in-class educational games were applied twice a week for approximately 30 minutes. After 8 weeks, the tests performed in the pre-tests were applied again in the same order (see Figure 1).

Population and sample of the research

A total of 24 female wrestling athletes who trained regularly 6 days a week and did not have any sports injury in the last 6 months participated in the study. 24 female wrestling athletes participated in the 12 wrestling athletes trainig (age: 20.08±2.19 year, height (cm): 1.60±5.33, body weight (kg): 59.50±10.38, bmi: 22.94±3.19) and 12 wrestling athletes control group (age: 17.83±0.93 year, height (cm): 1.63±5.25, body weight (kg): 60.91±10.44, bmi: 22.58±2.79) were randomly divided into 2 groups.

Data collection

Educational Games

Table 1 shows how the educational games were designed. The training group athletes played educational games lasting 30 minutes before wrestling training twice a week for 8 weeks. The games were designed to include memory, reaction, perception and decision-making skills. In the designed games, exercises involving music, colour, mathematical questions and fast reaction with the use of audio and visual clues by the researcher were applied to the athletes and the games were designed as mutual competitions with two partners and fun games in which team games were played. Attention was paid to designing games that usually require simple materials (tennis ball, coloured papers and music sound system). Different games were played every week to avoid monotonous factors. During the games, the researcher who played the games constantly endeavoured to increase the motivation with a loud voice. After 30 minutes of games, the training and control group athletes participated in wrestling training.

Table 1. Design of the games played for 8 weeks.

Weeks	Memory	Perception	Decision making	Reaction
First 4 weeks	Marked retention of shapes, numbers, colours (only shapes, numbers or colours)	Simple and uncomplicated stimuli (catching a single desired target before the opponent with the coach's command)	Finding memorised shapes, numbers and colours	Grabbing items such as tennis ball, pet bottle, ping-pong ball before the opponent when two people are sitting opposite each other with the external sound applied in perception.
Last 4 weeks	Keeping in mind stimuli containing number, colour, shape, which are more than one and are in front of them at the same time, such as keeping in mind more than one said colour.	Giving shape, number and colour stimuli at the same time, finding the result of the mathematical operation in the stimuli before finding the number stimuli, perceiving opposite colours in colours	Deciding the correct one among complex stimuli (choosing the yellow colour when told red, choosing the even number when told an odd number, etc.)	Reaching the desired goal before the opponent by perceiving, deciding and reacting quickly after complex stimuli.

Speedcourt® Agility Test

Speedcourt® (Globalspeed GmbH, Germany) agility test was used to measure the change of direction performance of athletes against a certain stimulus. The device has a total of 9 4.0x4.0-metre-wide boxes, 3x3 square boxes at a certain distance from each other. In front of the device, there is a screen directing the athletes. The athletes started the test by standing on the sensor in the centre of the test area with their faces facing the screen. The athlete standing at the centre point perceived the burning box on the screen and moved quickly to touch the specified place. After touching the specified place, the athlete quickly returned to the centre point and looked at the screen again and tried to perceive where he/she should go. The test was terminated after touching 10 boxes in total. Athletes performed the test with 2 repetitions and at least 3 minutes rest between repetitions.

Y-Reactive Agility Test

The athletes were tested for straight running and then their performances requiring a sudden change of direction by sensing the system that gives stimuli in the right or left direction. The test track was applied by creating a Y-shaped track. First, the course area was determined by creating a 5-metre straight line and two 5-metre-long lines that will form the letter Y at a 45-degree angle to this line. Witty light-based

timing system (Microgate, Polifemo Radio Light, Bolzano, Italy) was used as equipment for the test. The detection sensors of the system were positioned at a width of 1.5 metres and a height of 1.2 metres. Athletes first applied 5 metres sprint with maximum effort in the test. In the 5-metre sprint test, the athlete ran 5 metres in the specified direction with maximum effort when the system gave a stimulus to the right or left opposite the athlete passing through the sensor. In this way, the athletes' performance of suddenly changing direction while moving rapidly was tested. The test was performed with 3 repetitions in total and at least 3 minutes between each repetition.

Visual Hand Reaction Test

Witty light-based timing system (Microgate, Polifemo Radio Light, Bolzano, Italy) was used to test athletes' hand reaction skills to certain stimuli. A total of 8 light system stimulis of the device were positioned in such a way that the athletes could comfortably contact their hands. As soon as the athlete was ready, the system synchronised 8 light stimuli and activated the red-light stimulus in only 1 box. The athlete quickly perceived this stimulus and continued the test by extending his hand to the light as soon as possible. He performed the test in 3 different ways, both right and left-handed and both hands mixed. In total, the test was terminated by switching off the red stimulus 10 times.

Statistical Analyses

Statistical analyses of the study were performed with SPSS software version 20, Chicago, USA, compatible with Windows 10. The data were tested for conformity to normal distribution using the Shapiro-Wilk test. Paired Samples t test was used for pre and post-test comparisons within groups and Independent Samples t test comparison statistics were used for the differences between groups. In variance analyses, Levene's test was used according to the level of equality of variances. The significance level was accepted as $p<0.05$ for all analyses. The magnitude of the effect size was interpreted using thresholds as suggested by Cohen: 0.0 to 0.19-trivial; 0.20 to 0.49-small; 0.50 to 0.79-moderate; >0.80-large (Cohen, 1988).

FINDINGS

Table 2. Descriptive analyses of the training and control groups.

Groups	Variables	n	Min.	Max.	Mean ± SD
Training Group	Age (year)	12	18.00	24.00	20.08±2.19
	Height (cm)	12	150	171	1.60±5.33
	Body Weight (kg)	12	42.00	76.00	59.50±10.38
	Bmi (kg.m-^{2})	12	18.67	29.59	22.94±3.19
Control Group	Age (year)	12	17.00	19.00	17.83±0.93
	Height (cm)	12	153.00	170.00	163.75±5.25
	Body Weight (kg)	12	46.00	76.00	60.91±10.44
	Bmi (kg.m-^{2})	12	17.31	26.61	22.58±2.79

Bmi: body mass index

Table 2 shows the descriptive statistics of the training and control groups. Age, height, weight and body mass index of the athletes are shown in terms of minimum, maximum and mean values.

Table 3. Descriptive statistics of the performance tests of the training group

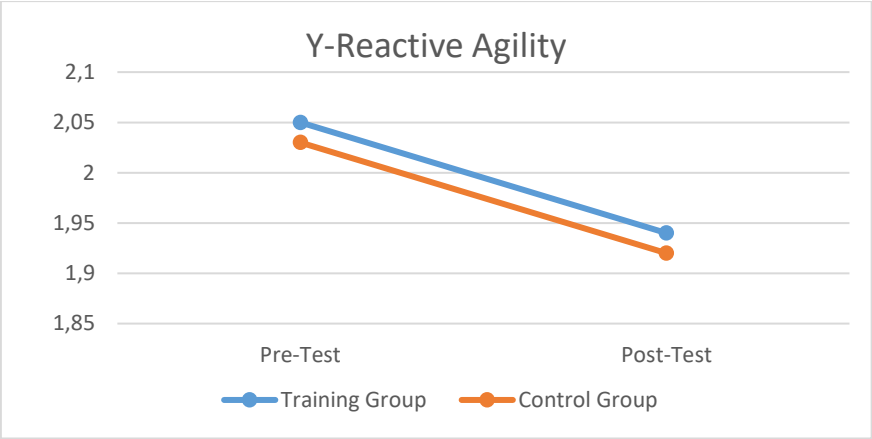
Variables	Pre-Test				Post-Test			
	n	Min.	Max.	Mean ± SD	n	Min.	Max.	Mean ± SD
Y- Reactive Agility (sec)	12	1.78	2.33	2.05 ±.167	11	1.76	2.15	1.94 ±.13
Speedcourt® Agility Total Duration (sec)	12	21.11	28.74	25.85 ±2.49	12	22.00	27.00	24.75 ±1.42
Visual Reaction Right and Left Hand (sec)	12	20.16	30.32	23.76 ±3.14	12	20.57	27.53	23.80 ±2.00
Visual Reaction dominant hand (sec)	12	20.39	28.36	24.19 ±2.59	12	20.95	26.90	23.88 ±1.89
Visual Reaction non-dominant (sec)	12	20.23	29.75	24.22 ±2.56	12	21.43	28.85	24.30 ±2.47

In Table 3, among the athletes who participated in the study, only one of the athletes did not have any data in the Y-Reactive Agility post-test. The data of the athlete in this test was excluded from the statistical analysis because of the athlete's not to perform the test.

Table 4. Descriptive statistics of the control group

Variables	Pre-Test				Post-Test			
	n	Min.	Max.	Mean ± SD	n	Min.	Max.	Mean ± SD
Y- Reactive Agility (sec)	12	1.70	2.29	2.03±.18	12	1.700	2.19	1.92±.144
Speedcourt® Agility Total Duration (sec)	12	23.00	33.00	27.47±2.83	12	23.00	33.00	27.08±2.71
Visual Reaction Right and Left Hand (sec)	12	21.31	30.77	24.99±3.00	12	20.86	32.24	24.41±3.65
Visual Reaction dominant hand (sec)	12	20.59	28.03	23.89±2.68	12	20.05	29.98	24.34±2.98
Visual Reaction non-dominant (sec)	12	22.10	27.33	25.39±1.73	12	20.98	31.32	24.54±2.76

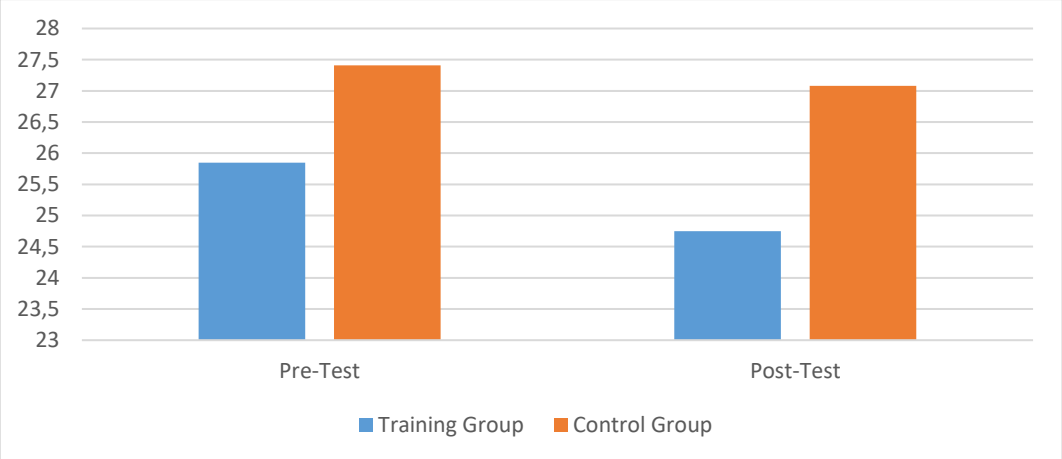
In Tables 3 and 4, descriptive statistics of the pre and post-tests of the athletes belonging to the control group who trained for 8 weeks are presented. Y-Reactive agility, Speedcourt® agility and Visual hand reaction tests are expressed in terms of total training time.



Graphic 1. Pre and post-test statistical analysis of training and control group

As a result of the in-group pre and post-tests of the experimental and control groups in Graph 1, the Y-Reactive agility test of the post-tests of the athletes belonging to the training group was statistically significant compared to the pre-test values (TG=p=0.027, t=2.593, df=10, d= 0.09)(CG=p=0.094, t=1.835, df=11, d= 0.10).

In the Speedcourt® test, there was no statistical difference between the training group (p=0.064, t=2.059, df=11) and the control group (p=0.382, t=.910, df=11). Similarly, there was no statistical significance in the pre and post-test in-group comparisons of the athletes' hand reaction (p>0.05).



Graph 2. Speedcourt® pre and post-test comparison analyses between groups

Graph 2 shows the pre and post-test comparison statistics of Speedcourt® total working time between the groups. While there is no statistical significance between Speedcourt® pre-tests (p=.150, t=-1.491, df=22), there is statistical significance between post-tests (p=0.015, t=-2.639, df=22, d=1.07). In Y-Reactive agility test total time comparison statistics, there was no statistical significance between the two groups in the post-tests (p=.769, t=.297, df=22, d= 0.01).

In the post-test comparison statistics between the groups, no statistical difference was found in the dominant hand reaction test total working time (p=.654, t=-.454, df=22), non-dominant hand (p=.825, t=-.224, df=22) and non-dominant hand reaction test (p=.825, t=-.224, df=22). No statistical

significance was obtained in the post-test comparison analysis of the hand reaction total test time applied with right and left hand mixed (z=-.771b, p=.440).

DISCUSSION

In this study, a statistical difference was found between the pre- and post-tests of the Y-Reactive agility skills of the training group athletes after playing 30-minute educational games 2 days a week for 8 weeks. While there was a statistical difference between the training and control groups in Speedcourt® agility skills after 8 weeks, there was no statistical difference in hand reaction skills.

Agility skill has a very complex structure. Athletes use both physical and psychological skills at the same time while applying agility skills. Among psychological skills, perception and decision-making skills are expressed as a very important skill for agility skill (Sheppard and Young, 2006). In the studies conducted on the agility skills of athletes after imagery training, there are studies showing that agility skills improve and do not improve. It was found that 47 female athletes aged between 19-28 years in different sports branches improved their decision-making skills, although there was no improvement in reactive agility skills after 3 weeks of imagery exercises (McNeil et al., 2021). In a different study, it was reported that there were improvements in the reactive agility skills of 32 football players aged 15.31±1.83 years after imagery exercises applied for 10 minutes twice a week for 8 weeks before training (Majlesi et al., 2021). In this study, it was found that there was a statistical difference in the agility skills of the athletes after 8 weeks, 3 times a week, 30 minutes of perception, decision making and reaction educational games. When compared with the results in the literature, we interpret that the application of 8 weeks and 30 minutes of exercises can reveal an improvement in athletes. At this point, it is thought that a certain period should pass for the development of the cognitive functions of the athletes and the exercise times should be in sufficient time intervals. In a study supporting this information, it was emphasised that there was a relationship between the ability of female athletes to solve complex stimuli in the Speedcourt® test and their perception skills, that exercises to improve the cognitive skills of athletes are important and that these features should be trained (Büchel et al., 2022). At this point, it comes to mind that educational games involving perception, decision-making and reaction in this study help athletes to improve their agility skills, and the information in the literature and the result of the research are in parallel.

Reaction time in wrestling sport can help athletes to achieve successful results in competitions. Athletes' fast and short-term reactions to stimuli help them gain advantage over their rivals (Çolakoğlu et al., 1993). It is known that performance skills of wrestling athletes can be improved with reaction exercises. It was reported that reaction skills could be increased with 10 minutes reaction exercises performed in the warm-up phases in a total of 24 wrestling athletes aged 18.6±1.8 years (Gierczuk et al., 2023). Similarly, in 17 female and 10 male karate athletes aged 17.4±3.52 years, it was found that there were improvements in the reaction skills of the athletes after simulation training for 10 minutes for 6 weeks (Witte et al., 2022). In a different study, it was reported that reaction times improved in the training group after foot reaction exercises applied for a total of 30 minutes 3 days a week for 12 weeks to a total of 22 wrestling athletes aged 11.82±0.75 years (Kaya, 2016). The researcher emphasised that the reason for this effect is that the reaction time of athletes between the ages of 7-12 is a period open to developmental periods. In this study, different results were obtained from the literature. After 8 weeks of perception, decision making and reaction exercises in the content, there was no statistical difference in the hand reaction times of the athletes. In the literature, the application of reaction exercises with equipment that is not simple or has better systems, and in this study, the application of 8 weeks of training with simple equipment suggests that it is not sufficient for the reaction development of athletes. Because athletes can move quickly while training with a device, but it comes to mind that it may cause prolongation in reaction times because athletes have fun in mutual educational games. One of the limitations of this study is that at this point, the exercises of the athletes were designed from simple games.

RESULTS

According to the results of the study, the agility skills of athletes can be improved after educational games involving perception, decision making and reaction. At this point, to improve the agility skills of athletes, as an alternative to serious exercises, agility skills can be improved through educational games

that will be applied in the classroom environment without much effort. Coaches and teachers can support the development of athletes by organising in-class activities and designing games according to the target, and educational games as one of the types of exercises that improve agility.

RECOMMENDATIONS

- In order to improve the agility skills of athletes, educational games lasting 30 minutes can be played before training.
- The educational games to be designed should include memory, perception, decision making and reaction skills.
- The educational games to be applied before the training can be played in the classroom environment and without much effort, so that physical fatigue is not created in the athletes before the main phase.

Ethics Approval Permission Information
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Protocol Number: E-81614018-000-2300057747 / 2023-10/2.27

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