



The Effect of Different Strength Training Exercises on the Performance Success of U17 Football Team Athletes

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Abstract: This study aimed to investigate the effects of strength training, consisting of resistance band exercises, core training, and plyometric exercises, on the performance of football players. Ten active male football players with an average age of $\bar{X}=16,60\pm0,52$ participated in the study. For the statistical analysis of the data, the changes in physical fitness parameters were examined after 8 weeks of resistance band, core and plyometric training. Data was obtained through speed dribbling tests, short pass tests, set-piece shooting tests, and shooting tests following a pass with the foot. In this context, a one-group pretest-posttest design, one of the experimental methods, was applied in the study. Data analysis was performed with the SPSS 27 IBM program. In the study, the Wilcoxon signed-rank test, one of the non-parametric tests, was used to determine the difference between the pretest and posttest of the football players. According to the findings obtained as a result of the research, it was determined that different strength training exercises (core, plyometric and resistance band) increased the speed dribbling performance indicators, short passing performance indicators, dead ball shooting performance indicators, and shooting from a pass performance indicators. In addition, it was determined that the pretest and posttest results of the footballers for all parameters represented a large effect size.

Keywords: Football, Resistance band, Core, Plyometric, Performance

Farklı Kuvvet Antrenmanlarının U17 Futbol Takımı Sporcularının Performans Başarısına Etkisi

Öz: Bu araştırmada, direnç bandı, core ve pliometrik antrenmanlardan oluşan kuvvet çalışmalarının futbolcuların performansı üzerindeki etkileri incelenmesi amaçlanmıştır. Araştırmaya yaş ortalaması $\bar{X}=16,60\pm0,52$ olan 10 aktif erkek futbolcu katılmıştır. Verilerin istatistiksel analizi için uygulanmış olan 8 haftalık direnç bandı, core ve pliometrik antrenman sonucunda fiziksel uygunluk parametrelerindeki değişimler incelenmiştir. Veriler sürat dripling testi, kısa pas testi, duran topla şut testi ve ayak pasıyla verilen topa şut testi ile elde edilmiştir. Bu bağlamda araştırmada deneysel yöntemlerden “Tek Grup Ön Test – Son Test Modeli” uygulanmıştır. Verilerin analizleri SPSS 27 IBM programı ile gerçekleştirilmiştir. Araştırmada futbolcuların ön test ve son test arasındaki farkı tespit etmek için nonparametrik testlerden Wilcoxon işaretli sıralar testi kullanılmıştır. Ayrıca veriler, ortalamalar ve standart sapmalar verilerek özetlenmiştir. Araştırma sonucunda elde edilen bulgulara göre, farklı kuvvet antrenmanlarının (core, pliometrik ve direnç bandı) futbolcuların sürat dripling performans göstergelerini, kısa pas performans göstergelerini, duran topla şut performans göstergelerini ve ayak pasıyla verilen topa şut performans göstergelerini arttırdığı tespit edilmiştir. Ayrıca futbolcuların tüm parametreler için ön test ve son test sonuçlarının büyük etki büyüklüğünde temsil ettiği tespit edilmiştir.

Anahtar Kelimeler: Futbol, Direnç bandı, Core, Pliometrik, Performans

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INTRODUCTION

Football is a particularly physically demanding sport that includes jumps, turns, tackles, high-speed runs and sprints, and many short-term intense movements (Bangsbo, 1994; Bangsbo, Nørregaard & Thorsø, 1991; Mayhew & Wenger, 1985; Nobari, Silva, Clemente, Siahkoughian, García-Gordillo, Adsuar & Pérez-Gómez, 2021). Many factors affect football players' performance. These factors are mobility, strength, speed, endurance, flexibility, quick thinking and decision-making (Helgerud, Engen, Wisløff & Hoff, 2001) A football player's performance is not solely dependent on physical capacity, but is a multi-dimensional construct resulting from the dynamic interaction of psychological, technical, and tactical components (Afonso, Forte, Branquinho, Ferraz, Garrido & Teixeira, 2025)

The muscles' ability to contract in the face of resistance or to withstand a certain amount of resistance is called strength (Şahin, 2004). Sprint strength, quick strength, striking strength, jumping strength and shooting strength, which affect athletic performance in football, are directly related to the general strength of football players (Aktuğ, 2013). With the development of the strength abilities of football players, their technical and conditional characteristics also improve and develop. At the same time, small muscle groups, which can develop to a more limited degree than large muscle groups, are also strengthened (Denner, 1987).

Exercises are important for football players. Exercises play a major role in improving football players' performance, reducing the possibility of injury, and staying at the highest level during the season. At this point, the effects of exercises performed with different equipment, such as resistance bands, on the physical fitness parameters of football players are important (Bompa & Haff, 2009). In another example, it was observed that repeated sprint training with progressive elastic resistance had positive effects on sprint performance and fore-and-back force generation in young elite football players. In short, it showed that the sprint capacity of football players can be further improved by adding increased resistance despite the athlete's displacement, in order to increase their ability to generate AP force at high speed during the final phase of acceleration (Le Scouarnec, Samozino, Andrieu, Thubin, Morin, & Favier, 2022). The core is the region of the body that includes the centre of gravity of the body and consists of 29 muscles, including the abdomen, waist, hips and pelvis (Samson, 2005). Exercise programs that aim to increase the strength of the deep muscles that keep the spine in balance and the muscles in the lumbopelvic region, and which can be performed using one's own body weight or with the help of various equipment such as exercise bands, Pilates balls, and BOSU balls, are called core training (Atan, Kabadayı, Eliaz, Çilhoraz & Akyol, 2013). Increasing the muscle stiffness of the trunk transfers the force more efficiently. This allows the extremities to move at a higher speed (Axel, Crussemeyer, Dean & Young, 2018). Mossa found that the strength, speed and agility performance of football players increased as a result of core training applied to 14-year-old football players (Mossa, 2022).

One of the methods that both improves the explosiveness of athletes and contributes to the rapid and efficient use of the force stored in the muscles is plyometric training (Aykora & Dönmez, 2017). This training is also referred to as achieving the maximum strength of the muscle in the

shortest time and obtaining the maximum strength at this point; in other words, the ability of the muscles to quickly and effectively generate maximum power (Dündar, 2015). Plyometric training is important for many branches of sport in terms of athletes' strength and rapid utilisation of this strength, despite causing as little increase in muscle tissue as possible. Plyometric training is mostly utilised in areas with extreme parameters such as power, speed, and explosiveness (Günay, Şıktar & Şıktar, 2017). Plyometric exercises such as standing and multiple jumps, box drills and depth jumps are also called plyometric exercises for the lower body. In addition, catches, medicine ball throws, and different drills are utilised for the upper body (Haff & Triplett, 2015). The materials used in such exercises are medicine balls of various weights, boxes of different sizes, hurdles, obstacles, cones, ladders, weighted vests and dumbbell sets (Chu, 1998). Yarıyan and Müniroğlu examined the effect of plyometric training on vertical jump, agility, speed and strength parameters of football players. In the study, statistically significant differences were found in all parameter values (Yarıyan & Müniroğlu, 2020).

When the performance test results obtained in terms of athletic performance were evaluated, it was determined that strength directly or indirectly affects athletes' performance in various sports disciplines (Gündüz, 1997). Foot speed is critical during contact with the ball in football. This important factor is the speed of the ball and the distance of the kick when the footballer strikes the ball. Therefore, strength training is important to determine training programs that can increase the foot speed of football players (Young & Rath, 2011). Günebakan determined the positive effect of different strength training programmes applied to young football players on anaerobic power, speed and functional movement screening test scores (Günebakan, 2024). Yang, Chen, Qi, Zhang and Men found that sprint interval training and plyometric training affected the physical performance of football players. In particular, it was determined that there were many improvements in anaerobic power, vertical jump, linear speed and change of direction performance of football players (Yang, Chen, Qi, Zhang & Men, 2024).

Since a study combining core, plyometric and resistance band training is lacking in the field, we think that this study will add value to the field. We also consider that it will provide support for new researchers to produce new ideas.

In this context, in this study, it was planned to apply strength training consisting of resistance band, core and plyometric training in addition to the normal training programme of the athletes on 3 days a week for 8 weeks. It was aimed to carry out these strength exercises applied in the research with the speed dribbling test, short passing test, shooting from a pass test, and dead ball shooting test. It is predicted that the applied strength exercises will significantly improve dribbling, short passing, shooting after passing, and set-piece shooting performance in football players.

METHOD

Research Design

A one-group pretest-posttest design, one of the experimental methods, was applied in the study. Since the effect of the experimental process in the study was tested on a single group, the one-group pretest-posttest experimental design, one of the quantitative research methods, was utilised. An experimental design is defined as a research design that is used to reveal the cause-and-effect relationships between variables (Büyüköztürk, 2016).

Study Group

The population of the study consisted of 16- and 17-year-old athletes belonging to the U17 teams of football clubs. The sample of the study was determined by purposive sampling method, which is one of the non-random sampling methods. The research was conducted with 10 volunteer male football players. One limitation of the study is that the research was conducted with 10 football players with a one-group pretest-posttest design. Another limitation is the lack of a control group. The research was carried out with a single football team (Şekerspor) in order to ensure the reliability of the research due to the potential effects of different training programmes. An informed consent form was obtained from the football players prior to the study.

Compliance with ethical standards

This study was conducted in accordance with the Declaration of Helsinki. Ethics approval for the study was obtained from the ethics committee of Gazi University (Meeting No. 02, January 28, 2025).

Study Protocol

The study group included in the research was subjected to resistance band exercises for 2 days and core and plyometric exercises for 1 day. Resistance band characteristics are as follows: Red colour, moderately difficult resistance, 1.8 force-extension relationship; green colour, difficult resistance, 2.3 force-extension relationship; blue colour, very difficult resistance, 3.2 force-extension relationship.

Resistance Band Training

Table 1. Resistance band training programme

Days	Resistance Band Training	1st 2nd and 3rd weeks			4th 5th and 6th weeks			7th and 8th weeks			Resting	
		Set	Repeat	Resistance Band	Set	Repeat	Resistance Band	Set	Repeat	Resistance Band	Set	Repeat
Monday	<ul style="list-style-type: none"> ➤ Forward to Lateral Step (Right foot), ➤ Forward to Lateral Step (Left foot), ➤ Straight Leg (Right foot), ➤ Straight Leg (Left foot), 	2	20 sec	Red	3	20 sec	Green	4	20 sec	Blue	20 sec	120 sec
Friday	<ul style="list-style-type: none"> ➤ Lateral Raise (Right foot), ➤ Lateral Raise (Left foot), ➤ Knee Drive (Right foot), ➤ Knee Drive (Left foot), ➤ Hamstring Curl (Right foot), ➤ Hamstring Curl (Left foot), ➤ Squats, ➤ Lateral Walk, ➤ Diagonal Walk, ➤ Glute Bridges, ➤ Scissors. 	2	20 sec	Red	3	20 sec	Green	4	20 sec	Blue	20 sec	120 sec

In addition to in-season football training, a different strength training programme, including the resistance band exercises specified in Table 1, was applied to the experimental group on 2 days a week for 8 weeks.

Core and Plyometric Training: The training sessions were performed in two sets during the first 3 weeks. When the sets were over, a 1-minute rest was given, and the next movement was started. Movements were performed for 15 seconds, and intermediate rests for 15 seconds. When done in this way, 1 set was completed. In the 4th, 5th and 6th weeks, three sets were performed. When the sets were finished, a 1-minute 30-second rest was given, and the next movement was started. Movements were performed for 15 seconds, and intermediate rests for 15 seconds. When done in this way, 1 set was completed. In the 7th and 8th weeks, four sets were performed. When the sets were finished, a 2-minute rest was given, and the next

movement was started. Movements were performed for 15 seconds, and intermediate rests for 15 seconds. When performed in this way, 1 set was completed. The movements are as follows: Sit-ups, Cross Sit-ups, Reverse Sit-ups, Plank, Crunch, Double Crunch, Drop Jump, Box Jump, Mini Squat Jump and Split Squat Jump.

Table 2. Core and plyometric training programme

Days	Core and plyometric training	1st 2nd and 3rd weeks		4th 5th and 6th weeks		7th and 8th weeks		Resting	
		Set	Repeat	Set	Repeat	Set	Repeat	Set	Repeat
Wednesday	<ul style="list-style-type: none"> ➤ Sit-ups, ➤ Cross sit-ups, ➤ Reverse sit-ups, ➤ Plank, ➤ Crunch, ➤ Double Crunch, ➤ Drop jump, ➤ Box jump, ➤ Mini Squat jump ➤ Split Squat Jump 	2	20 sec	3	20 sec	4	20 sec	20 sec	120 sec

In addition to in-season football training, different strength training programmes, including the core and plyometric exercises specified in Table 2, were applied to the experimental group on 1 day a week for 8 weeks.

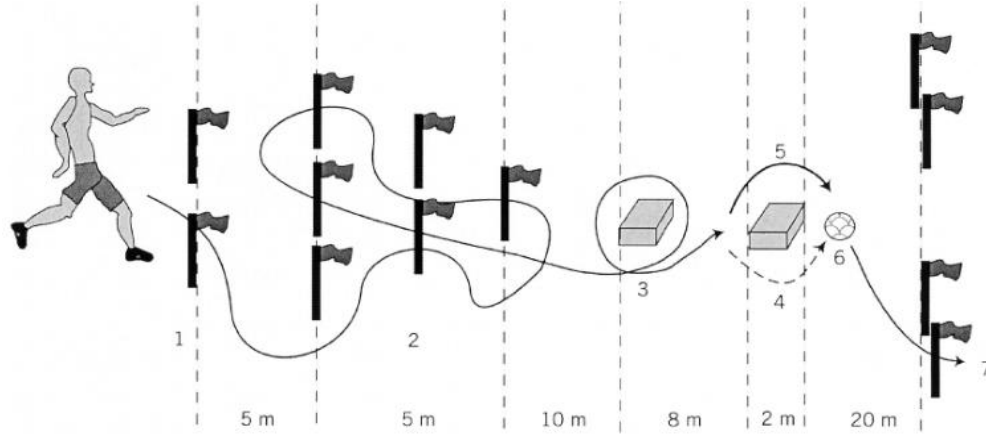
Table 3. In-season 8-week training plan

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Training Sessions	Regeneration	After the Main Workout Core Training	Training	After warm-up Plyometric training	After warm-up Resistance Band Training	After warm-up Resistance Band Training	Match Day
Training Load	Light (30-50%)	Medium (50-70%)	High (80 – 100%)	Medium High (70 – 80%)	Medium (50-70%)	Medium (50-70%)	High (100%)
Heartbeats per Minute	130 - 140	140 - 150	165 and over	150 - 165	140 - 150	140 - 150	180 and over

Data Collection Tools

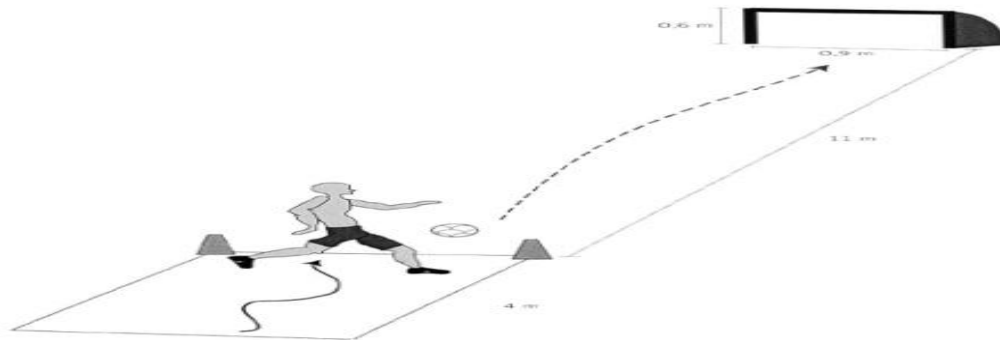
1. Speed Dribbling Test: The speed dribbling test provides a test of coordinated dribbling and speed under time pressure. On the ‘Ready and Go’ signal, the athlete starts with the ball behind the line (1). After 5 metres, he dribbles to the right around the first post of the triangle (2). He passes around eight posts arranged in different ways. After 10 metres, he dribbles around a block/box (3). After 8 metres, he sends the ball forward on one side of the square (4) and runs to the other side (5) to retrieve the ball (6). He dribbles the ball quickly and passes his foot with the ball between the flags (7). The researcher measures a total of 3 attempts made by the footballer, and takes the best score as the footballer’s speed dribbling test score (Rösch, Hodgson, Peterson, Graf-Baumann, Junge, Chomiak & Dvorak, 2000). The Speed Dribbling Test is shown in Figure 1.

Figure 1. Speed Dribbling Test.



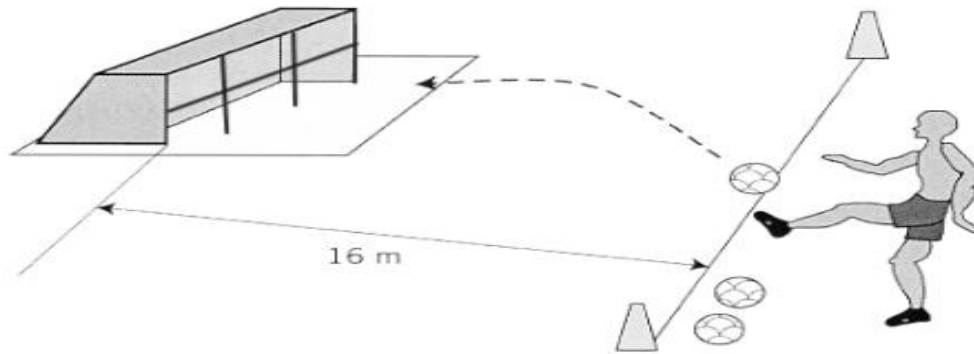
2. Short Passing Test: The short passing test measures the footballer's coordination and passing accuracy with the moving ball. The footballer dribbles the ball from 4 metres to the line. The distance between the line and the goal is 11 metres. The width of the goal is 0.9 metres, and the height is 0.6 metres. The researcher measures five short passing tests performed by the footballer. If the ball enters the goal, he gets 3 points; if the ball hits the crossbar or goalpost, he gets 1 point (Rösch, et al., 2020). The Short Passing Test is shown in Figure 2.

Figure 2. Short Passing Test



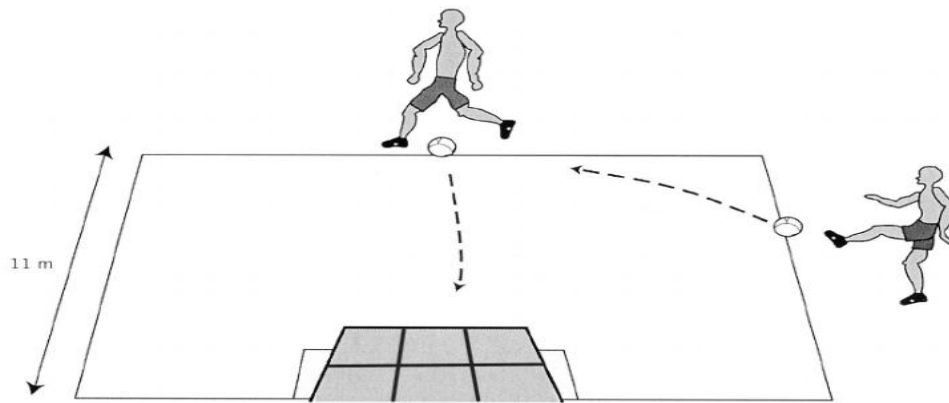
3. Dead Ball Shooting Test: The dead ball shooting test determines the measurement of shooting and accuracy with a dead ball. The football is placed 16 metres from the goal. The footballer shoots at the goal divided into six equal parts. The footballer aims the first shot at the upper right section. Then, he shoots at the upper left section. The researcher measures 3 shots of the footballer for each corner. If the footballer's shot goes into the right compartment, he gets 3 points; if the ball touches the element (rope) bounding the compartments, he gets 1 point. If the ball passes through the top centre section, he gets 1 point. However, if the shot passes through the lower compartments, the player receives zero (0) points (Rösch, et al., 2020). The illustration of the Dead Ball Shooting Test is given in Figure 3.

Figure 3. Dead Ball Shooting Test



4. Shooting From a Pass Test: The shooting from a pass test measures the coordination and accuracy of the shot made by the football player from a pass coming along the ground. The researcher passes the ball along the ground from 20 metres towards the penalty spot. The football player shoots the ball into the goal after a short run. The goal is divided into 6 equal sections. If the pass made during the test is not accurate enough, the pass is repeated. The researcher measures 5 shot attempts made by the football player. If the shot made by the football player hits the upper right and left sections of the goal, the football player gets 6 points. If the shot touches the edge of these sections, the football player gets 1 point. If the shot hits the top middle section, the football player gets 2 points. If the shot passes through the lower sections, the football player gets 1 point (Rösch, et al., 2020). The illustration of the Shooting From a Pass Test is given in Figure 4.

Figure 4. Shooting From a Pass Test



Data Analysis: Analyses were performed using the SPSS 27 (Statistical Package for the Social Sciences) program. For sample sizes of 10 and below 10, non-parametric methods are recommended because they do not rely on the assumption of normality, which is often violated in small data sets (Boedec, 2019; Dwivedi, Mallawaarachchi, Alvarado, 2017; Kim, Kim, Park, Han, Kim, Choi, Kim & Kim, 2024; Orhunbilge, 2000). In such studies, non-parametric tests such as the Wilcoxon signed-rank test can evaluate the differences between paired samples without relying on the normality assumption (Tsagris, Alenazi, Verrou, & Pandis, 2020; Joel, Ojo, Timothy, Ibukun, Jonathan & Ayedun, 2020). In this context, the Wilcoxon signed-rank

test was used to determine the difference between the pretest and posttest scores of the athletes in the study. In addition, the data were summarised by giving means and standard deviations. The statistical significance level was accepted as $p < 0,05$ in all evaluations.

RESULTS

In this section, the findings of the research are presented.

Table 4. Comparison of pretest and posttest measurements of the participants

Tests	N	Mean	Std. Deviation	z	p	r
Speed Dribbling - Pretest	10	24,66	1,576	-2,803	,005**	,89
Speed Dribbling - Posttest	10	21,33	1,693			
Short Passing - Pretest	10	9,60	3,026	-2,536	,011*	,80
Short Passing - Posttest	10	12,60	2,119			
Dead Ball Shooting - Pretest	10	4,90	2,234	-2,825	,005**	,89
Dead Ball Shooting - Posttest	10	11,50	1,780			
Shooting From a Pass - Pretest	10	5,80	5,959	-2,807	,005**	,89
Shooting From a Pass - Posttest	10	14,60	4,695			

** $p < 0,01$

As shown in Table 4, the pretest and posttest results of the football players participating in the study were compared for all parameters. A statistically significant difference was found between the pretest and posttest scores for speed dribbling, short passing, dead ball shooting, and shooting from a pass ($p < 0,05$). In addition, while the speed dribbling mean scores of the footballers decreased in the posttest, their mean scores for short passing, dead ball shooting, and shooting from a pass increased in the posttest. An attempt was also made to determine the effect sizes of the pretest and posttest results of the footballers for all parameters. According to Rosenthal's formula ($r = z / \sqrt{n}$), the effect size was calculated for the nonparametric tests (Rosenthal, 1991). As a result of the calculation, a significant improvement was found for all parameters between the pre- and post-application measurements. Since the effect sizes were ,80 and ,89, it was determined that the male footballer variable represented the pretest and posttest results for all parameters with a large effect size. Especially for speed dribbling, dead ball shooting, and shooting from a pass, the pre-test and post-test results represent a large effect size due to the fact that the pretest and posttest results show an effect size of ,89 (Cohen, 1988; Üstün & Eryılmaz, 2014).

DISCUSSION AND CONCLUSION

This study investigated the effect of different strength training exercises (core, plyometric and resistance band) on the performance success of U17 men's football team athletes in speed dribbling, short passing, dead ball shooting, and shooting from a pass. For this purpose, the parameters measured in the study were determined using two stages of research: pretest and posttest. The obtained results were discussed and presented in the light of the literature.

Dribbling is one of the techniques used in movements with the ball in football and should be performed by football players to improve their performance (Sridadi, Septiasari, Parijan & Ilham, 2021).

In this direction, when the experimental group's pretest and posttest measurement values were examined within the scope of the research, it was determined that their speed dribbling values showed a statistically significant difference. When the mean values were compared, it was determined that their posttest measurement values were better.

When the related literature is examined, the findings of experimental studies conducted in this direction overlap with the findings of our study. For example, Brull and Beltran, 2021 performed 8-week core training with young male (16-18 years old) footballers and found that it made a significant contribution to the development of speed and change-of-direction skills of the footballers at the end of the training. Furthermore, Lago-Fuentes, Rey, Padrón-Cabo, Rellán-Guerra, Fragueiro-Rodríguez and García-Núñez, 2018 found a significant improvement in the 10-metre sprint and repeated sprint tests of futsal players as a result of 6-week core training (18-28 years old) in 2018. Prieske, Mühlbauer, Borde, Gube, Bruhn, Behm and Granacher, 2016 observed technical and athletic performance in young football players (17±1 years old). As a result of the 9-week core training they applied, they found that it contributed positively to the 10-20 metre sprint performance of the athletes. Günebakan, 2024 determined the positive effect of a 6-week core and plyometric training programme on the speed development of 2024 young football players (18-22 years old). Turna, 2021 as a result of 6-week core training with young football players (9-11 years old), determined that it contributed positively to the basic motor development of the athletes.

In many experimental studies, the results of plyometric training programmes performed on footballers overlap with our study findings. Hammami, Negra, Aouadi, Shephard and Chelly, 2016 found that 8-week plyometric training programmes conducted with young football players (15.7±0.2 years) improved the speed parameters of the athletes. Moore, Hickey and Reiser, 2005 found significant improvements in 25 m sprints of football players as a result of a 12-week plyometric training programme with university football players. Slimani, Chamari, Miarka, Del Vecchio and Chéour, 2016 examined the effects of plyometric training on physical fitness in team athletes and found that plyometric training improved the speed and sprint performance of football players. Meylan and Malatesta, 2009 found that an 8-week plyometric training programme during in-season football training positively affected the 10-metre sprint performance of young football players (13.3±0.6 years).

The results of resistance band exercises performed on footballers in experimental studies in the literature also overlap with our study findings. Mor, Karakaş, Mor, Yurtseven, Yılmaz and Acar, 2022 determined that resistance band exercises performed on young footballers (15,18±,40 years old) provided a performance increase in 30 m sprint parameters in athletes.

According to the obtained results, it was determined that strength training with core, plyometric and resistance band exercises improved the speed dribbling performance of football players. In addition, it was determined that the speed dribbling pretest and posttest results represented a large effect size since the *r* value was ,89 (Table 3).

Passing in football is an individual technical skill that every player must understand and recognise. The quality of passes must be high in order to dominate the ball. Positive and quality

passes significantly contribute to a football team's success (Collet, 2013; Vembiarto & Lismadiana, 2018).

In this direction, when the experimental group's pretest and posttest measurement values were analysed, it was determined that their short passing values showed a statistically significant difference. When the mean values were compared, it was determined that their posttest measurement values were better.

In many experimental studies, the results of core training performed on footballers overlap with our study findings. It was determined that 6-week core training performed on football players in the 10-12 age group improved the passing and shooting skills of the athletes (Savaş, Eşkil, Türkmen, Yılmaz & Fakazlı, 2020). It was determined that 8-week core training improved the technical skills of football players in the 14 - 15 age group (Şimşek, 2019). Uluç and Durukan, 2023 investigated the effect of core training on balance, speed, coordination, agility, anaerobic power, technique and skills of female football players. As a result of the 12-week study, they found that the passing technical characteristics of the athletes also improved.

The findings of the plyometric training conducted by Şimşek on football players (14-15 years old) also overlap with our research findings. Şimşek determined that 8-week plyometric training for football players improved the technical skills of the athletes (Şimşek, 2019).

According to the obtained results, it was determined that strength training with core, plyometric and resistance band exercises improved the short passing performance of football players. In addition, it was determined that the short pass pretest and posttest results represented a large effect size since the r value was ,80 (Table 4).

Set-piece kicks are activities that occur during football matches and can affect the outcome of the match (García, Maneiro, Suárez, Boubeta, López, Sanjurjo, 2018). In football, even a shot on target indicates success (Peñas, 2008; Tenga, Ronglan & Bahr, 2010).

In this direction, when the experimental group's pretest and posttest measurement values were examined within the scope of the research, it was determined that their dead ball shooting values showed a statistically significant difference. When the mean values were compared, it was determined that their posttest measurement values were better.

In many experimental studies, the results of core training performed on footballers overlap with our study findings. Savaş et al., 2020 determined that 6-week core training improved the passing and shooting skills of football players in the 10-12 age group. Uluç and Durukan, 2023 determined that 12-week core strength training in female football players improved the passing and shooting skills of the athletes.

In many experimental studies, the results of plyometric training performed on footballers and our study findings are similar. Rubley, Haase, Holcomb, Girouard and Tandy, 2011 found that 14-week plyometric training performed on adolescent female footballers (aged 13.4 ± 0.5 years) improved the athletes' passing and shooting distance skills. Villarreal, Suarez-Arrones, Requena, Haff and Ferrete, 2015 investigated the effects of plyometric and sprint training on

physical and technical skill performance in adolescent football players (14-15 years old), and found that the training had a beneficial impact on the athletes' performance.

The results of resistance band exercises performed on footballers in many experimental studies also overlap with our findings. Granacher, Lesinski, Büsch, Muehlbauer, Prieske, Puta, Gollhofer and Behm, 2016 found that resistance band exercises also improved shooting performance. Akyüz, 2023 found that resistance band training improved the passing and shooting accuracy of 16-18-year-old football players.

In line with the obtained results, it was determined that strength training with core, plyometric and resistance band exercises improved the dead ball shooting performance of footballers. In addition, it was determined that the pretest and posttest results of shooting with a dead ball represented a large effect size since the r value was ,89 (Table 4).

The main objective of a football match is to score goals. For this purpose, footballers attempt to score goals by creating threats to the opponent and shooting the ball towards the goal (Fajen, Riley & Turvey, 2008).

In this direction, when the experimental group's pretest and posttest measurement values were examined within the scope of the research, it was determined that their values for shooting from a pass showed a statistically significant difference. When the mean values were compared, it was determined that the posttest measurement values were better.

When the relevant literature is examined, the results of many studies conducted in this direction overlap with our study findings regarding core training performed on footballers. Prieske et al., 2016 found that core training applied to football players (17±1 years old) contributed positively to the shooting performance of the athletes. Savaş et al., 2020 determined that core training applied to football players improved the shooting skills of the athletes. Uluç and Durukan, 2023 investigated the effect of core training on balance, speed, coordination, agility, anaerobic power, technique and skills in female football players (22,67 years old). As a result of the 12-week study, it was determined that the athletes' shooting technical characteristics also improved.

In many experimental studies, the results of resistance band training performed on footballers also overlap with our findings. Akyüz, 2023 determined that resistance band training applied to football players (16-18 years old) improved the shooting accuracy of the athletes. Granacher et al., 2016 also found that resistance band exercises applied to football players improved the shooting performance of the athletes.

When the related literature is examined, the results of plyometric exercises performed on football players (14 - 15 years old) in the research conducted by Şimşek, 2019 also overlap with our study findings. Şimşek determined that plyometric training applied to football players improved the shooting skills of the athletes.

According to the results of the research, it was determined that strength training with core, plyometric and resistance band exercises improved footballers' performance in shooting from a pass. In addition, it was determined that the r value of the pretest and posttest results for shooting from a pass was ,89 (Table 4), representing a large effect size.

The research was conducted during the season. At this point, coaches can consider the guidance to be given during the season. In the study, plyometric training and core training were performed on the same day due to lack of facilities. However, it is considered that performing these training sessions on different days will further enhance efficiency for young footballers. In this context, Table 3 can be utilised. At the same time, Table 1 can be used for the content of resistance band training and Table 2 can be used for the content of core and plyometric training.

The study used an experimental design and focused on skill-based performance variables. In this context, it was determined that the different strength training exercises (core, plyometric and resistance band) performed with the football players increased the performance indicators of speed dribbling, short passing, shooting from a dead ball, and shooting from a pass. It was also observed that the pretest and posttest results of the football players for all parameters represented a large effect size (.80 and .89). It is considered that these results will support the literature both practically and academically in addition to expanding the existing literature. In addition, since the age group following the research age group also includes professional football players, it is considered that applying the research protocol to adult football players as well as to young football players will contribute to the performance indicators of football players.

Limitations

The study has the following limitations:

- The study was conducted with 10 football players,
- The study lasted 8 weeks,
- Performance was measured with dribbling, short passing, set-piece shooting, and post-pass shooting tests,
- Since the study was conducted on a single group with pre-test and post-test measurements, there was no control group.

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