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The Effect of Trx Exercise Program on Sporting Performance of 13 – 15 Years Old Male Football Players

Trx Egzersiz Programının 13 – 15 Yaş Erkek Futbolcuların Spor Performansına Etkisi

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ABSTRACT

In this study, the effects of exercises done with the TRX equipment on sportive performance of football players have been investigated. The study was conducted at Kurt Brothers Astro Pitch allocated to Iktisas Sports Club. 20 players were selected between the ages of 13-15 who play football for Iktisas Sports Club. These players did TRX trainings twice a week (Saturday, Sunday) for 8 weeks. Before starting to work, the football players did warm-ups. Then, players were divided into two groups. Each group had 10 members. The first group was called as Football Player Control Group (FPCG). This group did routine football trainings and they did not take part in any programme after the trainings whereas the other group called as TRX Training Group (TRXA) were incorporated into the work programme after the necessary rest right after football training. At the end of 8 weeks of work, both pre-assessment and post-assessment data and in-group and between-group comparisons were analysed with the help of SPSS programme. When the effects of TRX exercise programs, applied for 8 weeks, on sportive performance in 13-15 age group of male football players were compared with statistical analyses, it was seen that the development of the football players in the TRXA group was higher than the football players in the FPCG group. It was observed that only the body weight and agility (Arrowhead) development in FPCG group were higher than TRXA group. Since TRX exercises have a positive effect on the performance of football players, these exercises can be suggested to take place in football trainings.

Keywords: TRX, Football, Functional exercise band, Performance.

ÖZET

Bu çalışmada TRX ekipmanıyla yapılan antrenmanların futbolcuların sportif performansına etkisi araştırılmıştır. Çalışma İktisas Spor Kulübü'ne tahsis edilen Kurt Kardeşler Astro Sahasında gerçekleştirildi. İktisas Spor Kulübü'nde futbol oynayan 13-15 yaş arası 20 oyuncu belirlendi. Bu oyuncular 8 hafta boyunca haftada iki kez (Cumartesi, Pazar) TRX antrenmanları yaptılar. Futbolcular idmana başlamadan önce ısınma çalışması yaptı. Daha sonra oyuncular iki gruba ayrıldı. Her grubun 10 üyesi vardı. Birinci gruba Futbolcu Kontrol Grubu (FPCG) adı verildi. Bu grup rutin futbol antrenmanları yaptı ve antrenman sonrasında herhangi bir programa katılmazken, TRX Training Group (TRXA) olarak adlandırılan diğer grup ise futbol antrenmanının hemen ardından gerekli dinlenmenin ardından çalışma programına dahil edildi. 8 haftalık çalışmanın sonunda hem ön değerlendirme hem de değerlendirme sonrası veriler ile grup içi ve gruplar arası karşılaştırmalar SPSS programı yardımıyla analiz edildi. 13-15 yaş grubu erkek futbolcularda 8 hafta boyunca uygulanan TRX egzersiz programlarının sportif performansa etkileri istatistiksel analizlerle karşılaştırıldığında, TRXA grubundaki futbolcuların gelişiminin diğerlerine göre daha yüksek olduğu görüldü. FPCG grubundaki futbolcular. FPCG grubunda sadece vücut ağırlığı ve çeviklik (Ok ucu) gelişiminin TRXA grubuna göre daha yüksek olduğu görüldü. TRX egzersizlerinin futbolcuların performansına olumlu etkisi olduğundan bu egzersizlerin futbol antrenmanlarında yer alması önerilebilir.

Anahtar Kelimeler: TRX, Futbol, Fonksiyonel egzersiz bandı, Verim.

INTRODUCTION

Football is one of the most watched and popular sports in the world. It is widely accepted that in order for the athletes to reach the expected sportive performance, they must have the necessary physical attributes suitable for their branches. Yet, just having these attributes does not necessarily mean that the athletes will show maximum performance (Özkan, 2005). The physical structure of the athlete is only one of the reasons that affect the maximum performance expected from him or her and it affects the performance positively when it is combined with other performance elements such as flexibility, speed, strength, power, quickness and endurance. (Açıkada, 1990). Besides all these, it has been proven that the strength trainings done during the pre-season and the season should be aimed at increasing performance, preventing injuries and promoting physical development. With this approach, many different strength training models have emerged over time.

Especially in the academies, functional training models that support the skeletal and muscle development of young players, who are still in the age of growth and development, have gained more importance. (Bompa, 2000). Functional training models include all kinds of body movements through special exercises. These trainings are accepted as an educational tool that is diversified in many different ways with the effect it provides in increasing the performance that can be applied to individuals in their jobs, sports, work, domestic duties, entertainment moments and among other activities. (Mallmann et al., 2019). This system is TRX (Training Resistance Exercises), also known as functional exercise bands or hanging exercise system, which is included in suspension training tools. (Eckstein et al., 2006; Dawes, 2017). TRX is an equipment that allows you to perform all functional fitness exercises by changing all body position and joint motion angles against gravity by using your own body weight. That's why, it is thought that TRX training will contribute positively to sportive performance in athletes.

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MATERIALS and METHODS

The Aim and Importance of the Research: This study aims to determine the performance values of 13–15 years old male football players, who play for Iktisas Sports Club in Siirt, in the developmental ages who do or do not do TRX (Training Resistance Exercises) training by using scientifically accepted materials and methods.

Research Model: This chapter looks at the scope of the study, the groups involved in the study, the collection of data, the tools used in the collection of the obtained data, and the methods and techniques used in the analysis of these data. One week before the start of the study, all participants were notified about the study. The study was carried out in Siirt Kurt Brothers Astro Pitch after the necessary permissions and voluntary consent forms were signed by the participants. In our study, there are Siirt Iktisas Sports Club players and they were randomly selected on a voluntary basis. The ages of the subjects varied between 13-15 years old. Height and weight ratios were not taken into account when selecting the subjects. A total of 20 students were randomly divided into 2 groups. The first group (n=10) was called as the TRX Training Group (TRXA), while the second group (n=10) was named as the Football Players Control Group (FPCG). TRXA group performed TRX exercise program 2 days (Saturday, Sunday) a week for 8 weeks after football trainings. On the other hand, FPCG group were not subjected to any training after routine football training. TRXA and FPCG had pre-assessments and post-assessments, including anthropometric measurements, Y-Balance Test, One-Legged Stance Test, Flexibility Test, Crunch Test, Arrowhead Test and 20m Sprint Test at the Siirt Kurt Brothers Astro Pitch before and after the study. One week before the evaluations, the players were given the necessary information about the study, method and procedure. Before TRX trainings, pre-test measurements had been taken and after 8 weeks of TRX trainings, post-test measurements were taken. Parents of all subjects, who were informed about the plan and the purpose of the studies, signed a voluntary consent form in which they declared that they participated in the study voluntarily. One subject in FPCG withdrew from the study voluntarily.

Table 1. Trx Training Program

NO	TRAINING MOVEMENT TO BE USED	NUMBER OF WEEKS TO BE APPLIED							
		1. Week	***2. Week***	***3. Week***	***4. Week***	***5. Week***	***6. Week***	***7. Week***	***8. Week***
1	Sprinter Start	10 x 2 sec	10 x 2 sec	15 x 2 sec	15 x 2 sec	20 x 2 sec	25 x 2 Sec	25x 2 sec	30 x 2 sec
2	Side Lunge	4 X 2 Sets	4 X 2 Sets	6 X 2 Sets	6 X 2 Sets	6 X 2 Sets	8 X 2 Sets	8 X 2 Sets	10 X 2 Sets
3	Ice Skater	4 X 2 Sets	4 X 2 Sets	6 X 2 Sets	6 X 2 Sets	6 X 2 Sets	8 X 2 Sets	8 X 2 Sets	10 X 2 Sets
4	Star Jump Squats	4 X 2 Sets	4 X 2 Sets	6 X 2 Sets	6 X 2 Sets	6 X Sets 2	8 X Sets 2	8 X Sets 2	10 X 2 Sets
5	Row – Hig Row	6 X 2 Sets	6 X 2 Sets	8 X 2 Sets	8 X 2 Sets	6 X Sets 2 High Row	6 X Sets 2 High Row	8 X Sets 2 High Row	8 X Sets 2 High Row
6	Lunge Jump	6 X 2 Sets	6 X 2 Sets	6 X 2 Sets	8 X 2 Sets	8 X 2 Sets	10 X 2 Sets	10 X 2 Sets	12 X 2 Sets
7	Susbended Crunch	4 X 2 Sets	4 X 2 Sets	6 X 2 Sets	6 X 2 Sets	6 X Sets 2	8 X Sets 2	8 X Sets 2	10 X 2 Sets
8	Sumo Squad	8 X 2 Sets	8 X 2 Sets	10 X 2 Sets	10 X 2 Sets	12 X 2 Sets	12 X 2 Sets	14 X 2 Sets	16 X 2 Sets
9	Side Plank	15 x 2 sec	15 x 2 sec	20 x 2 Sec	20 x 2 Sec	25 x 2 sec	25 x 2 Sec	35x 2 sec	40 x 2 sec
10	Susbended Lunge (Sağ – Sol Bacak)	For each leg 5x2 Sets	For each leg 5x2 Sets	For each leg 6x2 Sets	For each leg 6x2 Sets	For each leg 7x2 Sets	For each leg 7x2 Sets	For each leg 8x2 Sets	For each leg 10x2 Sets
11	Suspended Oblique Crunch	4 X 2 Sets	4 X 2 Sets	6 X 2 Sets	6 X 2 Sets	6 X Sets 2	8 X Sets 2	8 X Sets 2	10 X 2 Sets

The Analysis of Data: For the analysis, SPSS 22.0 program was used. And, while Wilcoxon Test was used to compare the measurement values of FPCG and TRXA between the pre-tests and post-tests within the groups, the Mann Whitney U test was used to compare the pre-tests and post-tests values between the groups.

Ethics Committee Approval: Ethics committee approval of the research was received from Van Yüzüncü Yıl University Social and Human Sciences Ethics Committee with the approval No. 2020/15-35.

RESULTS

Table 2. Comparison Of The Measurement Results Of Fpcg Between Pre-Test And Post-Test

Variants	Tests	X	Ss	Z	p
Height	Pre-Test	1,67	,080	-2,414	,016
	Post-Test	1,68	,077		
Body Weight	Pre-Test	55,86	12,134	-0,674	,500
	Post-Test	55,99	11,957		
BMI	Pre-Test	19,86	2,637	-1,540	,123
	Post-Test	19,62	2,479		
One-Legged Stance Test Right Leg	Pre-Test	70,45	20,518	-2,366	,018
	Post-Test	71,25	20,996		
One-Legged Stance Test Left Leg	Pre-Test	64,25	25,525	-2,240	,025
	Post-Test	65,89	24,520		
Standing Long Jump Both Legs	Pre-Test	212,22	21,516	-2,032	,042
	Post-Test	213,56	21,938		
Standing Long Jump Right Leg	Pre-Test	171,22	30,062	-2,375	,018
	Post-Test	173,44	29,691		
Standing Long Jump Left Leg	Pre-Test	177,11	25,384	-2,68	,007
	Post-Test	180,00	25,933		
Crunches	Pre-Test	26,78	6,099	-2,000	,046
	Post-Test	27,22	6,078		
Flexibility	Pre-Test	28,00	6,442	-1,890	,059
	Post-Test	28,56	6,635		
Arrowhead	Pre-Test	8,83	,469	-0,652	,515
	Post-Test	8,76	,479		
20 Yard Sprint	Pre-Test	4,07	,497	-2,041	,041
	Post-Test	4,05	,515		
Y-Balance Test Right Leg A	Pre-Test	72,00	5,000	-0,341	,733
	Post-Test	73,89	5,085		
Y-Balance Test Right Leg PM	Pre-Test	89,00	7,874	-1,902	,057
	Post-Test	92,33	8,986		
Y-Balance Test Right Leg PL	Pre-Test	85,33	6,538	-0,598	,550
	Post-Test	86,56	8,719		
Y-Balance Test Left Leg A	Pre-Test	70,78	4,494	-1,849	,064
	Post-Test	74,33	3,969		
Y-Balance Test Left Leg PM	Pre-Test	90,56	5,769	-0,119	,905
	Post-Test	91,33	7,550		
Y-Balance Test Left Leg PL	Pre-Test	87,33	4,950	-0,359	,720
	Post-Test	88,33	9,028		

** BMI, body mass index*

When Table 2 is examined, it is clearly seen that height, one-legged stance - right leg, one-legged stance - left leg, standing long jump - both legs, standing long jump - right foot, standing long jump - left foot, crunches and 20 yard sprint between pre-test and post-test values improved quite well statistically ($p<0.05$) for the football training group whereas body weight, BMI, flexibility, arrowhead, Y-Balance test - right leg A, right leg - PM, right leg - PL, left leg - A, left leg - PM and left leg - PL values did not show a statistically significant change ($p>0.05$).

Table 3. Comparison Of Measurement Results Of Trxa Between Pre-Tests And Post-Tests

Variants	Tests	X	Ss	Z	p
Height	Pre-Test	1,61	,065	-2,585	,010
	Post-Test	1,62	,060		
Body Weight	Pre-Test	47,39	8,191	-0,431	,667
	Post-Test	47,52	8,038		
BMI	Pre-Test	18,19	2,331	-2,666	,008
	Post-Test	17,97	2,256		
One-Legged Stance Test Right Leg	Pre-Test	73,83	25,154	-2,803	,005
	Post-Test	79,00	24,795		
One-Legged Stance Test Left Leg	Pre-Test	83,20	21,505	-2,803	,005
	Post-Test	86,36	21,455		
Standing Long Jump Both Legs	Pre-Test	189,70	17,764	-2,677	,007
	Post-Test	194,80	18,772		
Standing Long Jump Right Leg	Pre-Test	161,50	25,008	-2,807	,005
	Post-Test	173,30	26,479		
Standing Long Jump Left Leg	Pre-Test	157,10	22,437	-2,825	,005
	Post-Test	165,90	22,713		
Crunches	Pre-Test	25,90	7,249	-2,536	,011
	Post-Test	28,80	8,284		
Flexibility	Pre-Test	24,70	5,417	-2,536	,011
	Post-Test	28,10	4,358		
Arrowhead	Pre-Test	9,21	,407	-0,561	,575
	Post-Test	9,13	,393		
20m Sprint	Pre-Test	4,35	,290	-2,803	,005
	Post-Test	3,92	,500		
Y-Balance Test Right Leg A	Pre-Test	71,70	4,692	-1,612	,107
	Post-Test	73,30	5,187		
Y-Balance Test Right Leg PM	Pre-Test	88,40	6,703	-2,199	,028
	Post-Test	94,50	8,835		
Y-Balance Test Right Leg PL	Pre-Test	86,40	4,648	-1,797	,072
	Post-Test	89,80	7,131		
Y-Balance Test Left Leg A	Pre-Test	71,30	5,056	-1,474	,141
	Post-Test	73,50	6,916		
Y-Balance Test Left Leg PM	Pre-Test	88,60	5,168	-1,893	,058
	Post-Test	93,10	7,838		
Y-Balance Test Left Leg PL	Pre-Test	87,60	6,703	-1,532	,126
	Post-Test	91,50	7,044		

* *A, anterior; PM, posteromedial; PL, posterolateral*

When Table 3 is examined, it is seen in TRXA training group that height, BMI, one-legged stance - right leg, one-legged stance - left leg, standing long jump - both legs, standing long jump - right leg, standing long jump - left leg, crunches, flexibility, 20m sprint and Y-Balance test - right leg PM values showed statistically significant improvement ($p<0.05$) between pre-tests and post-tests unlike body weight, arrowhead, Y-Balance test - right leg, right leg pl, left leg, left leg pm and left leg pl values did not show a statistically significant change ($p>0.05$).

When the changes in the measurement results of FPCG and TRXA are analysed, it is seen that the improvements in TRXA group are at a higher level.It is seen that only body weight and arrowhead development of FPCG is higher than TRXA.

Table 4. The Comparison of Anthropometric Characteristics Pre-Test And Post-Test Measurement Results Of Fpcg And Trxa Between Groups

Variants	Group	X	Ss	U	P
Height Pre-Test	TRXA	1,61	,065	29,0	,190
	FPCG	1,67	,080		
Height Post-Test	TRXA	1,62	,060	25,5	,110
	FPCG	1,68	,077		
Body Weight Pre-Test	TRXA	47,39	8,191	27,0	,141
	FPCG	55,86	12,134		
Body Weight Post-Test	TRXA	47,52	8,038	25,0	,102
	FPCG	55,99	11,957		
BMI Pre-Test	TRXA	18,19	2,331	30,0	,221
	FPCG	19,86	2,637		
BMI Post-Test	TRXA	17,97	2,256	27,0	,142

* *BMI, body mass index*

When Table 4 is examined, it is seen that the height, body weight and BMI values of FPCG and TRXA groups did not differ statistically in the pre-tests and post-tests ($p>0.05$).

Table 5. The Comparison Of Strength, Crunches, Flexibility, Arrowhead, 20m Sprint Pre-Test And Post-Test Measurement Results Of Fpcg And Trxa Between Groups

Variants	Group	X	Ss	U	p
One-Legged Stance Test Right Pre-test	TRXA	73,83	25,154	42,0	,806
	FPCG	70,45	20,518		
One-Legged Stance Test Right Post-test	TRXA	79,00	24,795	38,0	,568
	FPCG	71,25	20,996		
One-Legged Stance Test Left Pre-test	TRXA	83,20	21,505	25,0	,102
	FPCG	64,25	25,525		
One-Legged Stance Test Left Post-test	TRXA	86,36	21,455	23,0	,072
	FPCG	65,89	24,520		
Standing Long Jump Both Legs Pre-test	TRXA	189,70	17,764	17,5	,025
	FPCG	212,22	21,516		
Standing Long Jump Both Legs Post-test	TRXA	194,80	18,772	22,5	,066
	FPCG	213,56	21,938		
Standing Long Jump Right Leg Pre-test	TRXA	161,50	25,008	34,0	,369
	FPCG	171,22	30,062		
Standing Long Jump Right Leg Post-test	TRXA	173,30	26,479	44,5	,967
	FPCG	173,44	29,691		
Standing Long Jump Left Leg Pre-test	TRXA	157,10	22,437	22,5	,066
	FPCG	177,11	25,384		
Standing Long Jump Left Leg Post-test	TRXA	165,90	22,713	30,0	,220
	FPCG	180,00	25,933		
Crunches Pre-test	TRXA	25,90	7,249	45,0	,999
	FPCG	26,78	6,099		
Crunches Post-test	TRXA	28,80	8,284	38,5	,594
	FPCG	27,22	6,078		
Flexibility Pre-test	TRXA	24,70	5,417	32,0	,285
	FPCG	28,00	6,442		
Flexibility Post-test	TRXA	28,10	4,358	40,0	,682
	FPCG	28,56	6,635		
Arrowhead Pre-test	TRXA	9,21	,407	18,0	,027
	FPCG	8,83	,469		
Arrowhead Post-test	TRXA	9,13	,393	25,5	,111
	FPCG	8,76	,479		
20m Sprint Pre-test	TRXA	4,35	,290	27,5	,153
	FPCG	4,07	,497		
20m Sprint Post-test	TRXA	3,92	,500	41,5	,775
	FPCG	4,05	,515		

When Table 5 is examined, it is seen that One-Legged Stance Test Right , One-Legged Stance Test Right , Standing Long Jump Both Legs , Standing Long Jump Right Leg , Standing Long Jump Left Leg , Crunches , Flexibility , 20m Sprint values of FPCG and TRXA did not indicate statistically significant difference in the pre-tests and post-test and post-tests ($p>0.05$), but the Arrowhead measurements statistically differed so much between the groups and the average of the TRXA was significantly higher ($p<0.05$). it is also seen that the Arrowhead values of the groups did not differ statistically at a significant level ($p>0.05$)

Table 6. The Comparison Of Y-Balance Test's Pre-Test And Post-Test Measurement Results Of Fpcg And Trxa Between Groups

Variants	Group	X	Ss	U	p
Y-Balance Test Right Leg A Pre-test	TRXA	71,70	4,692	41,0	,741
	FPCG	72,00	5,000		
Y-Balance Test Right Leg A Post-test	TRXA	73,30	5,187	41,0	,743
	FPCG	73,89	5,085		
Y-Balance Test Right Leg PM Pre-test	TRXA	88,40	6,703	44,5	,967
	FPCG	89,00	7,874		
Y-Balance Test Right Leg PM Post-test	TRXA	94,50	8,835	38,0	,567
	FPCG	92,33	8,986		
Y-Balance Test Right Leg PL Pre-test	TRXA	86,40	4,648	42,5	,836
	FPCG	85,33	6,538		
Y-Balance Test Right Leg PL Post-test	TRXA	89,80	7,131	31,0	,252
	FPCG	86,56	8,719		
Y-Balance Test Left Leg A Pre-test	TRXA	71,30	5,056	44,0	,935
	FPCG	70,78	4,494		
Y-Balance Test Left Leg A Post-test	TRXA	73,50	6,916	41,0	,742
	FPCG	74,33	3,969		
Y-Balance Test Left Leg PM Pre-test	TRXA	88,60	5,168	37,0	,509
	FPCG	90,56	5,769		
Y-Balance Test Left Leg PM Post-test	TRXA	93,10	7,838	38,5	,595
	FPCG	91,33	7,550		
Y-Balance Test Left Leg PL Pre-test	TRXA	87,60	6,703	41,0	,742
	FPCG	87,33	4,950		
Y-Balance Test Left Leg PL Post-test	TRXA	91,50	7,044	31,5	,269
	FPCG	88,33	9,028		

** A, anterior; PM, posteromedial; PL, posterolateral*

When Table 6 is examined, it is seen that there is no statistically significant difference in the pre-tests and post-tests ($p>0.05$) in terms of the Y-Balance Test Right Leg, Y-Balance Test Right Leg PM, Y-Balance Test Right Leg PL, Y-Balance Test Left Leg, Y-Balance Test Left Leg PM, Y-Balance Test Left Leg PL values of the FPCG and TRXA.

DISCUSSION AND CONCLUSION

When the effects of TRX trainings applied in our study during the 8 weeks of exercise period on the sportive performance of 13-15 years old male football players are compared with the statistical analysis, it is seen that the football players in TRXA group have a higher level of development compared to the players in FPCG. It was determined that only the body weight and agility (Arrowhead) development of FPCG were higher than TRXA.

Body mass index (BMI) is used to classify the obesity status of an individual or a group. The training lowers body fat rate. The decrease in body fat rate depends on the type and frequency of activity. (Zorba, 2001; Taş et al., 2011). Long and non-stop training activates the body's fat burning system. (Ergen, 2002). The type of performed exercise is related to many factors such as height, weight, age, and gender.

In a study conducted in 2016, the flexibility assessment was made with the Sit and Reach test. According to the results of the study, with 8 weeks of TRX training, flexibility, pre- and post-exercise averages were concluded statistically insignificant. (Smith et al 2016).

Because the average age of the subjects was high (40.1±13.5) in the study conducted by Smith and his friends, considering the negative effects of the age factor on flexibility, from this point of view it can be evaluated that why the flexibility values are statistically meaningless in the study. Again in 2016, in another study called as "Effect of TRX Suspension Training as A Prevention Program to Avoid the Shoulder Pain for Swimmers.", it resulted in that TRX workouts also improve flexibility and explosive strength. (Mohamed, 2016). It was first reported by Weis and his friends in 2010 that TRX exercises would stimulate the development of flexibility with a great increase. In studies conducted by Di Stefano, Janot and their friends in 2013, it was found out that TRX exercises increase the range of motion (ROM) and Sit and Reach Tests. (Di Stefano et al.; Janot et al., 2013).As it is mentioned above, there are studies that support and do not support the flexibility parameters of TRX training in terms of significance.

In our study, the assessment of flexibility and the Sit and Reach Test was conducted, and it was determined that in the intra-group comparisons of TRX Training Group (TRXA), the flexibility values did not change statistically significant at the $p<0.05$ level while $p>0.05$ did not show a statistically significant change in Football Players Control Group (FPCG). Also, no significant differences were found at the $p>0.05$ level in the intergroup comparisons of the flexibility values of TRX Training Group (TRXA) and Football Players Control Group (FPCG).

In this context, the insignificance of flexibility values found out in our study may be due to the fact that the program we applied was not implemented within the scope of a training program mainly aimed at flexibility. Mr. Atıcı and Mr. Bilgin stated that modified core workouts have a positive effect on flexibility parameters in Alzheimer's patients who are 55 years old and older. (Atıcı and Bilgin,2016). In 2016, the effect of suspension training on agility and strength performance in basketball players was investigated. During the study, TRX exercises were performed twice a week in addition to basketball training for 6 weeks. In the study where preliminary and final evaluations were made, Standing Long Jump test was used and a significant finding was found regarding ($p<0.05$) values in the study group. (Kınık, 2016).In our study, statistically significant differences were found at the $p<0.05$ level in terms of Standing Long Jump Both Legs, Standing Long Jump Right Leg and Standing Long Jump Left Leg values in the in-group comparisons of both the TRX Training Group and the Football Players Control Group.

In the comparisons between the groups, it was determined that Standing Long Jump Both Legs, Standing Long Jump Right Leg, and Standing Long Jump Left Leg values did not differ statistically ($p>0.05$) regarding the pre-tests and post-tests between the groups. In general, in many sources and studies, TRX exercises have been shown to have a positive effect on the performance development in sports branches. (Cortis et al., 2014).n another study conducted in 2010, It was concluded that these types of exercises are beneficial on throwing, jumping and balance parameters. (Sparkes and Behm, 2010). Mr. Akarcesme and Mr. Aktuğ concluded that the dynamic balance parameters were statistically significant, in their last measurements, in their study titled "Examination of the effect of 14-week volleyball-specific trainings on isokinetic knee muscle strength and dynamic balance performance and determining the relationship between isokinetic knee muscle strength and dynamic balance performance". (Akarçeşme and Aktuğ., 2014).In a study conducted by Parreira in 2013, he concluded that the low endurance rate of the hamstring and quadriceps muscles will negatively affect the balance. (Parreira, 2013).In another study conducted by Smith and his friends in 2016, by using One-Legged Stance Test (right or left leg), they observed that static balance increased after the 8-week program. According to Smith's findings, the duration of standing on one leg was found statistically significant with 7.9 seconds (Smith et al., 2016).In 2018, Mrs. Kılınç and his friends, in their study titled "Examination of the effects of swimming exercise and Thera-band exercises on dynamic and static balance in children aged 7-12 years", reached a statistically significant result in dynamic and static balance parameters in all of the balance tests they performed before and after exercises. (Kılınç, 2018).

In our study, in-group comparisons of the TRX Training Group (TRXA), it was found that One-Legged Stance Test Right, One-Legged Stance Test Left and Y-Balance Test Right Leg PM values improved statistically ($p<0,05$), yet Y-Balance Test Right Leg A, -Balance Test Right Leg PL, Y-Balance Test Left Leg A, Y-Balance Test Left Leg PM and Y-Balance Test Left Leg PL values did not show any statistically significant difference ($p>0.05$).In the intragroup comparison of the Football Players Control Group (FPCG), it was determined that One-Legged Stance Test Right and One-Legged Stance Test Left showed a statistically significant improvement. ($p<0.05$), but Y-Balance Test Right Leg A, Y-Balance Test Right Leg PM, Y-Balance Test Right Leg PL, Y-Balance Test Left Leg A, Y-Balance Test Left Leg PM and Y-Balance Test Left Leg PL values did not show any statistically significant difference ($p>0.05$).Moreover, there was no statistically significant difference found in the comparisons between the groups.In a study conducted by Doğan and his friends in 2016, it was concluded that 20m Sprint evaluation was significant ($p<0.05$). (Doğan et al., 2016). In another study conducted in 2016, 20m Sprint was found to be significant ($p<0.05$) in core trainings of female football players. (Taskin, 2016).As You can see, in our literature scan, there are studies that support and do not support the sprint parameters of TRX trainings in terms of significance.

In our study, there are statistically significant differences found at the $p<0.05$ level in the 20m Sprint values in the intragroup comparisons of the TRX Training Group (TRXA). Significant differences were found at the $p<0.05$ level in the in-group comparisons of the 20m Sprint values of the Football Players Control Group (FPCG). No statistically significant difference was faced at the $p>0.05$ level in the comparison of the 20m Sprint values between the groups.

Mr. Kınık used T Drill Test and Illinois Agility Test (IAT) to evaluate agility in his study titled “The effect of suspension training on agility and strength performance in elite basketball players” in 2016. He found the difference significant in the pre-test and post-test evaluations in the repeated measurement Anova Test, which he performed to determine the difference between the 6th week and 12th week measurements in the T Drill Test. On the other hand, Illinois Agility Test (IAT) was found insignificant, and he said that the reason for this was that the suspension training content they programmed was more suitable for strength development. (Kınık, 2016).

Agility consists of the ability to change direction, the ability to make decisions, and psychological and physical components. (Sheppard and Young, 2006; Hazır, 2010). In order to increase the agility performance, speed, strength, balance and coordination must act together. Sportive performance can be increased by agility-enhancing exercises and trainings that increase dynamic balance. (Karacabey, 2013). Functional exercises like TRX stimulate proprioceptive qualities in the hips, knees and torso. (Yaggie and Cambell, 2006; Tomljanović et al., 2011). Change of direction speed, technique, straight sprint reactive (elastic) strength, strength differences between the right and left legs and concentric muscle strength are the factors that determine the quality of the muscles of the lower extremity. (Yaggie and Cambell, 2006; Tomljanović et al., 2011). TRX exercises have a positive impact on the pelvic and core areas. (Bryne, 2014).In our study, we used the Arrowhead test, which is used to determine agility, especially in football players. And, in the in-group comparisons and intergroup comparisons of TRX Training Group (TRXA) and Football Players Control Group (FPCG), it is clearly seen that the Arrowhead values of the groups did not differ statistically at significant level ($p>0.05$).Smith and his friends used the Crunch Test to evaluate the endurance of the lumbopelvic hip complex in a study they conducted in 2016 and they evaluated that in the group performing TRX exercise, the crunch endurance improved with a 48% increase in the maximum crunch value at the end of 8 weeks. (Smith et al., 2016).

In our study, statistically significant differences were found at the p<0.05 level in the crunch values of both TRX Training Group (TRXA) and Football Players Control Group (FPCG) in the intra-group comparisons. In the intergroup comparisons of the crunch values of TRX Training Group (TRXA) and Football Players Control Group (FPCG), no significant differences were found at the p<0.05 level.In this study, when the crunch values of TRXA and FPCG were compared before and after the exercise, a statistically positive improvement was found between the averages.

As a result, When the changes in the measurement results of the TRX Training Group (TRXA) and Football Players Control Group (FPCG) are examined, it is seen that the developments in TRX Training Group (TRXA) are at a higher level. It is seen that only the body weight and Arrowhead development of Football Players Control Group (FPCG) is higher than TRX Training Group (TRXA)..

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