ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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The Effects of Functional Resistance TRX Suspension Trainings in the Development Group Basketball Players on Dynamic Balance Vertical Jump and Agility

Fonksiyonel Direnç TRX Süspansiyon Antrenmanlarının Gelişim Grubu Basketbol Oyuncularında Dinamik Denge Dikey Sıçrama ve Çeviklik Üzerine Etkileri

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ABSTRACT Objective: The purpose of this study was to investigate the effects of 8-week basketball trainings combined with suspension (TRX) trainings on balance, agility and vertical jump performance of developmental group basketball players. **Material and Methods:** Dynamic balance of the athletes were evaluated with star excursion balance test. Vertical jump test was done using contact mat (Newtest Powertime, Finland). In the T-test agility test, photocell and digital screen were used to determine the times. TRX Pro 4 suspension trainer equipment was used for suspension strength training applications. Twenty six male basketball players, with the age average of 12.89±0.28 volunteered in our study. The participants were randomly divided into 2 groups; one of which is control group (BASK) (n=13) and another as the experimental group (SUSP_BASK) (n=13). In addition to routine basketball trainings performed three times weekly, the players in SUSP_BASK group performed suspension strength training three times a week for 8 weeks. BASK group only performed the routine basketball trainings without any additional training. Vertical jump, balance and agility parameters were measured in the beginning and at the end of the study as initial test (T1) and final test (T2) along with anthropometric measurements. **Results:** SPSS version 18.00 was used in analysis and assessment of the collected data. Statistical significance level was set at $p<0.01$ and $p<0.05$. After 8 weeks, increases of ($p<0.01$), ($p<0.05$) significance level were respectively detected on the balance and vertical jump parameters of SUSP_BASK Group players. The difference on agility parameter was found to be insignificant ($p>0.05$). **Conclusion:** As a result, although 8-week basketball trainings combined with suspension trainings made significant differences on balance and vertical jump skill, the effect on agility was insignificant.

Keywords: Strength training; suspension training; basketball; vertical jump; star excursion balance test; agility T-test

ÖZET Amaç: Bu çalışmanın amacı, 8 haftalık süspansiyon (TRX) antrenmanları ile birleştirilmiş basketbol antrenmanlarının, gelişim grubu basketbolcularda denge, çeviklik ve dikey sıçrama performansları üzerine olan etkilerinin araştırılmasıydı. **Gereç ve Yöntemler:** Araştırmamızda, sporcuların dinamik dengesi yıldız denge testi ile değerlendirildi. Dikey sıçrama testi, kontakt mat (Newtest Powertime, Finlandiya) kullanılarak yapıldı. Süreleri belirlemek için T-test çeviklik testinde fotosel ve dijital ekran kullanıldı. Süspansiyon kuvvet antrenman uygulamaları için "TRX Pro 4 suspension trainer" ekipmanı kullanıldı. Çalışmamıza; yaş ortalaması 12,89±0,28 yıl olan, 26 erkek gönüllü basketbol oyuncusu dâhil oldu. Çalışmamıza katılan sporcular, kontrol grubu (BASK) (n=13) ve deney grubu (SUSP_BASK) (n=13) olmak üzere randomize şekilde ikiye ayrıldı. SUSP_BASK grubundaki sporcular, haftalık 3 gün olan rutin basketbol antrenmanlarına ek; 8 hafta, haftada 3 gün süspansiyon kuvvet antrenmanları uyguladı. BASK grubu ise haftada 3 gün olan basketbol antrenmanlarına devam etti ve bunun dışında ilave antrenman uygulamadı. Sporcuların antropometrik ölçümleri ile dikey sıçrama, denge ve çeviklik parametreleri çalışmanın başında, ön-test (T1) ve son-test (T2) olarak ölçüldü. **Bulgular:** Verilerin istatistiksel analizi ve değerlendirilmesinde SPSS versiyon 18.0 kullanıldı. İstatistiksel anlam değeri $p<0,01$ ile $p<0,05$ olarak kabul edildi. Sekiz hafta sonra SUSP_BASK grubundaki sporcuların, denge ve dikey sıçrama parametrelerinde sırasıyla ($p<0,01$), ($p<0,05$) anlamlılık düzeyinde artış bulundu. Çeviklik parametresindeki farkın ise istatistiksel olarak anlamlı olmadığı bulundu ($p>0,05$). **Sonuç:** Sekiz haftalık süspansiyon çalışmaları ile birleştirilmiş basketbol antrenmanları, denge ve dikey sıçrama yetisinde istatistiksel olarak anlamlı farklar oluştururken, çeviklik yetisine etkisi olmadığı belirlendi.

Anahtar Kelimeler: Kuvvet antrenmanı; süspansiyon antrenmanı; basketbol; dikey sıçrama; yıldız denge testi; çeviklik T-testi

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Suspension trainings are among the stabilization trainings and provides the person to exercise against his own body weight in a suspended position with belt and suspension ties that are hung up on a fixed point (such as ceiling or pull bar).[1] During the exercise one or both members of lower or upper extremity are supported with hand belts positioned on the ends of suspension cable which is the overhead connection point (such as ceiling or wall). The level of the exercise is adjusted via changing the work angle (taking the body closer to the ground) or adding balance equipments (swiss ball, bosu ball, wobble board, inflated disc etc.).[2] Suspension (TRX) trainings use the functional movements and dynamic positions for lower and upper extremity that requires person to proceed stabilisation. According to literature review; it has been demonstrated that the impaired stabilisation throughout the suspension trainings enhances the participance of motor unit, then forcing the muscle to work more in order to proceed the move. These exercises are performed simultaneously in order to develop strength, balance, flexibility and joint stabilisation. These multi-purpose exercises for whole body not only increase the strength, but also enhance the coordination, stabilisation and mobility in a short while.[3]

It has been found that most of the studies associated with the suspension strength trainings has been planned on muscle activations via electromyographic measurements.[1,2,4-10] Moreover, there are studies planned for different sport branches, and different age groups in which, the resistance are investigated, the physiological and metabolical effects have been researched, prevention of injury and rehabilitation program have been studied on body composition and some other biomotor skills for different training angles.[3,11-22]

When the conducted studies are reviewed, it has been seen that there are articles published on international journals planned with different purposes on suspension trainings in adults and elderly, there is a scarcity of studies that reveals the suspension trainings and its outcomes in puberty group. Moreover, the training duration of conducted studies is found to be insufficient to enhance the biomotor and support biomotor skills.[17]

The performance of basketball techniques accurately and fluently in an intended level can be provided via intermuscular and intramuscular coordination. Suspension trainings play an important role to enhance this coordination and to train the agility, balance and vertical jump that take place in all technical details of basketball. Thus, the purpose of the study is to investigate the effects of suspension strength trainings combined with basketball trainings that will be performed 3 times weekly and during 2 mesocycles (8 weeks) on developmental group basketball players. The hypothesis of the present study was set up as: Suspension strength trainings enhances the vertical jump, balance and agility parameters on developmental group basketball players.

MATERIAL AND METHODS

PARTICIPANTS

The procedures suggested by Beck were followed to calculate the adequate sample size a priori using the G*Power 3.196.[23] Thus, considering a power of 0.8, a significance level of 5% and an effect size (ES) of 1.01, it was found that 26 participants would be enough to provide 0.804 statistical power. Therefore, 26 male volunteers that are licensed basketball players with age average of 12.89±0.28 years, height average of 166.48±10.85 cm, weight average of 56.82±12.33 kg and training age average of 4.07±1.56 years participated in our study. Participants who volunteered in this study were playing the third basketball season. Detailed descriptive statistics of the participants are presented in Table 1. The participants were randomly divided into two groups: SUSP_BASK (experimental group) and BASK (control group). The inclusion criteria were; being male, in the age range of 12-14, performing regular basketball training at least for a year, training at least three times weekly, each training unit lasting ninety minutes, being an licenced basketball player, not having any disorder or disease associated with musculoskeletal or cardiovascular system, not having any injury that might cause restriction of movement within the last 6 months and not using any ergogenic support. The study was designed in accordance with the rules and principles of Helsinki Declaration and approved by the Ethics Committee of Ege University

(EGE.ETK.Date: 8/5/2018, Decree No: 18-5/24). The approval form for volunteering were filled by the participants and their parents.

ANTHROPOMETRIC MEASURES

The height of the participants were measured via metal height scale with the sensitivity of 1 mm mounted on the wall. The body weight of the participants were measured via electronic scale, when the participants had bare feet, wearing only t-shirt and shorts. The body mass index was calculated as kg/m². In order to be used in the normalisation of the balance test, the leg lengths of participants were measured on bare feet via measuring tape with the sensitiviy of 1 mm. Anterior and superior iliac crests on hips and medial malleolus crest on feet were taken as reference points.

EXERCISE PROTOCOL

The volunteers in the study were randomly divided into BASK and SUSP_BASK Groups. In order to obtain performance data, all the participants performed star excursion balance tests, T-tests of agility and vertical jump tests beginning and at the end of the study. The participants of BASK group kept on their regular basketball trainings without additional strength training. The participants of SUSP_BASK group performed 2-week familiarization phase prior to 8-week suspension strength training (Figure 1). Subsequent to familiarization process, the participants performed 24 session trainings, 3 times weekly with one day rest between each training, each of the unit trainings lasting for 25 min (Figure 1). Prior to suspension strength trainings, the participants of SUSP_BASK group went through warm-up protocol, including 5-min running in basketball field, 5-min warm-up drills for upper and lower extremity and 5-min dynamic stretching. In the first four week, the volunteers in SUSP_BASK group performed suspension strength trainings in which with the angular intensity of 60˚, the angle between the body and the ground. Standing upright position (90˚) was accepted as the starting position. In the latter four-week-period, the intensity increased 10˚. The volunteers in SUSP_BASK group performed suspension strength trainings in which with the angular intensity of 50˚, the angle between the body and the ground (Figure 1). After suspension strength trainings, the participants kept up with their regular basketball trainings.

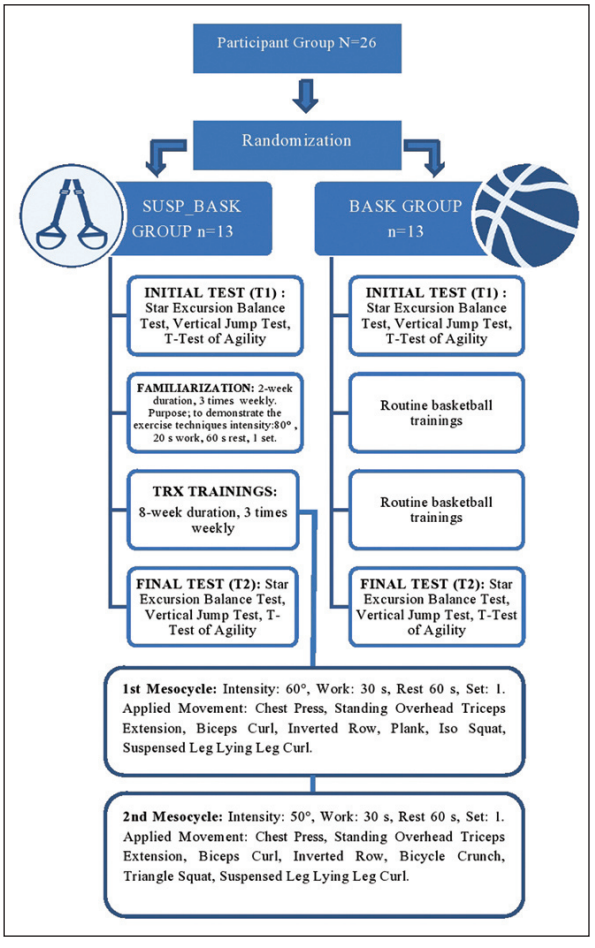

FIGURE 1: Flow chart.

STAR EXCURSION BALANCE TEST PROTOCOL

Each participant was allowed to have 6 test trials for each of eight aspects to minimize the effect of learning theory. Subsequent to 5-min rest period, the participants had 3 trials for each of the eight aspects, the averages of these 3 trials were recorded.[24] The rest period between the trials was 2 minutes.

It has been found that the leg length and the height were significantly associated with the reaching distance in most of the aspects. As leg length was the factor with the highest correlation, the reach distances of participants were normalised to leg length.[24] The obtained data were normalized with the formula of

[(Reach Distance/Leg Length)*100] for each participant. The normalized values were accepted as the percentage of the participant's reach distance.[25]

VERTICAL JUMP TEST PROTOCOL

Counter- movement jump mechanic was applied in the vertical jump test. In the study used Newtest Powertime-Finland brand wide measurement surface sensored mat and hand-held computer providing control based on the mat. The participants performed three vertical jumps and the best among the three was recorded.[26] The rest period between the trials was 2 minutes.

T-TEST OF AGILITY PROTOCOL

Through the implication of test, 4 agility cones, reflector photocell to measure time and a digital screen to measure time were used. The participants performed three trials and their best was recorded.[27] The rest period between the trials was 2 minutes.

STATISTICAL ANALYSIS

In order to investigate the outcomes of balance, agility and vertical jump in SUSP_BASK and BASK group, the accordance of the difference between initial and final test to normal distribution was assessed via Shapiro-Wilk test.

The previously obtained difference data between the initial test and final test were used in order to statistically assess the difference between two groups and the normality hypothesis was tested. In order to find out whether there's difference in terms of balance, agility and vertical jump between the groups; independent samples t-test and Mann-Whitney U test were used for normally distributed variables and non-normally distributed variables respectively. Levene test was used to investigate whether the varient homogenity hypothesis to agility value variation is provided according to groups. As it is $p>0.05$ in Levene test, the varient homogenity hypothesis was provided. SPSS 18.00 package program were used to analyse the data statistically. Cohen D was used for ES.[28] The ESs in Cohen were categorized as; 0-0.20 trivial, 0.20-0.50 small effect, 0.50-0.80 medium effect and $p>0.80$ as large effect.[29-31] Statistical significance level was set as $p<0.01$ and $p<0.05$.

TABLE 1: The descriptive statistics of participants.

	SUSP_BASK group (n=13)		BASK group (n=13)	
N=26	$\bar{X}$	SD	$\bar{X}$	SD
Age (Year)	12.95	0.25	12.82	0.29
Training age (Year)	4.23	1.54	3.92	1.58
Height (cms)	168.04	10.51	164.92	11.40
Weight (kg)	57.00	12.54	56.65	12.63
Body mass index	20.03	2.01	20.73	2.84
Right leg length (cms)	93.23	6.86	91.19	6.76
Left leg length (cms)	93.23	6.86	91.19	6.76

$\bar{X}$: Average; SD: Standard deviation; N: Total number of volunteers participated in the study; n: Total number of volunteers in the group; SUSP_BASK group: Experimental group; BASK group: Control group.

RESULTS

Shapiro-Wilk test was performed in order to detect whether the descriptive statistical variables were normally distributed. When the values of variation were examined; it was found that descriptive statistical variables were normally distributed as it is $p>0.05$ for all the variables (Table 1).

THE ANALYSIS OF STAR EXCURSION BALANCE TEST

The results of independent samples t-test and Mann-Whitney U test are applied for dynamic balance value variations are presented on Table 2. It was found out that there was increase of $p<0.01$ significance level in SUSP_BASK group which performed 8-week suspension strength training, in terms of medial ($p=0.001$, ES=1.11), posteromedial ($p=0.001$, ES=1.48), posterior ($p=0.001$, ES=1.49), posterolateral ($p=0.001$, ES=1.26) and anterolateral ($p=0.001$, ES=1.09) balance parameters for right leg, when compared to BASK group (Table 2). As presented in Table 2, since the significance level for left leg was $p<0.01$ for anteromedial ($p=0.009$, ES=0.78), anterolateral ($p=0.008$ ES=0.81), posterior ($p=0.001$, ES=1.38) and posteromedial ($p=0.001$, ES=3.61) balance parameters and $p<0.05$ for anterior ($p=0.011$, ES=0.76), medial ($p=0.044$, ES=0.59), posterolateral ($p=0.028$, ES=0.65) and lateral ($p=0.049$, ES=0.57) balance parameters for SUSP_BASK group which

TABLE 2: The results of independent samples t-test and Mann-Whitney U test with respect to variation of SUSP_BASK group and BASK group's balance parameters between the initial test and the final test.

	N=26	SUSP_BASK group variation between the initial test & final test (n=13)	BASK group variation between the initial test & final test (n=13)	Independent samples t-test			Mann-Whitney U test		
	Balance parameters	$\bar{X}$±SD	$\bar{X}$±SD	t value	p value	ES	U	p value	ES
Right leg	Anterior	2.62±1.16	2.22±7.21	0.200	0.843	0.05			
	Anteromedial	2.86±0.92	0.56±8.76	0.943	0.355	0.26			
	Medial	2.94±1.44	-3.71±5.79	4.021	0.001**	1.11			
	Posteromedial	4.03±1.13	-3.11±4.67	5.351	0.001**	1.48			
	Posterior	3.43±1.31	-3.79±4.67	5.368	0.001**	1.49			
	Posterolateral	1.73±0.37	-6.67±6.64	4.555	0.001**	1.26			
	Lateral	0.55±0.91	-3.85±10.35	1.525	0.140	0.42			
	Anterolateral	0.65±0.52	-6.31±6.32	3.958	0.001**	1.09			
Left leg	Anterior	2.68±0.57	-1.92±5.97	2.767	0.011*	0.76			
	Anterolateral	3.33±0.77	-1.04±5.34	2.918	0.008**	0.81			
	Lateral	0.48±0.75	-3.09±6.15	2.076	0.049*	0.57			
	Posterolateral	0.81±0.65	-3.23±6.18	2.341	0.028*	0.65			
	Posterior	2.63±1.30	-6.46±7.59				5.000	0.001**	1.38
	Posteromedial	3.26±3.36	-6.45±8.48				13.000	0.001**	3.61
	Medial	2.72±0.50	-1.15±6.52	2.131	0.044*	0.59			
	Anteromedial	1.60±1.61	-3.38±6.13	2.835	0.009**	0.78			

$\bar{X}$: Average; SD: Standard deviation; SUSP_BASK group: Experimental group; BASK group: Control group; N: Total number of volunteers participated in the study; n: Total number of volunteers in the group; ES: Effect size. **p<0.01; *p<0.05.

performed 8-week suspension strength training; a significant difference was observed when compared to BASK group.

As presented in Figure 2, all the parameters for right leg in BASK Group excluding anterior and anteromedial balance parameters are in tendency of de-

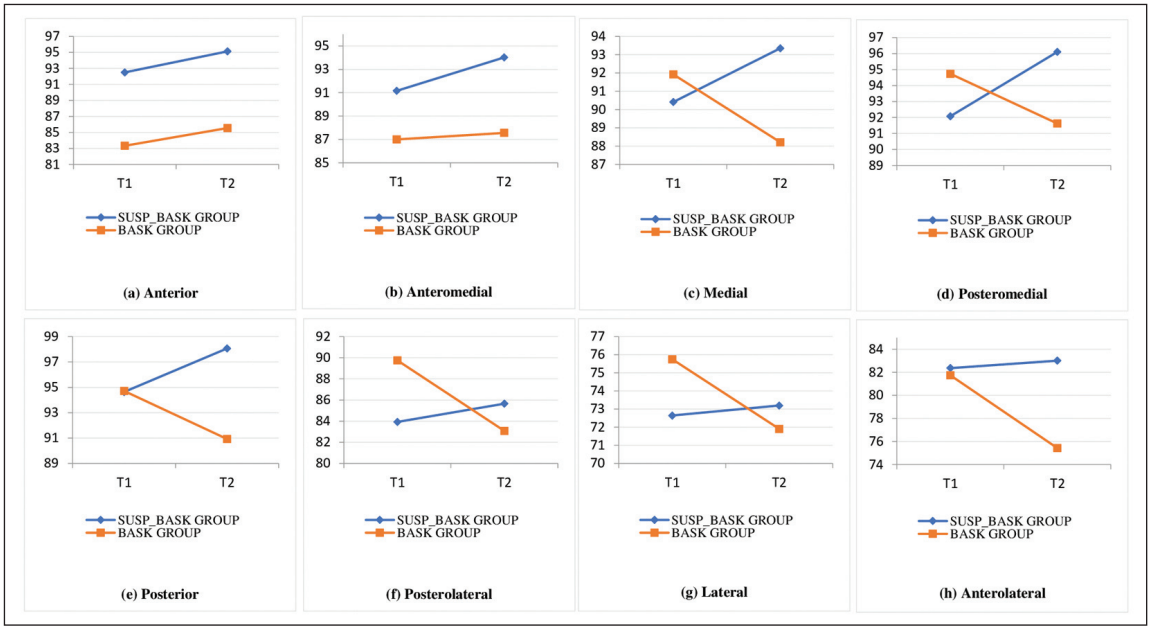

FIGURE 2: The line charts of the initial (T1) and final tests (T2) averages on right leg balance test variables in SuSP_BASK and BASK groups.

creasing. On the other hand, variable amounts of increase in all the reach aspects of right legs were observed in SUSP_BASK group ($p<0.01$-$p<0.05$). Thus, these outcomes revealed the effects of 8-week suspension strength training on right leg balance parameters.

When the improvement in right leg balance parameters between the initial test and final test of BASK group was examined; decreases in terms of all the balance parameters were seen in the final test when compared to the initial test (Figure 3). On the other hand, it was observed that all the balance parameters increased in SUSP_BASK group, proving that participating in 8-week suspension strength training increased the balance parameters in variable amounts ($p<0.01$-$p<0.05$).

THE ANALYSIS OF VERTICAL JUMP TEST AND T-TEST OF AGILITY

The results of independent samples t-test that is applied for agility value variations and Mann-Whitney U test that is applied for vertical jump test value variations are presented on Table 3.

According to Table 3, it is seen that 8-week suspension training made no statistical variation on agility values between 2 groups ($p=0.186$, ES=0.37), ($p>0.05$). As to variation on vertical jump value, it can be said that there had been an increase with ($p=0.022$, ES=11.25) $p<0.05$ between two groups.

As seen on Figure 4, it can be concluded that the agility parameter has regressed less in SUSP_BASK group, when compared to BASK group. Additionally,

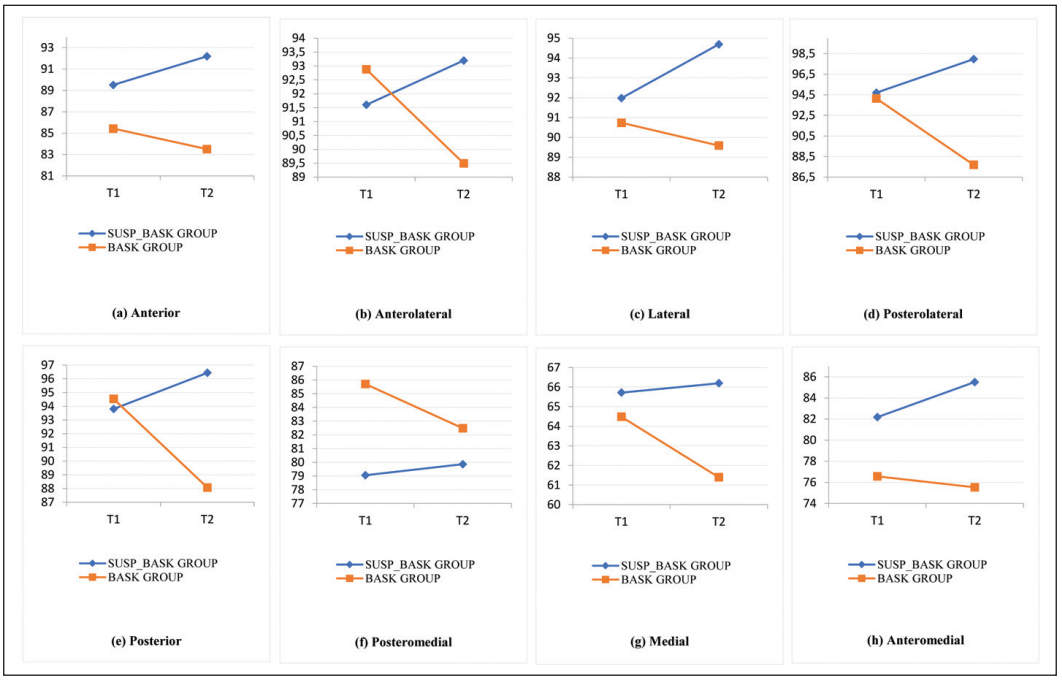

FIGURE 3: The line charts of the initial (T1) and final tests (T2) averages on right leg balance test variables in SUSP_BASK and BASK groups.

TABLE 3: The results of independent samples t-test and Mann-Whitney U test concerning the variations in agility and vertical jump values of SUSP_BASK and BASK group between the initial and final test.

N=26	SUSP_BASK group variation between initial test-final test (n=13) $\bar{X}$±SD	BASK group variation between initial test-final test (n=13) $\bar{X}$±SD	Independent samples t-test p value	ES	Mann-Whitney U test p value	ES
T-test of agility	0.19±0.51	0.44±0.41	0.186	0.37		
Vertical jump test	4.23±2.42	2.00±2.45			0.022*	11.25

$\bar{X}$: Average; SD: Standard deviation; SUSP_BASK: Experimental group; BASK: Control group; N: Total number of volunteers participated in the study; n: Total number of volunteers in the group; ES: Effect size. **p<0.01; *p<0.05.

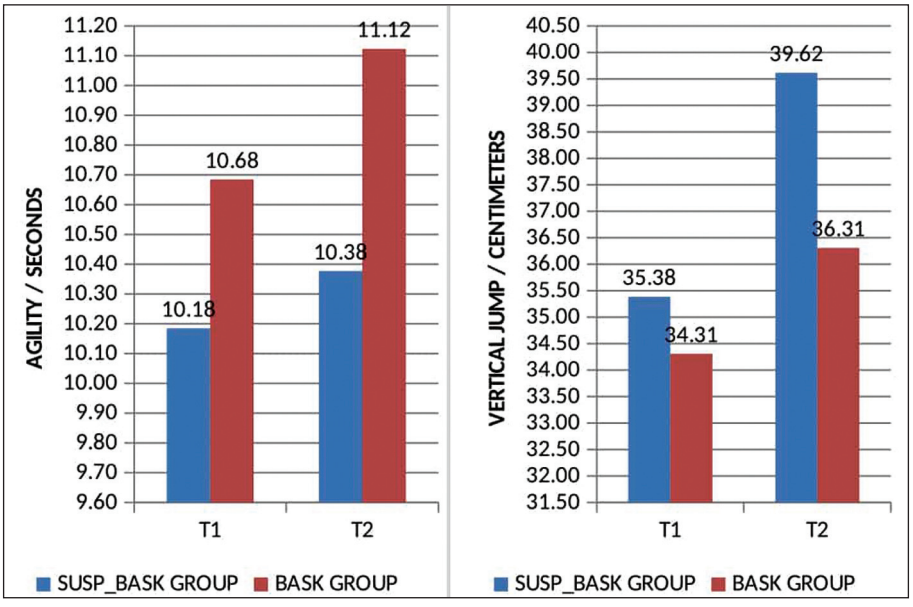

FIGURE 4: The column charts pertaining to the averages of agility and vertical jump variations belonging to the SUSP_BASK and BASK groups between the initial (T1) and final test (T2).

the vertical jump parameter belonging to the group which performed 8-week suspension strength training has dramatically increased.

DISCUSSION

The purpose of the current study was to investigate the effects of 8-week suspension (TRX) combined with basketball training on balance, agility and vertical jump performance belonging to developmental group basketball players. Thus, we designed our hypothesis on the idea that 8-week suspension training develops the balance, agility and vertical jump skills. basketball game includes patterns of movements in which the biomotor and auxillary motor skills requiring sudden attack or defense depending on acceleration, slowdown, rotation. These movements are performed in a restricted basketball court and requires acceleration, coordination and proper strength output.[31] These complicated movement mechanics of Basketball have led up the investigation about the effects of suspension trainings on the vertical jump, agility and balance performances.

When the studies concerning vertical jump in literature were reviewed, we encountered only with the ones which are designed for suspension training and its effect on vertical jump. Thus, the vertical jump data obtained in our study were compared to the data of resistance trainings that are performed on unstable grounds. In the study of Maté-Muñoz et al., the effects of conventional resistance trainings and resistance trainings on unstable ground on strength, power, movement speed and jumping skills in upper and lower extremities were investigated. Thirty six healthy sedentary men were divided into 3 groups. The first group performed conventional circuit resistance training, the second group performed circuit resistance training aiming at the same muscle groups with bosu and TRX on unstable ground conditions and the other group was the control group. The first two groups performed trainings three times weekly for 7 weeks.[21] In final tests performed subsequent to the application of training protocol, a significant increase on vertical jump skills belonging to the group performing resistance training on unstable ground conditions were reported ($p<0.001$).[21] These results are parallel with the data we obtained. In our study, the effects of 8-week suspension on vertical jump were examined and the vertical jump height was measured twice; as the initial and final tests. The vertical jump skills of the participants in SUSP_BASK group, performing suspension trainings showed a significant increase, when compared to BASK group ($p=0.022$, ES=11.25), ($p<0.05$).

When the studies concerning balance in the literature are reviewed, it was found out that the star excursion balance test performed in this study was used mostly in the studies on injury risks.[32-34] The other studies investigated the effects of strength or balance trainings on balance. Heitkamp et al. investigated the effects on strength or balance trainings on balance skills. The volunteers participating in the study were divided into two groups: balance training group (n=15) and strength training group (n=15). Single leg balance skill increased in balance training and strength training group with $p<0.01$ and $p<0.05$ significance level respectively; thus the group performing balance trainings showed a greater increase when compared to the group performing strength training.[35]

Our study investigated the effects of 8-week suspension training on dynamic balance, and significant ($p<0.01$) increase was observed in the SUSP-BASK group, in terms of medial, posteromedial, posterior, posterolateral and anterolateral balance parameters for right leg (Table 2). As the significance level of variation in terms of anteromedial, anterolateral, posterior and posteromedial balance parameters for left leg is $p<0.01$; and $p<0.05$ for anterior, medial, posterolateral and lateral balance parameters in SUSP_BASK, it can be said that a statistical difference was observed when compared to BASK group. We believe that compound TRX strength trainings performed on unstable conditions causes more motor units to work and to keep the stabilization, activates the synergist muscle groups more effectively; thus they have positive effects on balance parameters.

As to agility parameters, throughout our literature review concerning the effects of the resistance exercises performed on unstable ground, on the agility, we encountered a study that is conducted in 2011. In the forementioned study, mildly trained people within the age range of 22-25 were divided into two groups as conventional training and functional training groups. The groups performed training 3 times weekly during 5 weeks. Throughout this period, the variations in antropometry, jumping, agility and sprint skills were tracked.[19] In this study, conventional training group has performed training with free weight on the first session, and conducted training performing 4 different movements in 4 sets with 80% of 1 RM with 6-10 repetitions on the second session. Functional training group performed training of which intensity was determined by the participants, including 6 movements with 10-15 repetitions. TRX and other equipments that require stabilization were used in these trainings. At the end of this study where the agility parameter was assessed via hexagon Ag 5-10-5 test, a significant variation was reported on hexagon agility test results of functional training group $p<0.05$.[19] As a result of our study, it was found out that 8-week suspension strength training didn't bring statistically significant variation on the results of T-test of agility, ($p>0.05$). We believe the reason for that depends on either insufficient intensity of the performed training or the different characteristics of the test batteries that are used in both studies in order to assess the agility. Thus, no statistical difference was found out in Ag 5-10-5 test and the application of this test includes lateral accelarations that are similar to what we used in T-test, which we preferred to conduct in our study.

Further studies on strength trainings in unstable conditions (TRX) may cause variation in the values of agility parameters if more participants volunteer or the participants are above 13 years old or the angular intensity is more than 60° and 50° or if more training sessions are conducted.

CONCLUSION

Concludingly, in our study to investigate the effects of 8-week suspension trainings on vertical jump, agility and balance skills, we found out improvements in these parameters and our results have parallels with the results of the studies in literature, that are conducted with similar or different training methods. Our hypothesis proposing that suspension training improves vertical jump and balance skills are confirmed; however the hypothesis on improvement of agility skills was not confirmed. Thus, we concluded that suspension training doesn't significantly affect the agility skill. According to the obtained results, when the suspension trainings are properly designed in time ranges of unit trainings and macrocycles depending on age and sex, the addition

of suspension trainings into the conventional basketball trainings improves the balance and vertical jump parameters.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Onur Demirarar;* ***Design:*** *Onur Demirarar;* ***Control/Supervision:*** *Bahtiyar Özçıldıran;* ***Data Collection and/or Processing:*** *Onur Demirarar, Cansu Çoban;* ***Analysis and/or Interpretation:*** *Onur Demirarar, Cansu Çoban;* ***Literature Review:****Onur Demirarar, Merve Cin;* ***Writing the Article:*** *Onur Demirarar;* ***Critical Review:*** *Bahtiyar Özçıldıran, Merve Cin;* ***References and Fundings:*** *Onur Demirarar.*

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