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ORIGINAL RESEARCH

The Effect of TRX Suspension Training on Physical Capacity of Young Sedentaries

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Abstract

The aim of the study was to investigate the effect of of suspension training on speed, flexibility, jump and strength of sedertary young men. *Methods:* A total of 30 male, who do not do regular physical activity, volunteered to participate in this study. Participants' mean age, height and weight and standard deviation are 18.41±1.25 year, 170.83 ± 4.61 cm, 69.88 ± 3.17 kg, respectively. The participates were randomly divided into two groups as the Control Group (CG-n: 15) and the Total Resistance Exercises group (TRX-n: 15). TRX training protocols were applied to the participants as 8 weeks, 3 days/week, 45 minutes/day. All performance tests and training protocols in the study were applied in a synthetic floor gym with a temperature of 20-24°C for 8 weeks. Flexibility, strength (plank), speed (30 m) and vertical jump performances of the participants were evaluated before (pre-test) and after (post-test) the training. *Results:* In the post-test comparisons of the TRX group and the CG, no difference was found in the speed and vertical jump performances (p>,05). However, a significant difference was found in favor of the TRX group in flexibility and strenght performances (p<,05). *Conlusion*: 8 weeks of TRX suspension training is thought to improve physical performance in sedentary young men.

Keyword: Physical fitness, strength, suspension training, TRX.

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INTRODUCTION

Physical inactivity causes many diseases, especially heart diseases (Birinci et al., 2019). Exercise has many positive effects. These are hormonal, physiological and physical effects supported by studies (Paşaoğlu et al., 2019; Kirişçioğlu et al., 2019; Özdal et al., 2019; Özer et al., 2017; Vural et al., 2019). Despite these, people do not spare time for exercise. One of the most important reasons for not participating in physical activity is the inability to enjoy the activity. One possible way to increase the number of individuals participating in regular physical activity is to avoid traditional exercises and to participate in new methods that are easier to do and enjoy (Birinci et al., 2020; Smith et al., 2016). In addition to traditional methods, there are different methods such as bosu ball and pilates (Anderson & Behm, 2004; Santana et al., 2007). Total Resistance Exercises (TRX) has recently been added among these training models (Bettendorf, 2010; Gaetz et al., 2014).

TRX is a new type of exercise that has been increasingly used recently. Although it is performed using only body weight, it has been shown in studies that it improves strength, balance, flexibility and trunk stability at the same time. TRX uses the resistance created by the user's own body weight against gravity to create the physical stress necessary to develop and maintain health and fitness (Bettendorf, 2010; Çavlan, 2017; Dawes, 2017). TRX training is started to use for rehabilitation purposes by physiotherapists, athlete health clinics. It is also used in military unit training, sports halls, exercise studios and similar places. It is frequently used as a method by which professional and amateur athletes can apply a functional exercise method that they add to their training programs (Melrose & Dawes, 2015).

It allows movements to be performed in 3 different planes by using a band (Fitness Anywhere, LLC., 2011) In addition, it provides the opportunity to change the joint angles originating from the unstable plane and to adjust the intensity of the exercise (Melrose & Dawes, 2015). TRX has been reported to have a very functional structure that is used to improve strength, endurance, balance, coordination, flexibility and core stability (Wibowo & Fathir, 2017). When studies are examined, it has been determined that it increases coordination, maintains and improves posture, strengthens ligaments (Pastucha et al., 2012), and increases strength development (Carbonnier & Martinsson, 2012). In addition, it has been revealed that strength studies performed with TRX contribute to performance improvement and are also associated with health (Carbonnier & Martinsson, 2012; Pastucha et al., 2012).

TRX can be used almost anywhere by anyone, regardless of age, gender, education level, by diversifying exercise (Smith et al., 2016). According to the literature review we conducted, this training model, which is very new, focused on the elderly, professional athletes and rehabilitation studies (Mohamed, 2016). However, it is seen that the study examining the effect of TRX in sedentary individuals is quite limited. The aim of the study was to investigate the effect of suspension training on speed, flexibility, jump and strength of young sedanters.

METHOD

One week before the tests and training protocols started, the tests and training protocols to be applied in the study were introduced, the study was explained to each participant and the volunteer consent form was signed. Two days after the introductory week, the participants completed all the tests in the study at one-day intervals. During the tests and

training protocols, the participants were not involved in any other physical activity or training. Each of the participants was randomly divided into TRX group (TRX) and control group (CG). Speed, strength (plank), flexibility and vertical jump performances of the participants before (Pre-test) and after (Post-test) training protocol were determined. All performance tests and training protocols in the study were applied in a synthetic floor gym with a temperature of 20-24°C. Participants were encouraged to perform at their maximum during the tests. Participants were asked to maintain their normal dietary intake during the study, not to consume any ergogenic supplements and alcohol, and to maintain their sleep patterns. Participants stopped food intake (except water) 2 hours before testing and training. Before the tests, a general warming protocol lasting 15 minutes was applied to the participants. Flexibility, vertical jump, speed and strength tests were applied respectively after warming up. Two days after the pre-tests were completed, training protocols were applied to the participants as 8 weeks, 3 days / week, 45 minutes / day. During this period, the participants in the CG did not engage in any physical activity. The tests were repeated in the same way 2 days after the training protocols were completed.

Subject

Thirty male volunteers who do not do regular physical activity participated in our study. Participants' mean age, height and weight and standard deviation are 18.41±1.25 year, 170.83 ± 4.61 cm, 69.88 ± 3.17 kg, respectively. Participants were informed about the tests and training protocols.

TRX Protocol

5 different training programs with different exercises, repetitions and rest periods (Total Body, Core, Leg and Hip, Chest and Back, Arm and Shoulder) were planned for 8 weeks (Table 1). The angles that the participants could do a maximum of 10 repetitions in each movement were determined and they were made to do this in their training sessions while applying the movements according to the Vectorial resistance principle (Fitness Anywhere, LLC., 2011). In all exercise programs, 5 minutes of warm-up and 5 minutes of stretching exercises were performed at the beginning of each session. The training program and the applied movements are shown in Table 1 in detail.

Table 1. TRX Protocol

Week	Weekly Training Days (Number)	Training Time (min.)	Number of Sets	Number of Repetitions	Rest Between Sets (sec.)
1-8. Week	3	30	2	10	45
	Monday		**Wednesday**		**Friday**
Week 1	Total Body		Core Leg and Hip		Chest and Back Arm and Shoulder
Week 2	Arm and Shoulder Leg and Hip		Core Chest and Back		Total Body
Week 3	Arm and Shoulder Core		Leg and Hip Chest and Back		Total Body
Week 4	Total Body Core		Leg and Hip Arm and Shoulder		Chest and Back Stretching

Week 5	Chest and Back Leg and Hip	Total Body	Arm and Shoulder Core
Week 6	Arm and Shoulder Leg and Hip	Core Chest and Back	Total Body
Week 7	Total Body	Core Leg and Hip	Chest and Back Arm and Shoulder
Week 8	Chest and Back Leg and Hip	Total Body	Arm and Shoulder Core

Muscle Group	**Movements**	
Total Body	TRX Low Row TRX Triceps Press TRX Cycle Jump TRX Biceps Curl TRX Y Fly TRX Squat TRX Chest Press Mountain Climber TRX Lunge	TRX Hip Press TRX Hamstring Curl TRX Crunch TRX Side Plank TRX Chest Stretch TRX Half-Kneeling Hip Flexor Stretch TRX Low Back Stretch
Leg and Hip	TRX Hip Press TRX Hamstring Curl TRX Lunge	TRX Single Leg Squat TRX Cycle Jump TRX Squat
Core	TRX Resisted Torso Rotation TRX Crunch TRX Side Plank	TRX Pike TRX Mountain Climber TRX Leg Lowering
Arm and Shoulder	TRX Biceps Curl TRX Triceps Press TRX Y Fly	TRX Clutch Curl TRX Triceps Press Reverse Grip TRX W Fly
Chest and Back	TRX Chest Press TRX Clock Press TRX Chest Fly	TRX Low Row TRX Mıd Row TRX High Row

Performance Tests

Vertical Jumping

The vertical jump performance sensitivity of the participants was measured by using an electronic timing mat (Newtest Powertimer 300, Finland). It was measured 2 times, 30 seconds apart and the best scores were recorded (Alvurdu et al., 2019).

Speed Test

A wireless 2-door Sinar brand photocell device was used to measure the 30 meters speed of the participants. It was measured 2 times, 3 minutes apart, and the best scores were recorded (Topcu & Arabaci, 2017).

Sit-Reach Test

Sit-and-reach flexibility bench was used to measure flexibility. The participant sits on the floor and stretches his legs, rests his soles on the front face of the coffee table, stretches his arms as far as possible on the metric panel on the upper surface of the coffee table, and waits for two seconds at the last point where his toes touch. The last point touched on the metric panel is determined and saved. It was measured 2 times, 30 seconds apart and the best scores were saved in centimeters (Mihriay, 2020).

Strength Test (Plank Test)

While participants lying face down, only the elbows and toes were allowed to come into contact with the mat. The participant was asked to raise their torso from the ground. The test was terminated if they did not correct the position distortions in more than three seconds. The total time remaining in the appropriate position was used for analysis (Ünver et al,. 2020).

Statistical Analysis

SPSS 24 package program (Windows, Chicago, Illinois, USA) was used for data analysis. The distribution of normality was done by using the Shapiro Wilk test (p>,05). In group comparison dependent t test and between groups comparison independent t test was performed. The level of significance was determined as p <,05.

Results

Table 2. T-test results for dependent groups regarding the difference in pre-test and post-test scores of the TRX group

Test	N	X	SD	t	p
Pre-test Jump	15	34,47	6,77	-1,84	,086
Post-test Jump	15	36,20	7,41		
Pre-test Speed	15	4,56	,25	1,42	,178
Post-test Speed	15	4,54	,25		
Pre-test Flexibility	15	26,40	6,81	-7,31	**,000**
Post-test Flexibility	15	29,46	6,61		
Pre-test strength	15	135,60	69,40	-16,70	**,000**
Post-test strength	15	172,00	64,68		

When Table 2 is examined, no significant difference was found between the jump and speed test pre-test and post-test scores of the TRX group (p> .05). A significant difference was found between the flexibility and strength test pre-test and post-test scores of the group (t = -7.31, p <, 05; t = -16.70, p <, 05). While the average flexibility pre-test scores of the TRX group was 26.40, the average post-test scores were 29.46. While the average of power test pre-test scores is 135.60, the average of post-test scores is 172.00. The numerical difference between them was found significant in favor of the posttest scores. This finding can be interpreted as the training program applied to the TRX group improved the flexibility and strength parameters.

Table 3.T-test results for dependent groups regarding the difference in pre-post-test scores of the CG.

Test	N	X	SD	t	p
Pre-test Jump	15	35,07	7,46	-2,086	,056
Post-test Jump	15	35,60	7,51		
Pre-test Speed	15	4,67	,27	-,193	,849
Post-test Speed	15	4,68	,20		
Pre-test Flexibility	15	20,60	8,50	-,202	,843
Post-test Flexibility	15	20,67	8,31		
Pre-test strength	15	115,40	72,46	1,344	,200
Post-test strength	15	113,13	67,54		

When Table 3 is examined, there was no significant difference in jump, speed, flexibility and strength pre-post-test comparisons in the CG (p>, 05).

Table 4. Independent sample t test results regarding the difference in pre-test and post-test scores by groups

Test	Group	N	X	SD	t	p
Post-test Jump	TRX	15	36,20	7,41	,22	,827
	CG	15	35,60	7,51		
Post-test strength	TRX	15	172	64,69	2,43	**,021**
	CG	15	113,13	67,54		
Post-test Speed	TRX	15	4,54	,256	-1,36	,186
	CG	15	4,67	,267		
Post-test Flexibility	TRX	15	29,47	6,61	3,21	**,003**
	CG	15	20,67	8,31		

When Table 4 is examined, there is significant difference between strenght post-test scores between the groups in favor of the TRX group (t = 2,438, p <, 05). The average strenght post-test scores of the TRX group were 172.00, while the average post-test scores of the CG were 113.13. Flexibility test post-test scores between the groups showed a significant difference in favor of the TRX group (t = 3.209, p <, 05). While the flexibility post-test scores of the TRX group were 29.47, the CG post-test scores were 20.66. This finding can be interpreted as the experimental procedure applied to the TRX group improved the strength and flexibility parameters.

DISCUSSION

In this study, the effect of 8-week TRX training on flexibility, strength, speed and vertical jump in sedentary young men was investigated. In line with the findings, it was observed that those in the TRX group improved significantly in flexibility and strength data compared to the CG, while no difference was found between the groups in speed and

explosive power.

There are quite a limited number of studies investigating the effects of TRX on flexibility, jump, speed and power parameters in the literature. Smith et al. (2016) found that 8-week TRX suspension program implementation had no effect on flexibility performance. In our study, it was found that the TRX group showed better flexibility performance than the CG and there was a significant difference between them. It is seen that the average age of the subject group in the study is higher than the average age of the individuals in our study. It is known that the flexibility feature decreases as the age progresses. Therefore, it can be thought that the difference between studies is due to the average age.

Tomljanovic et al. (2011) compared the effects of a 5-week TRX with a 5-week traditional resistance exercise program. They found that the jump performance of the group doing the TRX exercise was significantly higher than the group that did traditional resistance exercise. Similarly, Şenol and Gulmez (2017) found a significant difference in the TRX group values when the vertical jump pre-test and post-test values were compared. Nalbant and Kınık (2018) found a positive effect on explosive force in a study in which they examined the effect of 6 weeks of exercise with 20 basketball players. In our study, no statistically significant difference was found in the vertical jump and speed performances between the groups. It can be thought that the different results among the studies resulted from the difference in exercise program, duration and physical levels of the subject groups.

When the studies are examined, it is seen that TRX training focuses more on the effect of posture and core stabilization. McGill et al. (2014) reports that the core stabilization muscles of TRX push-up positions are activated at the highest level. Byrne et al. (2014) examined muscle activation in the TRX and standard bridge position. It demonstrated that the instability presented in the TRX suspension system resulted in a significant increase in abdominal muscle group activation compared to the standard bridging group. Ghervan (2012) found that TRX training in professional athletes increased pull-up performance and contributed to development in the core region. Smith et al. (2016) found that TRX improved pull-up performance and endurance. The result we found in this study coincides with all the research findings examined. In all studies, it is shown that instability that occurs during exercise with TRX provides core muscle activation and as a result muscle development.

We believe that a broader study of the effectiveness of TRX exercises will contribute to science in improving the physical condition of individuals who are both healthy, disabled or in need of rehabilitation. As a result, it is tought that TRX training increase physical performance sedentary individuals.

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