

The effects of TRX exercises on the stabilizer muscles of women involved in recreational fitness

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Abstract

Objective of the study was to determine the degree of force impact of various TRX exercises on the stabilizer muscles of women involved in health fitness.

Methods and structure of the study. The experiment was conducted at the “Gravitation” fitness club, St. Petersburg. The study involved six women aged 38-45 years with different ratios of stabilizing muscle strength. Electrical activity was recorded in eight stabilizer muscles of the trunk and lower extremities while performing 17 common TRX exercises. Muscle electrical activity was recorded using the Delsys Trigno™ wireless system (Delsys Inc.). Using electromyography data, the strength developed by the muscles was indirectly assessed and TRX exercises were determined that had the greatest impact on individual stabilizer muscles.

Results and conclusions. Different directions and degrees of impact of TRX exercises on stabilizer muscles have been established. Complex impact exercises include “Diagonal twisting” and “Pica”, during which the relative electrical activity, characterizing the force developed, for the rectus and external oblique abdominal muscles, rectus femoris, trapezius and iliopsoas muscles ranges from 68.4% to 94.1%. The exercises that have the greatest selective impact include: for the rectus abdominis muscle – “Saw”, for the external oblique abdominal muscle – “Pike”, for the rectus femoris muscle – “Twisting”, for the biceps femoris muscle – “Plank on the back”, for the middle for the gluteal muscle – “Leg extension in a supine plank”, for the trapezius muscle – “Reverse plank”, for the iliopsoas muscle – “Pike”, for the quadratus lumborum muscle – “Side plank”. When performing these exercises, the relative electrical activity of the muscles is more than 80%. The obtained patterns must be taken into account when developing methods for correcting the physical fitness of women involved in health-improving fitness using TRX exercises.

Keywords: *fitness, TRX exercises, stabilizer muscles, electromyography.*

Introduction. The need to maintain an optimal level of vital activity shapes the need of the adult population for health-improving fitness classes. Among the entire list of fitness areas, one can highlight TRX training (TRX Suspension Training), which has become popular not only in the field of fitness, but also in sports activities (athletics, rowing, cross-country skiing, etc.) [2, 3, 8]. A distinctive feature of TRX classes is the use of special simulators - hanging loops of adjustable length, with the help of which the exercises are per-

formed. Varying the training load during TRX classes is carried out by changing the angle of the torso and the area of support. The main requirement for practitioners when performing TRX exercises is to maintain a “neutral” position of the torso from the head to the pelvis in the form of a straight line in various planes [9]. In this regard, TRX exercises influence the development of strength qualities of the stabilizer muscles (core muscles), the main function of which is to maintain a stable position of the pelvis, hips and spine [5].



An insufficient level of development of the strength of the stabilizer muscles provokes the appearance of destructive changes in the back area, which negatively affects the general condition of the human body [10]. This applies to all age groups involved in health fitness, including women of the 2nd period of adulthood, who make up a significant part of the contingent of fitness clubs.

Despite the attention of specialists to TRX training, it can be stated that at present the issue regarding the effect of TRX exercises on individual stabilizer muscles has not been sufficiently studied [1, 4]. As a rule, only a qualitative analysis of TRX exercises is performed from the perspective of functional anatomy. At the same time, it is necessary to obtain quantitative data on the degree of strength impact of TRX exercises on stabilizer muscles. In practice, it is not possible to directly determine the force developed by individual muscles, but indirectly assessing the differentiated strength effect of TRX exercises on stabilizer muscles becomes possible by analyzing their electrical activity.

Objective of the study was to determine the degree of forceful impact of various TRX exercises on the stabilizer muscles of women of the 2nd period of adulthood engaged in recreational fitness.

Methods and structure of the study. The experiment was carried out at the Gravitation fitness club,

St. Petersburg. Six women aged 38-45 years with 4 to 8 years of fitness experience took part in the study. The women were selected on the basis of preliminary testing, which allowed them to identify different variations in the ratio of stabilizer muscle strength, typical for those involved in recreational fitness [7].

Electrical activity of eight stabilizer muscles of the trunk and lower extremities was recorded while performing 17 common TRX exercises. Muscle electrical activity was recorded using the Delsys Trigno™ wireless system (Delsys Inc.). Periods of muscle activity were identified on electromyograms and the RMS indicator was determined, which makes it possible to indirectly assess the efforts being developed [6]. In order to compare the effects of different TRX exercises, the relative electrical activity of the stabilizer muscles was calculated. To do this, for each muscle the percentage of RMS values to their maximum value was calculated when performing all exercises. For each exercise, four cycles of movements or holding a static position for 15 s were analyzed.

Results of the study and discussion. The table shows the average values for the subjects of the relative electrical activity of the stabilizer muscles when performing TRX exercises. The names of the exercises are given in accordance with the terminology adopted in TRX training [9]. As can be seen from the table, the relative electrical activity and, ac-

Relative electrical activity of stabilizer muscles during TRX exercises, %

Exercise	Muscle							
	RA	OA	RF	BF	GM	TR	IL	QL
«Bend to the side»	24,3	54,6	12,2	12,9	28,5	35,7	24,6	57,8
«Diagonal Twist»	77,3	89,6	76,4	14,0	23,7	77,0	79,3	43,7
«Forearm Plank»	52,7	53,2	42,6	9,3	12,5	21,8	39,4	25,0
“Leg Raises in Forearm Plank”	40,3	38,5	65,0	9,0	56,9	26,7	57,2	37,0
«Saw»	82,1	57,5	54,7	11,4	14,0	27,3	50,8	33,1
«Pullover on the knees»	70,7	48,2	6,8	11,0	14,7	14,6	25,7	21,0
«Climber»	74,5	69,5	76,9	13,4	25,3	33,7	73,0	42,9
«Back plank»	8,2	6,0	6,6	96,6	52,7	48,0	18,0	50,4
“Leg spread in back plank”	10,3	7,9	10,8	43,7	91,6	59,2	63,6	60,1
«Side plank»	56,8	62,9	51,3	13,1	52,0	54,9	49,8	98,0
«Twisting»	69,4	87,4	97,8	11,9	19,7	37,1	87,5	43,1
«Reverse plank»	13,2	7,6	9,7	81,5	48,3	49,8	23,4	48,7
«Exit to reverse plank»	27,1	25,5	8,3	72,0	44,1	79,4	31,1	64,6
«Leg Curl Lying on Your Back»	11,5	7,1	7,8	92,2	36,6	47,9	29,2	47,9
«Glute Bridge»	10,6	8,8	6,9	77,9	40,7	64,6	33,0	49,9
«Pika»	76,7	94,1	68,4	11,2	26,5	75,7	92,1	46,3
«Palm Plank»	69,2	45,2	47,3	9,2	12,0	32,0	47,8	24,2

Note: RA - rectus abdominis muscle, OA - external oblique muscle, RF - rectus femoris muscle, BF - biceps femoris muscle, GM - middle gluteus muscle, TR - trapezius muscle, IL - ilio-lumbar muscle, QL - square muscle of the lower back. The largest values of the electrical activity of each muscle are highlighted.



cordingly, the force effect of TRX exercises on the stabilizer muscles differ significantly. Some of them have a complex effect on several muscles of the stabilizers of the trunk and lower extremities at once. These include "Diagonal Twisting" and "Peak". Other exercises, such as "Bending to the side", "Saw", "Pullover on the knees" and "Bending the legs lying on the back", mainly affect only one muscle, and the exercises "Plank on the forearms" and "Plank on the palms" have relatively little effect on the efforts developed by all muscles.

We can distinguish exercises that have a pronounced selective effect on individual stabilizer muscles, during which muscle activity reaches 80 percent or more of the maximum. For the rectus abdominis muscle it is "Saw"; for the external oblique abdominal muscle – "Pike", "Diagonal twist" and "Twist"; for the rectus femoris muscle – "Twisting"; for the biceps femoris muscle – "Spine plank", "Supine leg curl" and "Reverse plank"; for the gluteus medius muscle – "Leg extensions in the plank on the back"; for the trapezius muscle – "Exit to the reverse plank"; for the iliopsoas muscle – "Pike" and "Twisting"; for the quadratus lumborum muscle – "Side plank".

It should be noted that without obtaining quantitative data, the degree of impact of certain TRX exercises on stabilizer muscles is not so obvious. In particular, when performing the "Side Plank" exercise, the quadratus lumborum muscle turned out to be maximally loaded, but at the same time, the external oblique abdominal muscle and the iliopsoas muscle did not show high enough activity, as might be expected. There is reason to believe that unstable support on suspension loops leads to an increase or redistribution of the load on individual muscles.

Conclusions. The degree of forceful impact of various TRX exercises on the stabilizer muscles of women in the 2nd period of adulthood varies significantly. TRX exercises are divided into complex exercises and exercises that have an increased impact on individual stabilizer muscles. The focus of TRX exercises must be taken into account when developing a method for correcting the physical fitness of those engaged in recreational fitness.

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