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Comparison between Functional Training and Resistance Training for Balance.

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Abstract: *The decrease in some physical qualities is quite evident with aging and inactivity. So, training programs should include functional exercises in order to keep body's good functionality. The proprioceptive stimulation is an essential component for functional training, as a key figure on stabilization and maintenance of balance, which is one of the most important physical capability for quality of life. This study aimed to compare the balance assessment results of people who practice Functional Training and conventional Resistance Training. A 6 male and female volunteers sample for each group was used, aged 40-55 years old, who should had practiced the pre-ordered activity for at least 3 months. Specific Static and Recovered Balance assessments were applied for both groups. For the first one, time should last as long as possible, while for the second one, as short as possible. For static balance test, G1 had 27,05% better results than G2, and for recovered balance test, G1 had 45,55% better results than G2. Thus, we observed that the Functional Training Group had better responses for both tests. It seems that functional training method can be more efficient for balance, in comparison to resistance training method.*

Keywords: *Functional Training, Resistance Training, Balance.*

I. Introduction

Balance is one of the most important factors for quality of life, given that it's necessary, for all daily movements, to have static or dynamic balance, which depends on our effector organs' perception about space and other body parts, and position and strength/tension they should do for body movement, according to the internal and external forces. This perception is called proprioception. Tubino and Moreira [1] affirms that static balance is the one achieved in a specific stop position; dynamic balance is the one achieved in motion; recovered balance is the physical capability that explains the balance's recovery into some position. The first and third ones are assessed and compared by our study's physical tests.

Functional Training (FT) is a physical training method aiming to work the body functionally through exercises that simulate daily-living activities and sports gestures, or to supply the body needs of rebalancing, attempting to make human movement more efficient, preventing injuries and strengthening joints. FT isn't a new thing, because human functionality has always been a matter of survival [2]. In Greek mythology, full functionality was considered important for success in challenges. For performance improvements, Greek Olympic athletes used to develop instruments and methods of specific trainings. The same was made by the roman gladiators. However, over the years, sports in general and the expertise of coaches started to use techniques and methods of training differentially, fully focused on the specific sport gesture.

Currently, FT keeps its essence in being a physical training method aiming to improve health, performance or injuries prevention related-fitness. FT has the characteristic of converging human essential bio motor abilities, allowing more efficient movements. We observe today a lot of people with postural problems caused by several times-repeated movements or simply by bad posture, shortenings and muscle weakness, resulting from inactivity [3]. FT develops the capability of performing tasks often interfered or prevented by these shortenings, as it suggests a body stabilization before performing a movement, aiming for the muscle-joint balance, improving human body's functional capability.

Conventional Resistance-Training (RT), often called bodybuilding or strength-training, is one of the most efficient methods in body-mass gains and strengthening. It is a practical safe and a very popular activity, prescribed to any person without medical restrictions and indicated to some treatments after rehabilitations and medical conditions [4]. More traditionally used focused on isolated movements, with gains in strength and muscle work groups independently, RT generally uses a movement plan [5].

Proprioception is a key figure in joint stability [6]. This sensory property allows the sensorimotor system equalize the forces necessary to keep the joint in steady state. The proprioceptive sense involves muscles length, tendons tension, joints angles, deep pressure on the soles of the feet, and other acting forces. This sensory property is quite important for the body balance. Maintenance of body balance is a result of joint control of these segments and environment, mediated by the sensory information and the motor activity [6].

Daily living or sports activities implicates joint instability events, challenging postural balance. The joint stability is defined as the ability of a joint in returning to its original state after suffering a disturbance, countering the instability events [6].

The functional capacity of the human body is the ability to perform normal activities of daily life efficiently independently. Lack of physical activity and aging are two factors causing various systems and physical qualities deterioration that reduce the human body's functional capacity. Therefore, the practice of exercises can maintain or recover these qualities losses, essential for every human being, regardless of the stage of life in which he finds himself, restoring movement and body balance [5].

Thus, our study shows the need of prescribing functional exercises in order to a more beneficial training program not only in physical aspects but in the use of physical valences on daily life of those who practice it.

II. Method

Our study had a qualitative-comparative orientation, using direct documentation through exploratory field research with fitness assessments application. It was carried out in October, on two gyms, *Crossfit Funcional* and *Stimulus Academia*, located in the neighborhoods *Meireles* and *Joaquim Nabuco*, respectively, in the city of Fortaleza-CE, Brazil. The pre-selected population consisted of 20 non-athlete male and female volunteers, aged 40-55-years-old, in 2 groups of 10 individuals: Group 1 (G1) consisted of people who practiced noncompetitive FT for at least 3 months; Group 2 (G2) consists of people who practices RT also for at least 3 months.

According to the inclusion criteria, only 6 subjects from each group could definitely compose the sample. Both gyms were selected in order to facilitate the study for having some bonds with their professionals. Inclusion criteria were: being healthy, practicing only FT or RT for at least 3 months, aging 40-55 years-old and not being athlete. For each balance assessment, there were 3 tests, prevailing their best result. All volunteers signed an Informed Consent Form about the relevance of the research and all its stages, allowing any clarification, stating the duration of implementation. guaranteeing confidentiality and complete freedom of the individual to refuse participation or withdraw the consent at any stage of research without any penalty or prejudice to their care.

The assessment tests were: Carnaval's [7] "Airplane" static balance test (SB) and "*Amarelinha*" recovered balance test (RB). For SB assessment, the subject stays supported on only one of the lower limbs, with the other lower limb extended parallelly to the ground. The body stays parallel to the ground followed by the extended leg prolonging. The upper limbs must be 90º abducted, simulating an airplane image. With a chronometer, the time of sustaining in stable position is scored. For RB assessment, and adapted hopscotch is painted on the ground. The subject starts at its first square relying on one of the lower limbs, waiting for the test to begin, then must go all the outward journey and return jumping with one leg without losing balance (without stepping with the other member on the floor). In case of losing balance, the assessed must return to the first square. The time spent on the route is marked with a stopwatch. Each test was performed three times for each individual, producing data so that they could have their best results compared: the longest time for SB and the shortest time for RB.

III. Results

Volunteers' features are shown in Tables 1 and 2. Table 3 shows mean results for both groups.

Table 1. Results and individual features of G1

Subject	Gender	Age	Practice time	Balance Assessment	
				SB	RB
1	M	47	2 years and 3 months	2'32"59	18"17
2	M	45	2 years and 1 month	2'32"92	22"05
3	M	42	1 year and 1 month	1'15"90	*
4	F	40	3 months	1'24"78	20"25
5	F	40	1 year and 4 months	1'03"90	25"72
6	F	46	1 years and 4 months	1'14"16	23"25

* unable to complete the test

Table 2. Results and individual features of G1.

Subject	Gender	Age	Practice time	Balance Assessment	
				SB	RB
1	M	49	11 months	1'31"72	57"78
2	M	44	2 years and 6 months	1'00"92	19"89
3	M	41	1 year and 5 months	2'06"08	35"80
4	F	44	1 year and 11 months	40"68	*
5	F	42	1 year and 10 months	1'20"43	14"64
6	F	55	10 years	40"97	32"28

* unable to complete the test

Table 3. SB and RB arithmetic mean results of G1 and G2

Mean		
	SB	RB
G1	1'40"71	21"89
G2	1'13"47	32"8

In Table 4, we can see that SB's mean time of G2 is 27,05% shorter than G1's, and RB mean time of G2 is 46,55% longer than G1's.

Table 4. Differences between each group time

	SB	RB
G1	1'40"71	21"89
G2	1'13"47	32"8
Time difference	27"24	10"19
% Difference	27,05%	46,55%

IV. Discussion

Postural control depends on the sensory information available to trigger motor actions. There is a dependence correlation on proprioceptive organs, visual and vestibular system, forming the proprioceptive system. Many studies show that exercise programs that stimulate the proprioceptive sensory pathways can be used to improve the stability of the balance, reducing sports injuries [9] and elderly falls incidences [9].

We could observe that G1, whose participants trained strength functionally by proprioceptive stimuli, had greater levels for balance than G2, whose participants trained conventionally resistance exercises. Strength is a fundamental physical valence in order to have balance in the elderly stage, as shown by Pedro and Amorim [10]. However, Martins et al. [11] showed in their study a non-relation between muscular strength and balance in a younger population. Besides that, Bellew et al. *apud* Martins et al. [11] discussed that not-standing exercises, such as leg-press and knees extension, may not reflect in body stability improvements.

Martins et al. [11] say that it's important to note that proprioceptors, muscle spindle and Golgi tendon organs, are considered sensory organs that monitor the state of the musculoskeletal system. Thus, by training muscles, those organs are being trained and activated. Lemos [9] claims that, due to the reeducation promoted by protection reactions obtained through proprioceptive training, the person can improve balance recovery, easily returning to normal pivot shaft in a short time. Studies involving the proprioceptive stimulation in the elderly have confirmed the efficiency of the training that involves postural maintenance challenging exercises for gains in balance, decreasing falls propensity and improving quality of life [12,13]. Researches with athletes, such as the one by Holm et al. [7], show significant improvements in balance, especially in dynamic balance, for those ones who practiced proprioceptive training, and lower incidence of injuries during games. Kovacs et al, Malliou et al. and Sá and Pereira [7] and Mohammadi [9] applied a proprioceptive based-training in an athletes group, concluding that the group had a lower injuries incidence and significant improvements in balance.

As it's seen in some studies, training with exercises that challenge balance is clearly efficient for better motor responses under stress. However, more studies are needed specifically for the non-adult athlete population. There aren't enough studies about younger groups and their body balance maintenance. Mann et al. [14] reviewed 29 scientific articles about body balance and exercises, of which only 2 were about subjects within 18-24 years-old, and only 1 were with adults over 43 years-old. Even with a great difference between G1 and G2, this study had a small number of volunteers, not ideal for more conclusive findings. It is necessary to study this population with a larger number of subjects.

V. Final Considerations

FT has a distinct approach in training the individual for their daily-life needs, observing the usual movements and joint precariousness that weaken the movement and balance. Importantly, the balance, as many other bodily capabilities, has its decline with aging, and there is a need to maintain functional strength and body balance in order to achieve functional independence in the future.

By this study, we can consider that a physical training program requires exercises with proprioceptive stimulation to achieve better motor responses in various situations of imbalance, making the training really 'functional' regarding to body balance. We could observe that even younger active individuals have some balance deficiency. It explicit the need of upgrading some professionals to pay more attention to the prescription of such exercises. Ultimately, we found that FT method can be more efficient than conventional fitness methods for static and dynamic balance.

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