



## EDITORIAL

# Systematization of Functional Training Sessions to Benefit Physical Fitness for Daily Activities in Older People

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## Editorial

Tools applied today in the Functional Training (FT) have long been used in general fitness programs, but systematic use and scientific interest are recent phenomena. Thus, there are many methodological conflicts and divergences in the prescriptions of this method [1]. For example, some studies have associated FT with the use of instability in many exercises [2,3], while others use unstable bases in a small portion of training [4,5] or simply do not use [6,7]. Thus, there is still an absence of a systematic FT model in the studies available in the literature [1], and for this reason the objective of this editorial was to suggest a functional training protocol that can be tested and applied safely, as well as being effective in increasing performance in daily activities. The information in this manuscript can help guide a therapeutic approach capable of contributing effectively to the treatment of physical disabilities in older people.

In older people, a FT program should focus on improving physical function-related conditioning abilities. Therefore, the perfect manipulation of all the variables necessary to prescribe training combined with the selection of specific exercises is essential, in order to minimize adaptive competition (neuromuscular and/or metabolic) and maximize performance in daily activities. Moreover, when thought to promote multisystem adaptations in senile, it should be composed of multicomponent, multiplanar and multi-joint exercises, combined with acceleration, reduction and stabilization movements, performed at maximum concentric speed in movement patterns

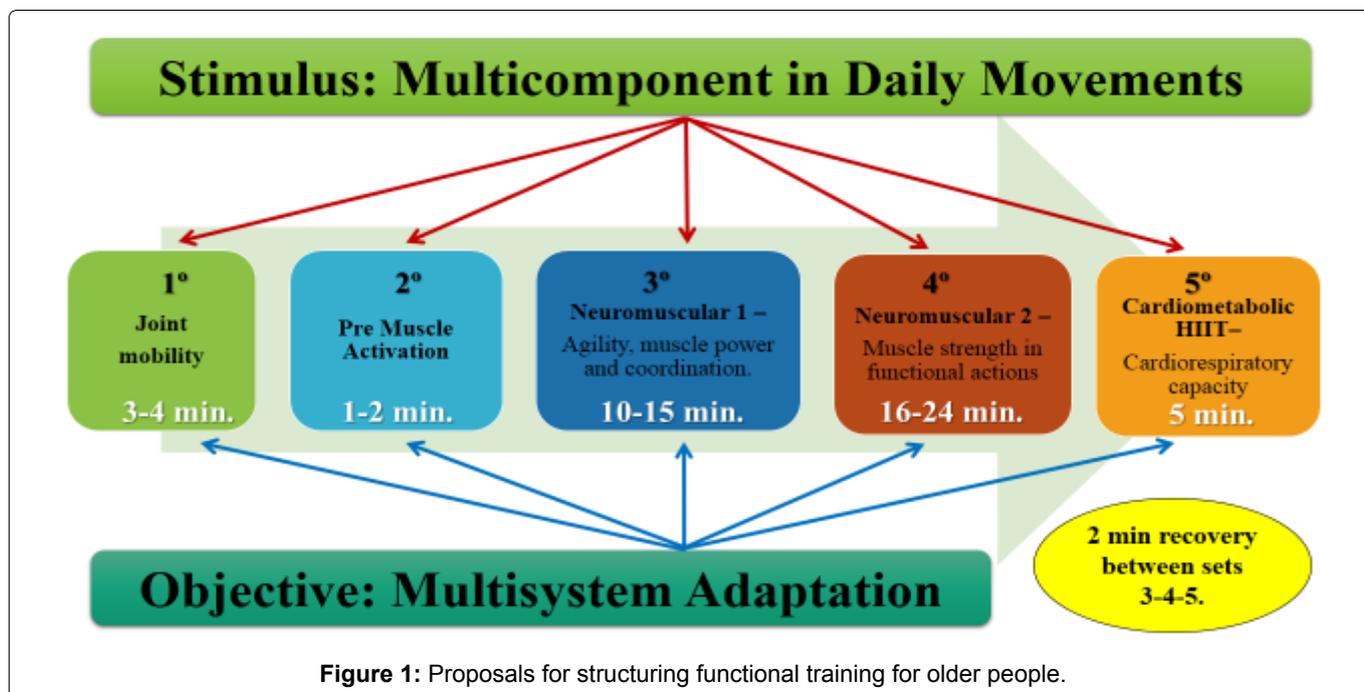
similar to those performed in daily activities [7].

The structure of the session in circuit form is essential to reduce fatigue and increase exercise variability. The circuits should consist of 5-10 stations, with strength and muscle power exercises for the main muscle actions, alternating the body segments. For each exercise, a range of 12-15 repetitions using moderate loads (approximately 40-60% of a maximum repetition) is suggested, progressing to 08-12 repetitions with heavier loads (approximately 75-85% of a maximum repetition) [8].

The elderly should be instructed to move quickly from one exercise to another (15-30 seconds of transition between stations), being advised to complete 2-3 passes in the circuit. However, this relationship between execution and rest, named as training density, should be handled from several factors, such as: Level of physical fitness, training phase, presence of pathologies and goals.

Training loads should progress according to the elderly ability and comfort level, and it is recommended to use specific exertion perception scales such as OMNI-GSE [9], which is used to control the overall training intensity, in which participants are instructed to choose a single score that will reflect their degree of fatigue during and after each training set, where zero represents no symptoms (very, very mild) and 10 represents maximum symptoms (very, very difficult).

The sessions should be divided into sets to adjust the intensity and volume for each component of



physical fitness to be stimulated (Figure 1), namely: (1) 5 min of mobility for the main joints involved in daily activity (ankle, hip and glenohumeral) and general warm-up exercises that include ten repetitions of squats and jumps; (2) 10-15 min of intermittent activities organized in circuit that should require mainly agility, coordination and muscle power (OMNI: 6-7); (3) 16-24 min of multi-joint exercises for lower and upper limbs, and with intense recruitment of spinal stabilizer muscles, also organized in a circuit (OMNI: 7-8); and (4) 5 min of intermittent activities (OMNI: 8-9) [7].

Next, we present an intervention model with particularities not yet popularized in the current literature:

### Set 1: Joint Mobility and Pre Muscle Activation (Time 5 Min)

The purpose of this exercise set is to prepare the musculoskeletal system for the stressful activities that will follow, through significant increases in range of motion and body stability.

Mobility exercises should be applied with emphasis on the main joints related to the functionality of the elderly, with 1-2 sets of eight seconds per exercise and 3-5 exercises per joint, in a total time of 3-4 min. Joint rotation movements are especially requested and are intended to increase the ability to perform movements at large joint amplitudes due to reduced joint stiffness, increased muscle temperature and decreased muscle spindle firing rate [10].

From a practical point of view, after performing mobility activities, muscle pre-activation exercises should be applied, with 1-2 sets of 12-20 repetitions on squats and jumps. The purpose is to improve body stability, provide muscle post-activation, stimulate the central

nervous system and prevent injury [11].

### Set 2: Neuromuscular 1 (Time 10-15 Min)

The aim of the present set is to optimize muscle activation, improve inter and intramuscular coordination, proprioception, balance, agility and cognition, through activities in circuit, which will primarily require muscle power in a set of complex motor systems [12,13].

The exercises should require a combination of acceleration, reduction, stabilization, force production and manipulation movements, always being performed at maximum concentric speed, with a motor complexity that can be performed by elderly. There should be a gradual progression, starting with two passages in the first weeks to three passages during the final phase of the program [7].

The stimulus/pause ratio (density) is suggested to start at a 1:1 ratio (e.g. 30 seconds of stimulation/30 seconds of pause) and to progress to 3:1 at the end of the program (45/15). Intensity should be progressive 5-7 on a perceived exertion scale or 40-60% reserve heart rate [8].

Following are suggestions for intensity progression and stimulus variation in five main activities:

#### Ball launches

From the 1<sup>st</sup>-12<sup>th</sup> session, horizontal throws should be made at the wall at maximum concentric speed. From the 13<sup>th</sup>-24<sup>th</sup> session, vertical throws should be performed as high as possible.

#### Displacements between cones

1<sup>st</sup>-12<sup>th</sup> session should be performed linear hazing. From the 13<sup>th</sup>-24<sup>th</sup> session lateral movements or jumps must be performed.

## Jumps platform (10 cm)

1<sup>st</sup>-12<sup>th</sup> session the step up and down activity should be performed. From the 13<sup>th</sup>-24<sup>th</sup> session, vertical jumps should be performed.

## Coordinating exercises on agility stairs

From the 1<sup>st</sup>-12<sup>th</sup> session, linear movements should be performed (entering and leaving the stairs). From the 13<sup>th</sup>-24<sup>th</sup> session lateral movements or jumps must be performed.

## Alternating waves (battle rope)

Alternate linear movements must be performed with stabilization of the shoulder girdle; every 12 sessions the length of the chord may be increased for intensity progression.

## Set 3: Neuromuscular 2 (Time 16-24 Min)

The purpose of this set is to develop strength, increase muscle mass and bone mineral density, reduce body fat, improve body stability and motor efficiency for daily activities through multi-joint exercise, which require intense activation of stabilizing muscles of the spine also performed in circuit form for lower and upper limbs, alternating these body segments [13].

The movements should be similar to the daily activities of the elderly, applying a combination of essential actions such as pulling, pushing, carrying objects, crouching and lifting, always performed at maximum concentric speed, with an executable motor complexity and following a gradual progression, starting with two passages in the first weeks to reach three passages during the final phase of the program [7].

Intensity in this set can be controlled by an effort and progressive scale (70-85% of a maximum repetition) by adding external load to the possible exercises (e.g. front kettlebell squats). In those performed with their own body weight (example: Pulling on suspended tape), modifications should be made according to the elderly's ability and comfort level, to maintain 08-12 submaximal repetitions, respecting a 1-2 second cadence in the phase concentric and 3-4 seconds in the eccentric. The loads should be increased with a self-reported grade 6 (easy) on the OMNI-GSE scale and/or with the number of repetitions performed until voluntary fatigue or inability to sustain quality of exercise, i.e. if the participant performs more than the maximum number of pre-set repetitions (> 12), a 5-15% increase in external load should be performed immediately at the next session [7].

Training density should start from 1/1 and progress to 3/1 at the end of the program. Following are suggestions for progression of intensity and variation of stimuli in eight main exercises:

## Kettlebell lifting

From the 1<sup>st</sup>-12<sup>th</sup> session, the exercise should be per-

formed with an external load of 12-16 kg. From the 13<sup>th</sup>-24<sup>th</sup> session, with 16-20 kg.

## Pulling with hanging tape

Four lines should be marked parallel to the hanging tape offset, with a distance of 20 centimeters (cm) between them. The overload will be given with the highest inclination of the body during the sessions.

## Sit and stand (40 cm bench)

1<sup>st</sup>-12<sup>th</sup> session, exercise should be performed with one's own body weight. From the 13<sup>th</sup>-24<sup>th</sup> session, holding at chest height an average external load of 5-10 kg.

## Push-ups (60 cm bench)

From the 1<sup>st</sup>-12<sup>th</sup> session, the exercise should be performed on a 60 cm bench. From the 13<sup>th</sup>-24<sup>th</sup> session, on a 40 cm bench.

## Farmers walk

From the 1<sup>st</sup>-12<sup>th</sup> session, the exercise should be performed with an external load of 8-12 kg. From 13<sup>th</sup>-24<sup>th</sup> to the session, with an external load of 12-16 kg.

## Rowing with elastic

Three lines should be demarcated parallel to the fixing point of the elastics, with the first line at a distance of 40 cm and between the others a distance of 20 cm. The overload will be given with the participant positioning in the most distant lines of the fixation point, causing greater tension in the elastic.

## Pelvis elevation

From the 1<sup>st</sup>-12<sup>th</sup> session, exercise should be performed with one's own body weight. From the 13<sup>th</sup>-24<sup>th</sup> session, a pedestal (10-15 cm) should be added to support the feet, increasing the range of motion.

## Front plank exercise

From the 1<sup>st</sup>-12<sup>th</sup> session, the exercise should be performed by resting your elbows on a 40 cm bench. From the 13<sup>th</sup>-24<sup>th</sup> session, it should be performed leaning on a pedestal (10-15 cm).

## Set 4: Cardiometabolic - High Intensity Interval Training (Time 5 Min)

The aim of this set is to increase  $VO_{2max}$  and the ability of skeletal muscle to resynthesize ATP by oxidative metabolism through intermittent high-intensity exercise [14] and cognitive stimuli in dual-task activities [15].

The elderly, following a gradual progression, should use collective activities with executable motor complexity. Density should start at a 1:2 ratio and progress to 2:1 at the end of the program. It is recommended not to exceed 30 seconds of stimulation, with an intensity equivalent to 8-9 on an effort perception scale [9] or 80-90% of reserve heart rate.

Following is a description of three activities that can meet these requirements:

### Interval running

Within 30 meters, groups of five participants should be separated. For each group, three participants formed a column behind a cone and the other two formed another column at a distance of 20 meters. The working time consisted of traveling this distance at top speed and recovery is taking place while other group members are sprinting. Total volume should be progressive 8-12 sprints per participant.

### Rope pulling competition

Using rope-training equipment, participants will be divided into two groups, distributed at the ends of the rope. Activity begins with the groups pulling the rope at full strength. This action of muscle strength will be used how work time. To achieve maximum effort within the estimated time, two coaches positioned in the middle of the rope are required to equalize forces between groups. The total volume is 4-8 10-second of efforts with 20 seconds of recovery.

### Classical aerobics

In this activity, the density is controlled by music bpm - high intensity (150-165 bpm) and low intensity (130-145 bpm). Rhythmic movements of executable complexity should be used, with slight displacements in the recovery phase and quick jumps or movements in the effort phase. The total volume should be five min.

It is noteworthy that the recommendations presented must be adapted to the physical conditions of each individual and are an update of the proposal of Functional Training for Older People, published by Resende-Neto, et al. [7], was elaborated according to the concepts presented by Stenger, et al. [16] and previously tested by Resende-Neto, et al. [17].

### References

- Liu C, Shiroy DM, Jones LY, Clar DO (2014) Systematic review of functional training on muscle strength, physical functioning, and activities of daily living in older adults. *Eur Rev Aging Phys Act* 11: 95-106.
- Pacheco MM, Teixeira LA, Franchini E, Takito MY (2013) Functional vs. Strength training in adults: specific needs define the best intervention. *Int J Sports Phys Ther* 8: 34-43.
- do Rosario JT, da Fonseca Martins NS, Peixinho CC, Oliveira LF (2017) Effects of Functional Training and Calf Stretching on Risk of Falls in Older People: A Pilot Study. *J Aging Phys Act* 25: 228-233.
- Weiss T, Kreitingner J, Wilde H, Wiora C, Steege M, et al. (2010) Effect of functional resistance training on muscular fitness outcomes in young adults. *J Exerc Sci Fit* 8: 113-122.
- Distefano LJ, Distefano MJ, Frank BS, Clark MA, Padua DA (2013) Comparison of integrated and isolated training on performance measures and neuromuscular control. *J Strength Cond Res* 27: 1083-1090.
- Lohne-Seiler H, Torstvei MK, Anderssen SA (2013) Traditional versus functional strength training: effects on muscle strength and power in the elderly. *J Aging Phys Act* 21: 51-70.
- Resende-Neto AG, Da Silva-Grigoletto ME, Santos MS (2016) Treinamento funcional para idosos: uma breve revisão. *R Bras Ci e Mov* 24: 167-177.
- Romero-Arenas S, Martínez-Pascual M, Alcaraz PE (2013) Impact of resistance circuit training on neuromuscular, cardiorespiratory and body composition adaptations in the elderly. *Aging Dis* 4: 256-263.
- Da Silva-Grigoletto ME, Viana-Montaner BH, Heredia J, Fernando MO, Pena G, et al. (2013) Validación de la escala de valoración subjetiva del esfuerzo OMNI-GSE para el control de la intensidad global en sesiones de objetivos múltiples en personas mayores. *Kronos* 12: 32-40.
- Sá MA, Matta TT, Carneiro SP, Araujo CO, Novaes JS, et al. (2016) Acute Effects of Different Methods of Stretching and Specific Warm-ups on Muscle Architecture and Strength Performance. *J Strength Cond Res* 30: 2324-2329.
- Gourgoulis V, Aggeloussis N, Kasimatis P, Mavromatis G, Garas A (2003) Effect of a submaximal half-squats warm-up program on vertical jumping ability. *J Strength Cond Res* 17: 342-344.
- Byrne C, Faure C, Keene DJ, Lamb SE (2016) Ageing, muscle power and physical function: a systematic review and implications for pragmatic training interventions. *Sports Med* 46: 1311-1332.
- Fragala MS, Cadore EL, Dorgo S, Izquierdo M, Kraemer WJ, et al. (2019) Resistance Training for Older Adults: Position Statement From the National Strength and Conditioning Association. *J Strength Cond Res* 33: 2019-2052.
- Milanović Z, Sporiš G, Weston M (2015) Effectiveness of high-intensity interval training (HIT) and continuous endurance training for vo2max improvements: a systematic review and meta-analysis of controlled trials. *Sports Med* 45: 1469-1481.
- Herold F, Törpel A, Schega L, Müller NG (2019) Functional and/or structural brain changes in response to resistance exercises and resistance training lead to cognitive improvements - a systematic review. *Eur Rev Aging Phys Act* 16: 10.
- Stenger L (2018) What is functional/neuromotor fitness? *ACSM's Health & Fitness Journal* 22: 35-43.
- Resende-Neto AG, Do Nascimento MA, De Sá CA, Ribeiro AS, Desantana JM, et al. (2019) Comparison between functional and traditional training exercises on joint mobility, determinants of walking and muscle strength in older women. *J Sports Med Phys Fitness* 59: 1659-1668.