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Original Articles

Functional, cardiorespiratory, psychosocial, hemodynamic and anthropometric parameters in functional training practitioners: a short-term longitudinal study

Parâmetros funcionais, cardiorrespiratórios, psicossociais, hemodinâmicos e antropométricos em praticantes de treinamento funcional: um estudo longitudinal de curto prazo

Parametros funcionales, cardiorrespiratorios, psicosociales, hemodinamicos y antropometricos en praticantes de entrenamiento funcional: un estudio longitudinal de curto plazo

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Keywords:
Functional training;
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ABSTRACT
To analyze the short-term behavior of functional, cardiorespiratory, psychosocial, hemodynamic and anthropometric outcomes of middle-aged women practicing Functional Training (FT). Women practicing FT were evaluated for health outcomes before and after 16 weeks of training. Participants showed significant improvements in waist circumference, waist-to-height ratio and abdominal resistance. Sixteen weeks of FT (three weekly sessions) provided improvements in waist circumference, waist-to-height ratio and abdominal resistance in healthy middle-aged women practicing the modality.

Palavras-chave:
Treinamento funcional;
Mulheres;
Exercício físico;
Saúde.

RESUMO
Analisar o comportamento de curto prazo de desfechos funcionais, cardiorrespiratórios, psicossociais, hemodinâmicos e antropométricos de mulheres de meia idade praticantes de Treinamento Funcional (TF). Mulheres praticantes de TF avaliadas em desfechos de saúde antes e após 16 semanas de treinamento. As participantes apresentaram melhoras significativas na circunferência de cintura, na relação cintura-estatura e na resistência abdominal. Dezesseis semanas de TF (três sessões semanais) proporcionaram melhoras na circunferência de cintura, na relação cintura-estatura e na resistência abdominal em mulheres saudáveis de meia idade praticantes da modalidade.

Palabras-clave:
Entrenamiento funcional;
Mujeres;
Ejercicio físico;
Salud.

RESUMEN
Analizar el comportamiento de curto plazo en desfechos funcionales, cardiorrespiratorios, psicosociales, hemodinámicos y antropométricos de mujeres de media edad practicantes de Entrenamiento Funcional (EF). Mujeres practicantes de EF evaluadas en desfechos de salud antes y después de 16 semanas de EF. Las participantes presentaron mejoras significativas en circunferencia de cintura, en relación cintura-estatura y en resistencia abdominal. 16 semanas de EF (tres secciones semanales) proporcionaran mejoras en circunferencia de cintura, en relación cintura-estatura y en resistencia abdominal en mujeres saludables de media edad practicantes de la modalidad.

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INTRODUCTION

Functional Training (FT) is a training modality based on activities, exercises, and movements considered functional, meaning that they have applicability and transfer effects to daily life and natural activities (Alleman et al., 2018). It is grounded on principles such as acceleration, stabilization, and deceleration, and aims to enhance movement skills, core strength, and neuromuscular efficiency (Silva-Grigoletto et al., 2014). FT promotes the synergistic, integrated, and balanced improvement of different physical capacities to ensure efficiency and safety during daily, occupational, and/or sporting tasks, mainly based on the principle of training specificity (Silva-Grigoletto et al., 2020).

Daily activities occupy approximately one-third of a person's daily time (Silva-Grigoletto et al., 2014), and regular moderate-intensity physical exercise is positively associated with the ability to perform them (Gomes et al., 2021). Therefore, training is applied considering the characteristics of daily activities and resembling various day-to-day situations, with body weight resistance and free weights, multiplanar and unstable exercises, with patterns such as squatting, pulling, pushing, and carrying.

This modality emphasizes both movement preparation and cardiorespiratory fitness. According to Silva-Grigoletto et al. (2020), because cardiorespiratory fitness is a general predictor of physical activity and influences several health parameters, FT sessions should aim to stimulate this capacity at levels higher than those typically observed in traditional strength training, provided that appropriate training intensity and rest intervals are applied.

Moreover, alternative training modalities, different from weight training and aerobic exercises on treadmills or cycle ergometers, are studied on a smaller scale despite gaining more participants. However, in practice, FT has been widely practiced by different populations, such as healthy populations, sports practitioners, university students, and even the older people (Feito et al., 2018; Boyle, 2016; Qu, 2022; Dias et al., 2023), leading people who do not fit into and do not adhere to traditional exercise programs offered by training centers to practice regularly.

Some studies have investigated functional training in different populations and for various outcomes. Regarding functional outcomes, Correa et al. (2022) proposed a 12-week functional training program in older women, observing reductions in pain, and increases in flexibility, lower limb strength, and cardiorespiratory capacity. Regarding cardiorespiratory outcomes, studies show that functional training, including high-intensity protocols, increases VO_{2max} and aerobic endurance in different populations (young adults, elderly women, and sedentary individuals) (Dashti et al., 2025; Menz et al., 2019; Posnakidis et al., 2022). For psychosocial outcomes, functional training programs promote improvements in quality of life (Rahimi Ahmad Baladi et al., 2021), reduce symptoms of anxiety and stress (Trujillo-Gutiérrez et al., 2025), and foster socialization, engagement, and autonomy, especially among older adults and people with clinical conditions (Delle Fave et al., 2018). In terms of hemodynamic outcomes, resistance and multicomponent training protocols significantly reduce systolic and diastolic blood pressure in older adults and individuals with hypertension or cardiovascular risk (Banks et al., 2024; Saraiva et al., 2024; Poli et al., 2025). Finally, for anthropometric outcomes, FT has been shown to reduce body weight, body mass index, waist and hip circumferences, as well as body fat percentage, in adolescents, adults, and the elderly, including overweight and obese individuals (Wang et al., 2024; Ameur et al., 2024; Forte et al., 2024).

Furthermore, FT can be easily and cheaply implemented in various health promotion spaces, such as health centers. However, this type of training often lacks systematization for the progression of exercises and training itself, which weakens it. Also, functional training can be a proposal that can be worked at high intensity and reduced training volume (Teixeira et al., 2016), relating to today's society, where lack of time is one of the barriers to regular physical exercise. In this sense, monitoring the practice of functional training in existing training models becomes important, different from studies with greater control of variables, to verify how participants respond to different health outcomes in a practice inserted in the fitness market, potentially verifying if, in the "real world" practice, what is observed in experimental studies on the subject also occurs.

This study aimed to analyze the short-term (four months) behavior of functional, cardiorespiratory, psychosocial, hemodynamic, and anthropometric outcomes of middle-aged women practicing functional training.

METHODS

STUDY DESIGN

This is an observational, short-term longitudinal study (16 weeks), part of a project titled "Alternative Training Modalities and Health (MALTS)," approved by the Ethics Committee of the Federal University of Santa Catarina (UFSC) under opinion No. 5.410.178 and CAAE No. 54371021.0.0000.0121.

PARTICIPANTS

The sample was selected non-probabilistically, by convenience, consisting of middle-aged women practicing functional training in a community in the city of Florianópolis/SC. All participants had been regularly engaged in functional training prior to the beginning of the study and continued their usual training routine throughout the 16-week follow-up period. Participation in the research was voluntary and conditioned to the signing of the Free and Informed Consent Term (FICT).

The physical education professional responsible for the functional training practice and the participants of the modality were contacted to present the research objectives and procedures, via email and in person. Evaluations were carried out at the training site, comprising an initial evaluation and an evaluation after 16 weeks of training, in April and August 2022, respectively. All interested and eligible participants were instructed to avoid physical exercise, alcoholic and caffeinated beverages 24 hours before the evaluations.

EXPERIMENTAL PROCEDURES

In the initial evaluation, sample characterization data were extracted, including sociodemographic data, health history, and physical activity history. Additionally, before and after 16 weeks of practice, hemodynamic, psychosocial, functional, and anthropometric parameters were evaluated in this order.

For hemodynamic parameters, heart rate (HR) and blood pressure (BP) were collected following the Brazilian Guidelines for Blood Pressure Measurement (Feitosa et al., 2024), using an OMRON device (model HEM 7122). Three measurements were taken with a 1-minute interval between each, adopting the average of the three measurements for BP and the value of the first measurement for HR (Feitosa et al., 2024).

Quality of life, sleep quality, and depressive symptoms were evaluated using the WHOQOL - bref questionnaire (World Health Organization Quality of Life) (Fleck et al., 2000), Pittsburgh scale (Buysse et al., 1989), and PHQ-9 (Patient Health Questionnaire-9) (Kroenke et al., 2001), respectively.

For anthropometry, body mass (Electronic scale, model PP 180, Marte®, with 100 g precision), height (Stadiometer, Alturaexata®, with 1 mm precision), and waist circumference (Flexible and inelastic tape measure, Cescorf®, with 1 mm precision) were considered. Waist circumference was measured in the region located between the last rib and the hip bone, considering the narrowest region of the abdomen. These data were used to determine Body Mass Index (BMI) and Waist-to-Height Ratio (WHtR).

Additionally, participants underwent three distinct physical tests: Flexibility, Abdominal Strength-Resistance, and Aerobic Fitness. Flexibility was assessed using the Sit and Reach test (Wells and Dillon, 1952) on the Wells bench. In this test, the participant, barefoot, sits with knees extended and feet supported on the base of the bench. Leaning forward, the goal is to reach the greatest possible distance on the ruler fixed to the bench. Each participant performed two attempts, with the highest value recorded.

To measure Abdominal Strength-Resistance, a variant of the Pollock and Wilmore (1993) protocol was adopted. During the evaluation, participants performed as many abdominal flexions as possible in one minute (FAb1). The initial position consisted of lying on the back, with knees bent, feet firmly on the ground, and arms crossed over the chest, performing abdominal flexion. The test adaptation aimed to avoid hip flexion, focusing only on the abdomen, to ensure greater safety for the evaluated. The repetition was considered valid only if the participant completely lifted the shoulder blades off the ground.

Finally, aerobic fitness was assessed by the six-minute step test, where participants performed as many step-ups and step-downs on a twenty-centimeter-high step as possible in six minutes. During the evaluation, the evaluator informed the elapsed time every minute. No additional incentives were offered to improve performance, aiming to ensure greater reliability in the results obtained (ATS, 2002; Dal Corso et al., 2007).

EXPOSURE – FUNCTIONAL TRAINING

Functional training was performed three times per week, with each session lasting 60 minutes. The sessions alternated between circuit and paired-set formats, rather than following a single model (more details on training formats are provided in Box 1). Importantly, each session followed only one of these formats. Each session was divided into a warm-up, main part, and cool-down with

Box 1. Examples of functional training class plans.

MODEL	EXERCISES	SERIES, STIMULUS DURATION, RECOVERY
Circuit	Squat	3 rounds
		60 s at each exercise station
		30 s rest between sets
	Burpee	2min rest between rounds of the circuit
	Rowing Abdominal	
	Jumping Rope	
	Hip Raise	
	Plank	
	UP & Down Steps	

s = seconds; min = minutes.
Source: the authors.

Box 1. Continued...

MODEL	EXERCISES	SERIES, STIMULUS DURATION, RECOVERY
Paired set	Station 1: Squat + dumbbell press Station 2: Abduction with elastic band + stationary running Station 3: Hip raise with feet on balance disc + climbing plank Station 4: Jumping jack + agility exercise with cones	3 sets 45 s on each exercise of the station 22 s of rest between exercises 2 min rest between the different stations

s = seconds; min = minutes.
Source: the authors.

stretching. Circuit-based sessions included seven to 14 exercises completed for three rounds. In the paired-set format, participants were divided into pairs; each pair performed one exercise for three sets, alternating efforts with their partner before moving to the next station. In both methodological formats, exercises were performed with stimuli ranging from 45 to 60 seconds, interspersed with recovery periods of 22 to 30 seconds, depending on stimulus duration. It is worth noting that the researchers did not interfere with the training performed, as the study aimed to describe the practical reality of the modality among participants.

STATISTICAL ANALYSIS

Continuous variables were tested for normality and homogeneity using the Shapiro-Wilk and Breusch-Pagan tests, respectively. Those classified as normal were described by mean and standard deviation and those classified as non-normal were described by median and interquartile range. Categorical variables were described by absolute frequency (sample number) and relative frequency (%). The significance index adopted was 0.05. The statistical test used to compare the outcomes between the two evaluation moments was the paired t-test. Additionally, effect sizes (Cohen's d for paired samples) were calculated to quantify the magnitude of the differences observed. The data was statistically processed using the R Commander statistical software (version 4.3.0).

RESULTS

Of the 12 participants in the functional training program, four were excluded because they did not take part in the second collection period, so eight participants were considered in this study. Their characterization data is described in Table 1.

It can be highlighted the exclusive presence of middle-aged women, primarily married, with complete high school education, practicing functional training for over a year, and who also practice walking at other times. The results of physical tests, psychosocial questionnaires, anthropometric data, and hemodynamic outcomes can be observed in Tables 2, 3, 4, and 5, respectively.

Table 1. Characteristics of the sample (n=8).

	Mean ± SD or n (%)
Age (years)	49.00 ± 6.50
Height (cm)	161.50 ± 3.47
BMI (kg/m^2)	24.49 ± 2.52
HTN	2 (25%)
Asthma	1 (12.5%)
Practice Time (months)	15.75 ± 6.36
Marital Status	
Married	5 (62.5%)
Divorced	1 (12.5%)
Single	2 (25%)
Education Level	
Complete Elementary	2 (25%)
Incomplete Elementary	1 (12.5%)
Complete High School	3 (37.5%)
Undergraduate	1 (12.5%)
Postgraduate	1 (12.5%)
Extra Physical Activity Practice	
Yes	6 (75%)
No	2 (25%)
Modality	
Walking	6 (100%)
Frequency	
1 a 2x per week	1 (16.7%)
3 a 4x per week	3 (50%)
>5x per week	2 (33.3%)

Data is described by mean and standard deviation and absolute and relative frequency; cm = centimeters; kg = kilograms; BMI = Body Mass Index; kg/m^2 = kilograms per square meter; HTN = Systemic Arterial Hypertension.

Regarding physical tests, good values and maintenance of these in flexibility and cardiorespiratory fitness can be highlighted, in addition to the increase in abdominal resistance (p=0.031). Regarding anthropometric data, there was a slight increase in mass and BMI, but without significant statistical difference, a decrease in waist circumference (p=0.001) and waist-to-height ratio

Table 2. Physical tests (n=8).

Outcomes	Baseline	16 weeks	p	Effect size (d)
Flexibility (cm)	21.88 ± 11,10	23.42 ± 9.94	0.100	0.146
Abdominal Resistance	38.25 ± 5.31	50.37 ± 11.50	0.031	1.354
Aerobic Fitness (number of step-ups)	179.62 ± 13.94	187.50 ± 18.19	0.129	0.486

Data is described by mean and standard deviation. cm = centimeters.
Source: the authors.

Table 3. Psychosocial outcomes (n=8).

Outcomes	Baseline	16 weeks	p	Effect size (d)
Sleep Quality	4.50 ± 2.67	5.87 ± 3.72	0.218	0.350
Depressive Symptoms	5.37 ± 4.62	6.57 ± 5.22	0.061	0.244
Quality of Life				
Physical Domain	77.85 ± 12.70	77,50 ± 10.46	0.513	-0.033
Psychological Domain	76.33 ± 4.84		0.554	-0.161
Social Relationships	75.00 ± 19.81	74.20 ± 7.69	>0.999	0.146
Environment	70.57 ± 13.32	77.83 ± 18.95	0.621	-0.021
General Perception	75.00 ± 14.43	70.33 ± 7.65	0.363	0.606
Health Satisfaction	71.42 ± 30.37	83.33 ± 12.90 66.66 ± 20.41	0.363	-0.181

Data is described by mean and standard deviation.
Source: the authors.

Table 4. Anthropometry (n=8).

Outcomes	Baseline	16 weeks	p	Effect size (d)
Body Mass (kg)	66.48 ± 7.97	67.63 ± 8.08	0.063	0.143
BMI (kg/m^2)	25.30 ± 2.52	25.54 ± 2.61	0.427	0.094
Waist Circumference (cm)	81.83 ± 5.67	77.37 ± 6.16	0.001	-0.752
WHtR	0.50 ± 0.03	0.47 ± 0.04	0.003	-0.785

Data described by mean and standard deviation; BMI = Body Mass Index; kg = kilograms; kg/m^2 = kilograms per square meter; cm = centimeters; WHtR = Waist-to-Height Ratio.
Source: the authors.

Table 5. Hemodynamic Outcomes (N=8)

Outcomes	Baseline	16 weeks	p	Effect size (d)
Systolic Blood Pressure (mmHg)	122.37 ± 7.76	122.37 ± 11.53	>0.999	0.000
Diastolic Blood Pressure (mmHg)	72.00 ± 6.09	72.87 ± 8.59	0.637	0.117
Heart Rate (bpm)	69.87 ± 11.05	69.37 ± 7.90	0.848	-0.052

Data is described by mean and standard deviation. mmHg = millimeters of mercury; bpm = beats per minute.
Source: the authors.

(p=0.003). Hemodynamic outcomes showed no difference, with good results in both evaluation moments. Finally, there was the maintenance of psychosocial outcomes, which were already considered adequate.

DISCUSSION

The results demonstrated that in the analysis of 16 weeks of functional training with a weekly frequency of three times in active middle-aged women, there were significant improvements in waist circumference, waist-to-height ratio, and abdominal resistance, as well as maintenance of heart rate, blood pressure, BMI, and body mass values. Additionally, in other outcomes, there were slight improvements, although not significant, such as cardiorespiratory fitness and flexibility.

Regarding the significant results found for waist circumference and abdominal resistance, these denote

that even after more than a year of functional training practice, the practitioners are still responsive to these variables. The abdominal strength-resistance test showed an improvement of 31.68%, while the reduction in waist circumference represented a change to a value below 80 cm, which is associated with a lower risk for the development of Non-Communicable Chronic Diseases (Grossl et al., 2010). The above results and the anthropometric results, such as the maintenance of BMI and body mass, suggest a possible reduction in overall body fat and, mainly, visceral fat and a slight increase in lean mass.

Such changes can be explained by specific exercises for the Core region and the aerobic component, related to functional training or unsupervised physical activities, such as the walks performed by the participants, as the aerobic component is related to improvements in anthropometric outcomes, such as waist circumference (Oliveira et al., 2022). And, due to the total weekly minutes (180 min) of functional training practice, which approaches the time of moderate physical exercise for changes in body composition, of 200 minutes, and the high intensity of functional training that can produce good results in body fat (Netto and Aptekmann, 2016). Finally, the reduction in waist-to-height ratio, from a loss of visceral fat, without impact on overall mass, has significant clinical relevance.

Regarding the other results that showed stability, heart rate, blood pressure, flexibility, and cardiorespiratory fitness showed good values in both collection moments, both for physical exercise practice and for health in general, as already evidenced by the literature (Fachineto et al., 2016; Feito et al., 2018; Silva-Grigoletto et al., 2020). Additionally, the maintenance of these outcomes in a population with declines due to age is positive, considering that being middle-aged and later in old age can lead to a gradual reduction in the capacities of various organic systems, such as loss of muscle strength, decreased functional capacity, and aerobic resistance (Fachineto et al., 2016). Furthermore, the verification that, in several outcomes, the pre-values were good allows speculating that the practice time of these participants is a highlight factor for maintaining these values in good or excellent classification ranges.

The stability of physiological and functional outcomes in our sample should be interpreted with caution. Given participants' prior training experience and their relatively high baseline values, the absence of further improvements may suggest the presence of a ceiling effect, as additional gains tend to be harder to detect in individuals who are already physically fit. This remains, however, a hypothetical interpretation, since our study design does not allow the confirmation of a true ceiling effect. Nonetheless, similar patterns have been reported in the literature; for example, Rodrigues et al. (2021) observed ceiling effects in agility and cardiorespiratory capacity among older physically active women.

For psychosocial outcomes, it was found that sleep quality and depressive symptoms did not show significant improvements, even showing a slight increase in average values from baseline to sixteen weeks. Although the functional tests showed important changes for the clinical profile, there was no difference in the participants' perception of the physical domain from the quality-of-life questionnaire. However, in general perception, there was an improvement from baseline to sixteen weeks, although not significant. These results may be explained by the fact that participants already presented favorable baseline values, which reduced the possibility of detecting additional improvements. It is also important to note that psychosocial measures are influenced by many factors beyond physical exercise, including work demands, family responsibilities, and daily stress, which were not controlled in this study. Even with a sixteen-week intervention, these external variables may have contributed to the maintenance of the outcomes. In this context, the stability of psychosocial measures in a middle-aged population, in which declines are usually expected, can still be interpreted as a positive finding.

Additionally, the maintenance of psychosocial results may be related to the previous sense of belonging of the participants, as they already practiced the collective modality before this study (15.75 ± 6.36 months) and for being all residents of the same territory, sharing common characteristics in their way of living (Bavoso et al., 2017). The fact that depressive symptoms showed a slight increase, although not significant, denotes that in their lives, participants may present psychosocial difficulties, such as discouragement and little interest in doing things. However, they seek in the functional training group a place to take care of their health and stay active, which can contribute to their mental health at that moment, demonstrated by adherence to classes and practice time. One possible explanation for the maintenance of psychosocial variables, rather than their improvement, is that for this group of already trained women, higher doses of functional training might have been necessary to achieve further psychosocial benefits, such as a higher weekly frequency, greater training volume, longer session duration, or higher stimulus intensity, among other aspects.

The study presents practical applications, such as presenting functional training to middle-aged women as a modality capable of bringing improvements in physical tests and body composition components, as well as demonstrating the effectiveness in maintaining the outcomes in question in this type of training. Additionally, functional training is a low-cost and easily applicable modality, which can be reproduced in outdoor spaces and even community centers. Finally, the practical application that, in the public in question, even after almost a year and a half of practice, two outcomes are still responsive, and other outcomes remain stable.

The present study has some limitations, such as the sample size, which was reduced, and the absence

of a control group. Another possible limitation is that the maintenance of some physiological and functional variables may indicate a ceiling effect of functional training in this population. However, it also has strengths, such as the analysis of a robust group of outcomes, the fact of new evidence in the area of functional training, an area that still lacks studies to demonstrate the behavior of health outcomes, some methodological aspects, such as the control of the type and weekly frequency of exercises that participants performed beyond functional training, as well as the practice time of the modality, in months.

CONCLUSION

It is concluded that over 16 weeks of functional training with a weekly frequency of three times in active middle-aged women, there were significant improvements in waist circumference, waist-to-height ratio, and abdominal resistance. Additionally, there was maintenance of aerobic fitness, flexibility, hemodynamic, and anthropometric outcomes. For psychosocial outcomes, no significant improvements were observed.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

DATA AVAILABILITY

The datasets generated and/or analyzed during the current study are available from the corresponding author upon request.

AUTHORS' CONTRIBUTION

Author Maria Eduarda de Moraes Sirydakis was responsible for study design, data collection, statistical analysis, and manuscript preparation. Author Marina Isolde Constantini was responsible for study design, data collection, statistical analysis, and manuscript preparation. Author Angelica Danielevicz was responsible for study design, data collection, statistical analysis, and manuscript preparation. Author Maria Madalena Mendes Brito contributed to data interpretation, and critically revised the manuscript. Author Juliane Bregalda was responsible for study design, data collection, statistical analysis, and manuscript preparation. Author Guilherme Pelliciari de Lima was responsible for study design, data collection, statistical analysis, and manuscript preparation. Author Cintia de la Rocha Freitas conceived the study, provided methodological supervision, reviewed the manuscript, and approved the final version for publication. Author Rodrigo Sudatti Delevatti conceived the study, provided methodological supervision, reviewed the manuscript, and approved the final version for publication.

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REFERENCES

Alleman P, Nogueira FCDA, De Souza EA, de Freitas VH. Efeito do treinamento funcional em variáveis antropométricas e no desempenho físico de mulheres treinadas. Arq Ciênc Esporte. 2018;6:64-6.

Ameur R, Maaloul R, Tagougui S, Neffati F, Hadj Kacem F, Najjar MF, et al. Unlocking the power of synergy: High-intensity functional training and early time-restricted eating for transformative changes in body composition and cardiometabolic health in inactive women with obesity. PLoS One. 2024;19(5):e0301369. https://doi.org/10.1371/journal.pone.0301369. PMid:38691521.

ATS: American Thoracic Society. ATS Statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med. 2002;166(1):111-7. https://doi.org/10.1164/ajrccm.166.1.at1102. PMid:12091180.

Banks NF, Rogers EM, Stanhewicz AE, Whitaker KM, Jenkins ND. (Resistance exercise lowers blood pressure and improves vascular endothelial function in individuals with elevated blood pressure or stage-1 hypertension. Am J Physiol Heart Circ Physiol. 2024;326(1):H256-69. https://doi.org/10.1152/ajpheart.00386.2023. PMid:37975709.

Bavoso D, Galeote L, Montiel JM, Cecato JF. Motivação e autoestima relacionada à prática de atividade física em adultos e idosos. Rev Bras Psicol Esporte. 2017;7(2):26-37.

Boyle M. Functional Training for Sports. 3rd ed. Champaign (IL): Human Kinetics; 2016.

Buysse DJ, Reynolds CF lll, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193-213. https://doi.org/10.1016/0165-1781(89)90047-4. PMid:2748771.

Correa LDP, Bento TPF, Guariglia DA, Rodrigues GF, Conti MHSD. Effects of functional training on pain and functional capacity in elderly women. Fisioter Mov. 2022;35:e35149. https://doi.org/10.1590/fm.2022.35149.

Dal Corso S, Duarte SR, Neder JA, Malaguti C, de Fuccio MB, de Castro Pereira CA, et al. A step test to assess exercise-related oxygen desaturation in interstitial lung disease. Eur Respir J. 2007;29(2):330-6. https://doi.org/10.1183/09031936.00094006. PMid:17050559.

Dashti A, Rahimi M, Azimkhani A. Effects of functional training on physical function, cardiorespiratory fitness, and quality of life in older women: a 6-week randomized controlled trial. Biol Res Nurs. 2025;27(4):570-80. https://doi.org/10.1177/10998004251337063. PMid:40273460.

Delle Fave A, Bassi M, Boccaletti ES, Roncaglione C, Bernardelli G, Mari D. Promoting well-being in old age: the psychological benefits of two training programs of adapted physical activity. Front Psychol. 2018;9:828. https://doi.org/10.3389/fpsyg.2018.00828. PMid:29910755.

Dias CRC, Rocha SV, Cardoso JP, Ferreira BMP, Conceição AF, Santos CAD. Indicators of functional fitness and cognitive commitment in elderly. Rev Bras Med Esporte. 2023;30:e20220414.

Fachineto S, Berté JK, da Silva BM, Junior LPG. Efeitos de um programa de exercícios físicos sobre variáveis fisiológicas, musculares e metabólicas em mulheres da meia-idade e terceira-idade. Revista Brasileira de Prescrição e Fisiologia do Exercício. 2016;10(58):261-6.

Feito Y, Heinrich KM, Butcher SJ, Poston C, Walker S. High-intensity functional training (HIFT): Definition and research implications for improved fitness. Sports (Basel). 2018;6(3):76. https://doi.org/10.3390/sports6030076. PMid:30087252.

Feitosa ADDM, Barroso WKS, Mion D Jr, Nobre F, Mota-Gomes MA, Jardim PCBV, et al. Diretrizes brasileiras de medidas da pressão arterial dentro e fora do consultório–2023. Arq Bras Cardiol. 2024;121:e20240113. PMid:38695411.

Fleck M, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L, et al. Aplicação da versão em português do instrumento abreviado de avaliação da qualidade de vida" WHOQOL-bref. Rev Saude Publica. 2000;34(2):178-83. https://doi.org/10.1590/S0034-89102000000200012. PMid:10881154.

Forte P, Encarnação SG, Branquinho L, Barbosa TM, Monteiro AM, Pecos-Martín D. The effects of an 8-month multicomponent training program in body composition, functional fitness, and sleep quality in aged people: a randomized controlled trial. J Clin Med. 2024;13(21):6603. https://doi.org/10.3390/jcm13216603. PMid:39518745.

Gomes ES, Ramsey KA, Rojer AGM, Reijnierse EM, Maier AB. The association of objectively measured physical activity and sedentary behavior with (instrumental) activities of daily living in community-dwelling older adults: a systematic review. Clin Interv Aging. 2021;16:1877-915. https://doi.org/10.2147/CIA.S326686. PMid:34737555.

Grossl T, De Lima LRA, Karasiak FC. Relação entre a gordura corporal e indicadores antropométricos em adultos frequentadores de academia. Motricidade. 2010;6(2):35-45. https://doi.org/10.6063/motricidade.6(2).152.

Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606-13. https://doi.org/10.1046/j.1525-1497.2001.016009606.x. PMid:11556941.

Menz V, Marterer N, Amin SB, Faulhaber M, Hansen AB, Lawley JS. Functional vs. Running low-volume high-intensity interval training: effects on vo2max and muscular endurance. J Sports Sci Med. 2019;18(3):497-504. PMid:31427872.

Netto JDSC, Aptekmann NP. Efeitos do treinamento funcional sobre a composição corporal: um estudo em alunos fisicamente ativos de academia. Rev Bras Fisiol Exerc. 2016;15(2):68-76. https://doi.org/10.33233/rbfe.v15i2.143.

Oliveira DM, Fernandes EV, Silva AFAC, Souza Xavier A, Gouvêa LF, Pêssoa DM Fo. Consumo de álcool, nível de atividade física e composição corporal de praticantes de caminhada recreativa. Res Soc Dev. 2022;11(7):e0911729496.

Poli L, Petrelli A, Fischetti F, Morsanuto S, Talaba L, Cataldi S, et al. The effects of multicomponent training on clinical, functional, and psychological outcomes in cardiovascular disease: a narrative review. Medicina (Kaunas). 2025;61(5):822. https://doi.org/10.3390/medicina61050822. PMid:40428780.

Pollock ML, Wilmore JH. Exercícios na saúde e na doença. 2. ed. Rio de Janeiro: Medsi; 1993.

Posnakidis G, Aphamis G, Giannaki CD, Mougios V, Aristotelous P, Samoutis G, et al. High-intensity functional training improves cardiorespiratory fitness and neuromuscular performance without inflammation or muscle damage. J Strength Cond Res. 2022;36(3):615-23. https://doi.org/10.1519/JSC.0000000000003516. PMid:32108722.

Qu Y. Impacts of functional training on college students'physical capacity improvement. Rev Bras Med Esporte. 2022;29:e20220326. https://doi.org/10.1590/1517-8692202329012022_0326.

Rahimi Ahmad Baladi S, Tadibi V, Hosseeinpoor Delavar S, Amiri E, Jalilvand M. The effect of sixteen weeks of functional training on quality of life and mental health in military personnel. Majallah-i Ilmi-i Pizishki-i Jundi/Shapur. 2021;20(5):446-55. https://doi.org/10.32598/JSMJ.20.5.2234.

Rodrigues KP, Prado L, de Almeida ML, Yamada AK, Finzeto LC, Bueno CR Jr. Effects of combined versus multicomponent training in physically active women aged 50–75 years. Res Q Exerc Sport. 2021;93(4):710-7. https://doi.org/10.1080/02701367.2021.1910119. PMid:34735310.

Saraiva BT, Franchini E, Ribeiro AS, Gobbo LA, Correia MA, Vanderlei LC, et al. Effects of 12 weeks of functional training vs. Muay Thai on cardiac autonomic modulation and hemodynamic parameters in older adults: a randomized clinical trial. BMC Cardiovasc Disord. 2024;24(1):433. https://doi.org/10.1186/s12872-024-04096-3. PMid:39153977.

Silva-Grigoletto MED, Brito CJ, Heredia JR. Treinamento funcional: funcional para que e para quem? Rev Bras Cineantropom Desempenho Hum. 2014;16(6):714-9. https://doi.org/10.5007/1980-0037.2014v16n6p714.

Silva-Grigoletto MED, Resende-Neto AG, Teixeira CVLS. Treinamento funcional: uma atualização conceitual. Rev Bras Cineantropom Desempenho Hum. 2020;22:e70646. https://doi.org/10.1590/1980-0037.2020v22e72646.

Teixeira CVLS, Evangelista AL, Pereira CA, Da Silva-Grigoletto ME. Short roundtable RBCM: treinamento funcional. Revista Brasileira de Ciência e Movimento. 2016;24(1):200-6. https://doi.org/10.18511/0103-1716/rbcm.v24n1p200-206.

Trujillo-Gutiérrez FJ, López-Aguilar J, Álvarez-Salvago F, Morente-Oria H, Jiménez-García JD. Acute effects of a single-bout session of high-intensity functional training

and moderate-intensity functional training on cognitive functions, anxiety, and stress in healthy adults. Appl Sci (Basel). 2025;15(1):439. https://doi.org/10.3390/app15010439.

Wang Z, Ma H, Zhang W, Zhang Y, Youssef L, Carneiro MAS, et al. Effects of functional strength training combined with aerobic training on body composition, physical fitness, and movement quality in obese adolescents. Nutrients. 2024;16(10):1434. https://doi.org/10.3390/nu16101434. PMid:38794672.

Wells KF, Dillon EK. The sit and reach: a test of back and leg flexibility. Res Q Exerc Sport. 1952;23(1):115-8.