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Is there any Non-functional Training? A Conceptual Review

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Abstract

This conceptual review aimed to investigate whether "functional training" (FT) programs are different from traditional strength, power, flexibility, and endurance training programs. A search for the twenty most recent papers published involving FT was performed in the PubMed/Medline database. Definition, concepts, benefits, and the exercises employed in FT programs were analyzed. The main results were: 1) there is no agreement about a universal definition for FT; 2) FT programs aim at developing the same benefits already induced by traditional strength, power, flexibility, and endurance training programs; 3) exercises employed are also the same. The inability to define FT makes differentiation difficult. Physical training programs can be easily described and classified as strength, power, flexibility, endurance, and the specific exercises employed (e.g., traditional resistance training, ballistic exercises, plyometrics and Olympic-style weightlifting, continuous and high-intensity interval training). This proper description and classification may improve communication in sports science and improve interdisciplinary integration. Aiming to avoid confusion and misconceptions, and based on the current evidence, we recommend that the terms FT, high-intensity FT, and functional fitness training no longer describe any physical training program.

Keywords: core training, exercises, flexibility, fitness, periodization.

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1 Introduction

Exercise adaptations are highly dependent on the specific training stimulus (1-3). Therefore, an apt description of physical training programs is essential for planning neuromuscular, cardiovascular, metabolic, and functional exercise performance and recovery enhancements. Force, work, and power represent the basic mechanical concepts used in describing muscular activity, function, and the classification of training stimuli/programs (4, 5).

Strength is defined as the force that can be developed by the muscles performing a particular joint movement (e.g. elbow flexion, knee extension) (6). Work is expressed when the point of application of the force moves through displacement (6), and power is the rate of performing work; the derivative of work concerning time; the product of force and velocity (6). In addition, muscles can maintain either a specific isometric force, or power level, involving combinations of concentric and eccentric muscular actions, a functional property connoted as endurance (4). Flexibility refers to the intrinsic property of body tissues determinant of range of motion achievable without injury (7).

Strength, power, endurance and flexibility are well-defined concepts within exercise prescription and muscle performance (8-10), nutritional requirements (11) and the study of specific neuromuscular, cardiovascular, and metabolic adaptations (2, 9, 12). Strength and power training encompass short-duration activities performed at high- or near maximal intensities, increasing the capacity to perform high-force, and high-velocity efforts (1, 12). Exercises employed in these programs involve traditional resistance training, ballistic exercises, plyometrics and Olympic-style weightlifting (8). On the other hand, endurance training encompasses exercises performed at various intensities, lasting for several minutes up to hours (13), increasing the capacity to sustain repetitive high and low-intensity efforts (9), encompassing the application of continuous and high-intensity interval training methods (9).

Endurance training covers exercises performed at various intensities, lasting for several minutes up to hours (13), increasing the capacity to sustain repetitive high and low-intensity efforts (9). Both continuous and distinct variations of high-intensity interval training (HIIT) can be prescribed (9, 14).

Otherwise, despite these well-consolidated characterizations of sports physical demand, training programs designs and adaptations, a recently increasing number of articles introduce apparently "new" physical training programs. Among sports scientists, it is common to hear from students, coaches, and athletes: *"I'm working with functional training (FT)," "I'm engaged on a high-intensity FT program," "I'm investigating the neuromuscular responses to functional training."* These statements caught our attention and have been criticized properly (15, 16). Recently we have raised issues regarding the concepts and definition of FT (15). Unfortunately, we found inconsistencies and misconceptions on the FT definition, cited references that do not support the statements, and no differences regarding benefits and training methods already used in sports training (15).

Considering that the dissemination of inconsistent concepts and definitions can induce irreparable professional conduct and poor academic background, the present conceptual review aimed to investigate whether FT programs are different from traditional strength, power, flexibility, and endurance training programs. We hypothesized that there is no universal definition for FT, and that these programs aim at developing the same adaptations already present in strength, power, flexibility, and endurance training programs. FT exercises/training methods are also the same already employed in athletes' training programs.

2 Materials and Methods

To attend to the purposes of the conceptual review study, we performed a non-exhaustive search for the twenty most recent papers published about FT present in PubMed/Medline

database. The search was completed in April 2021. The article's reference list was consulted for additional definitions. The heterogeneity of the studies was considerable (e.g., exercise protocols, fitness level of the participants, variables measured). Thus, we have decided not to evaluate the studies from a statistical point of view. Instead, we performed a qualitative analysis, focusing on the FT definitions, exercises employed, and benefits reported by the authors. All other authors read this qualitative analysis carefully, and edits have been incorporated.

3 Results

Examining the search results, we found additional FT "variations" (e.g., high-intensity FT, and functional fitness), that were included in the analysis of definitions, benefits and exercises employed. In addition to the articles, three textbooks were included (17-19).

3.1 Functional training definitions

Tables 1, 2 and 3 present the FT, high-intensity FT (HIFT), and functional fitness (FF) definitions, respectively.

Please, Insert Table 1 About Here

Please, Insert Table 2 About Here

Please, Insert Table 3 About Here

3.2 Functional training adaptations

The adaptations/benefits proposed by each training program were extracted from the definitions and additional descriptions presented in the articles. Tables 4, 5 and 6 present the FT, HIFT, and FF adaptations/benefits.

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Figure 1 presents a summary of the adaptations/benefits induced by FT, HIFT and FF training programs.

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3.3 Functional training exercises

The description of exercises employed in FT programs was extracted from the definitions present and consulting the training protocols described in the methods section. Tables 7, 8 and 9 present the FT, HIFT, and FF exercises employed.

Please, Insert Table 7 About Here

Please, Insert Table 8 About Here

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Figure 2 presents a summary of the exercises/training methods employed in FT, HIFT and FF training programs.

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4 Discussion

The objective of this study was to investigate whether FT programs are different than traditional strength, power, flexibility, and endurance training programs. The main results were: 1) there is no agreement about a universal definition for FT (see Table 1); 2) FT programs aim at developing the same adaptations already present in traditional training programs (see Tables 4, 5, 6 and Fig. 1); 3) exercises employed are also basically the same (see Tables 7, 8, 9 and Fig. 2). Our main finding is that the FT is not different from traditional strength, power, and endurance training, therefore, corroborating our hypothesis.

Although muscle strength, power, flexibility, and endurance are well-defined concepts used in exercise prescription (4, 6, 8, 9, 12, 20), FT problems arise in the following domains:

1. FT involves resistance training (21). Thus, it could be defined as resistance training.
2. FT is related to developing different physical capacities in an "integrated and balanced manner" (22). The interference phenomenon with concurrent training presents attenuated muscle strength and mass gains compared to strength and power alone (23). Thus, how does FT provide different physical capacities in an "integrated and balanced manner"? Additionally, the authors (22) did not provide any scientific data to support "an integrated and balanced" development of different physical capacities.
3. Strength exercises combined with endurance exercises could be described as "combined", or "concurrent training". Therefore, there is no need to "create" new terminology (i.e., FT) containing inconsistencies (15).
4. FT programs aim at an increase in efficiency and safety during activities related to daily living, work, and sports (22); all these benefits are already well-related to the practice of traditional training programs (2, 3, 8, 11, 12, 14). Thus, it is not an exclusive or differentiating characteristic of FT programs per se (15).

5. HIFT was defined as typically involving high-volume and high-intensity exercises, with short rest intervals using of multiple joint exercises (24). This definition consists of a basic description of a strength, power and endurance session adopted as a part of the preparation of elite athletes in specific phases of periodization (20, 25, 26).
6. FF has defined a trend toward using strength training (22, 27). Thus, it could be easily described as a strength training program.
7. FF was stated to be also known as HIFT (28). Thus, FF is HIFT.
8. The difference found between FT and HIFT programs is inconsistent. Since exercise intensity is a training variable and not an exercise type, it would be expected that FT and HIFT were defined as the same training program performed with different intensities only. It was surprising to verify that they are considered separate entities.

Some of the FT problems stated above were previously highlighted (15), but we considered them pertinent to highlight again.

Muscular fitness is composed of the functional parameters of strength, endurance, and power, and each improves consequence to an appropriately designed resistance training regimen (29). The definition of physical fitness implies an optimal combination of physical, physiological, biochemical, biomechanical and psychological characteristics that contribute to competitive success in sports (30). The physical fitness of an athlete is usually particular to a given class of competition (30), and each component of physical fitness (e.g., cardiorespiratory, muscular strength and endurance, body composition, flexibility, and neuromotor fitness) conceivably influences some aspect of health (29). In this context, both FF definitions found (27, 28) are not in agreement with the American College of Sports Medicine position stand (29), which states that FF training incorporates motor skills such as balance, coordination, gait, agility, and proprioceptive training, with physical activities such as tai ji (tai chi), qigong, and yoga (29).

Another inconsistency in the FF definition was the use of the expression *extreme conditioning program* (28). If the adjective "*extreme*" is employed to classify these programs, what kind of adjective should we use to classify the physical training programs performed by elite athletes of wrestler, soccer, football, rugby, basketball, mixed martial arts, triathletes, marathonists, and track and field athletes, among others? We are conscious that physical training programs promoted by some fitness companies (e.g., CrossFit®, Insanity®, Gym Jones®, and P90X®) were previously classified as *extreme conditioning programs* (24). They are defined as typically involving high-volume and high-intensity exercises, with short rest intervals and multiple joint exercises (24). Some include variations of the Olympic-style weightlifting and high-intensity interval training, plyometrics, and ballistic exercises (24). Nevertheless, this training configuration is not exclusive, as it has already been adopted as a part of training programs of elite athletes in specific phases of periodization (20). Additionally, *High global performance* cited as an objective of FF program (28) represents an extremely vague and inconsistent adaptation.

The main confusion about all these "new" training programs (i.e., FT, HIFT and FF) is that they aim at neuromuscular adaptations that could be easily defined as strength, power, endurance, and flexibility programs (see Tables 4, 5 6 and Fig 1). Functional movements/exercises/activities are often cited as training stimuli, but the non-functional movements are not defined. To the best of our knowledge, there is also no concise definition of functional movements as well. By the way, is there any non-functional movement performed from skeletal muscles?

Regarding FT adaptations/benefits, a particular concern was placed in the study of McLaughlin et al. (31), where gait, balance, and FT were considered as different training interventions. In their study (31), an overview of systematic reviews examined the effect of Balance and FT on

health outcomes in adults aged 18 years or older. The authors concluded that balance and FT reduced the rate of falls and the number of people who fell and improved physical functioning and physical activity in healthy community-dwelling adults aged 65 years and older (31). This separation observed of training interventions to improve gait and balance from FT reinforces FT definitions' confusions, inconsistencies, and weaknesses.

FT, HIFT, and FF training programs present several similarities to those already used for elite athletes for several decades (8, 25, 26, 29, 32). Among them were high-volume and high-intensity exercises, with short rest intervals using multiple joint exercises (24) and variations of the Olympic-style weightlifting, high-intensity interval training, plyometrics and ballistic exercises (24). All these exercises are also employed in the physical training of professional athletes and recommended for developing and maintaining the cardiorespiratory, musculoskeletal, and neuromotor fitness of healthy adults and the elderly (8, 25, 26, 29, 32). One of the definitions states that FT uses strength exercises aimed at improving core stability (22). Curiously, a systematic review about the most effective exercises to stimulate the activity of the core muscles (33) concluded that free weight exercises (squat and deadlift) are optimal to achieve this goal and that performing floor exercises, adding balls/devices appears to be unnecessary and not recommended (33). The systematic review results (33) reinforce that if one of the objectives of FT is to improve core stability, traditional strength and power exercises are the most efficient.

Curiously, one paper provides an equivocal separation of traditional resistance training and FT (34). Traditional resistance training was considered as a conservative training method that uses resistance machines with gradual, progressive load increases (34), and FT as combining multi-planar, coordinated and multi-articular movements, organized according to movement patterns such as squat, pushing, pulling and transporting in blocks that stimulate power, speed, stability

or maximum strength. Considering that all these exercises are often employed in athletes' strength and power training, there is no rationality in separating traditional from FT.

Indeed, the term FT originated in sports medicine and, more specifically, in rehabilitation clinics (35). Early definitions focused on rehabilitation to enhance or develop the skills associated with activities of daily living and, frequently, involving older adults (35). In this context, the desired outcome is to restore (or rehabilitate) neuromuscular function. Guidelines and arguments for implementing FT for back pain prevention are essentially the same for back pain rehabilitation (16). This is because the "functional" status of rehabilitation exercises is related to the activities and functions of the body and contextual factors such as environmental and personal factors (36). Although, strength and conditioning professionals are constantly working to improve a specific neuromuscular function. Therefore, the term FT becomes redundant and confused (15).

Fleck and Kraemer (17) proposed that the general definition of FT is the training that is meant to increase performance in some type of functional tasks, such as activities of daily living or tests related to athletic performance (17). Thus, FT could refer to virtually any training meant to increase motor performance (17). Considering that in exercise physiology, muscle strength, power, flexibility, and endurance are often regarded as functional aspects of the neuromuscular system, this general definition (17) appears to be the most rational.

5 Conclusions

The current data show that FT programs are not different from those traditional training programs already used in sports training, and there is no consistent universal definition for FT. Also, the claimed FT's adaptations are the same biological adaptations induced by traditional training programs (e.g., strength, endurance), as well as the "functional movements" are already employed in the physical training plan of professional, recreational athletes, healthy

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adults, and the elderly. In other words: There is no "non-functional" training. Therefore, there is no rationale in classifying exercise training programs as FT. Insisting in the use of this term (i.e., FT) it is a classic case of needlessly reinventing the wheel (15).

6 Future Recommendations

Based on the current results, we recommend that the terms functional training, high-intensity functional training, and functional fitness no longer describe any physical training program. These can be easily classified as strength, power, endurance, flexibility, and described according to the specific exercises employed (e.g., traditional resistance training, ballistic exercises, continuous and high-intensity interval training), improving communication and interdisciplinary integration.

Sports activities may be broadly classified into events that require great expressions of strength and power (e.g., Olympic-style weightlifting, powerlifting, and throwing events in track and field) and those tremendous demanding endurance (e.g., marathon run and triathlon) (1). In addition, many activities like middle-distance sprint running and team and combat sports, which are characterized by intermittent efforts, require combinations of high levels of strength and power, combined with a well-developed aerobic capacity for peak performance (1).Table 10 summarizes the skeletal muscle functional proprieties definition and exercises/training methods used for their development.

Please, Insert Table 10 About Here

In addition to physical training, literature presents several adaptations and health benefits of endurance and strength and power training that may also be used in the proper classification of training stimulus (2). Our intention with this article was not to disqualify the studies, physical training programs, and the practice of the physical activities, but to provide the correct

definitions of terms and concepts to allow proper communication between students, coaches, athletes, and sports scientists.

7 Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

8 Author Contributions

BNI conceived the idea, performed the initial data collection, wrote the first draft, worked on all drafts, and formatted the manuscript for submission. APS, MM, CPCS, BVC, DJO, and GRM helped develop the main idea and draft the paper. All authors read and approved the last version of the manuscript.

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11 Figure Legends

Figure 1. Summary of adaptations/benefits induced by FT, HIFT and FF training programs. *Other adaptations cited are neuromuscular control, joint mobility and stability, central stability, trunk alignment and lower limb joint; conditional and coordinative capacities; ability to perform the ADL at home, work, or play without undue risk of injury or fatigue; jump ability; gait speed and quality of life.

Figure 2. Summary of the exercises/training methods employed in FT, HIFT and FF training programs.

12 Tables

Table 1. FT definitions.

Reference	Functional Training Definition
Lajoso-Silva et al. (38)	FT utilizes multi-articular movements to improve balance, increase muscular power and strength, and enhance conditional and coordinative capacities.
Gali, J. C. et al. (39)	FT combines neuromuscular control, joint mobility and stability, central stability, trunk alignment and lower limb joint. Unlike traditional muscle strengthening programs, several joints and muscles are exercised in the three planes of movement during FT, simultaneously challenging the brain and the body.
McLaughlin, E. C. et al. (31)	Functional training uses functional activities as the training stimulus and is based on the theoretical concept of task specificity.
Farrokhzad, S. et al. (40)	FT is a set of sports activities that are based on daily routine activities such as walking, climbing up stairs and going down, getting up and sitting down and move light things. FT was focused improving physical fitness such as endurance, strength, flexibility, and balance.
Da Silva-Grigoletto, M. E. et al. (21)	FT involves resistance training and associated techniques to develop strength, as well as balance, motor coordination, power, and muscle endurance, increasing the ability of individuals to execute ADL, whether they be simpler tasks of daily living or more complex athletic maneuvers.
Cheng, T. T. J. et al. (41)	A form of training that uses modular movements that involve the recruitment of multiple muscle groups, FT is the only program that combines weightlifting, gymnastics, and metabolic conditioning in one continuous session.
Peterson, James A. (42)	FT is designed to enhance the ability of exercisers to meet the demands of performing a wide range of ADL at home, work, or play without undue risk of injury or fatigue.
Aragão-Santos, J. C. et al. (43)	FT is a multicomponent training method, which stimulates different physical capacities in the same session. This training method can be carried out with an emphasis on traditional exercises such as squats to improve the strength of lower limbs (element-based

	functional training) or using exercises more like daily activities such as carrying actions or sit and get up from the floor (task-specific-based functional training).
La Scala Teixeira, C. V. et al. (22)	The development of different physical capacities in an integrated and balanced manner to provide autonomy, efficiency and safety during activities related to ADLs, work and/or sports. For this purpose, FT uses strength exercises generally characterized by integrated, multi-joint/multi-segment, asymmetrical, multi-planes, acyclic, intermittent, speedy, and unstable movements that emphasize core stability.
Fleck and Kraemer (17)	The training that is meant to increase performance in some type of functional task, such as activities of daily living or tests related to athletic performance. FT could refer to virtually any type of training meant to increase motor performance.
Boyle (19)	Functional training on the other hand uses many concepts developed by sport coaches to train speed, strength, and power to improve sport performance and reduce incidence of injury.
Boyle (18)	Functional training can therefore be described as purposeful training. In fact, functional training is more accurately represented as “sports-general” training. Functional training is a system that encourages the training of balance and the balancing of training. It is characterized by actions such as squatting and lunging or pushing and pulling. Functional training is best described as a continuum of exercises that teach athletes to handle their own body weight in all planes of movement.

458 ADLs: activities of daily living; FT: functional training; HIIT: high-intensity interval training.

459 Table 2. HIFT definitions.

Reference	HIFT Definition
Feito et al. (44)	A training style [or program] that incorporates a variety of functional movements, performed at high intensity [relative to an individual's ability], and designed to improve parameters of general physical fitness (e.g., cardiovascular endurance, strength, body composition, flexibility, etc.) and performance (e.g., agility, speed, power, strength, etc.).
Teixeira, R. V. et al. (45)	HIFT is a modality characterized by presenting high volumes and training intensities with constantly varied exercises with or without any recovery interval between the series. HIFT training sessions consist of Olympic weightlifting exercises (e.g., clean and jerk, snatch), gymnastics (e.g., lunges and pull-ups) and metabolic conditioning (e.g., running and rowing). In addition to the diversity of functional movements performed in high intensity, HIFT aims to improve physical conditioning variables (i.e., strength, body composition, among others) and performance (i.e., speed, power, among others).
Gomes, J. H. et al. (46)	Exercise regimen characterized by high intensity, constant variation, and functional movement is often performed in rapid, successive repetition with limited or no recovery time. HIFT is based on the concept of increased work capacity over time while using a variety of exercise modalities, including mono-structural (e.g., running, rowing, etc.), as well as body weight movements (e.g., squats, push-ups, etc.) and weightlifting derivatives (e.g., snatch, shoulder press, deadlift, etc.).
Browne, J. D. et al. (47)	HIFT incorporates many of the same principles as HIIT, including the relatively high work-to-rest intervals. However, HIFT training goes further and weaves multimodal resistance training with cardiovascular exercises. HIFT consists of a variable series of these functional whole-body exercises with little rest, while HIIT consists of unimodal, single-plane movements with distinct periods of low-intensity activity or rest.
Ben-Zeev, T. et al. (48)	HIFT is a form of physical activity that can be modified to any fitness level and elicits greater muscle recruitment than repetitive aerobic exercises, thereby improving cardiovascular endurance, strength, and flexibility. HIFT emphasizes functional, multi-joint movements via HIIT and muscle-strengthening exercises.

460 ADLs: activities of daily living; HIFT: high-intensity functional training; HIIT: high-intensity interval training.

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461 Table 3. Functional fitness definitions.

Reference	Functional Fitness definition
Thompson (27, 28)	A trend toward using strength training to improve balance, coordination, muscular strength, and endurance to improve activities of daily living typically for older adults and in clinical populations.
Tibana et al. (28)	A relatively new form of exercise (also known as HIFT; extreme conditioning programs) that is currently being marketed to a wide range of active (athletes, military) and inactive populations. The competitive functional fitness (e.g., CrossFit®) often consists of a variety of training methods, such as weightlifting/powerlifting, repeated gym bodyweight exercises, cardiovascular exercises, sprints, and flexibility mixed to achieve a high global performance.
Peterson, James A. (42)	Functional fitness is a by-product of the synergistic integration of the various components of fitness (physical and neuromuscular) and the muscle groups and joints involved in a movement activity or training effort.

462 ADLs: activities of daily living; HIFT: high-intensity functional training; HIIT: high-intensity interval training.

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464 Table 4. Adaptations/benefits provided by FT programs.

Reference	FT adaptations/benefits							
Lajoso-Silva et al. (38)	Strength	Power	Balance	Conditional and coordinative capacities				
Gali, J. C. et al. (39)	Neuromuscular control, joint mobility and stability, central stability, trunk alignment and lower limb joint							
Farrokhian, S. et al. (40)	Strength	Balance	Endurance	Flexibility				
Da Silva-Grigoletto, M. E. et al. (21)	Strength	Power	Balance	Endurance	Coordination			
Cheng, T. T. J. et al. (41)	Strength	Power	Balance	Endurance	Coordination			
Peterson, James A. (42)	Ability of performing the ADL at home, work, or play without undue risk of injury or fatigue.							
Aragão-Santos, J. C. et al. (43)	Strength	Jump ability	Gait speed	Quality of life				
La Scala Teixeira, C. V. et al. (22)	Strength	Power	Balance	Coordination	Endurance	Speed	Agility	Flexibility

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467 Table 5. Adaptations/benefits provided by HIFT programs.

Reference	**HIFT adaptations/benefits**						
Feito et al. (44)	Strength	Power	Flexibility	Speed	Agility	Endurance	Body composition
Teixeira, R. V. et al. (45)	Strength		Power	Speed		Body composition	
Gomes, J. H. et al. (46)	Strength	Power	Flexibility	Speed	Agility	Endurance	Body composition
Ben-Zeev, T. et al. (49)	Strength	Power	Flexibility	Speed	Agility	Endurance	Body composition

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469 Table 6. Adaptations/benefits provided by functional fitness training programs.

Reference	**Functional fitness adaptations/benefits**				
Thompson (27)	Strength	Power	Balance	Coordination	Endurance
Tibana et al. (28)	High global performance				

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472 Table 7. Exercises and employed in FT programs.

Reference	Exercises employed in FT programs			
Lajoso-Silva et al. (38)	Multi-articular movements			
Gali, J. C. et al. (39)	Olympic weightlifting	Strength exercises	Plyometrics	Endurance training
McLaughlin, E. C. et al. (31)	Functional activities			
Farrokhian, S. et al. (40)	Daily routine activities	Walking	Climbing up stairs and going down	Getting up and sitting down and move light things
Da Silva-Grigoletto, M. E. et al. (21)	Resistance training and associated techniques			
Cheng, T. T. J. et al. (41)	Olympic weightlifting	Gymnastics	Modular movements	
Aragão-Santos, J. C. et al. (43)	Squats		Daily routine activities	
La Scala Teixeira, C. V. et al. (22)	Strength exercises			

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475 Table 8. Exercises employed in high-intensity functional training programs.

Reference	HIFT Exercises/training methods employed						
Feito et al. (44)	Functional movements						
Teixeira, R. V. et al. (45)	Functional movements	Olympic weightlifting	Running	Rowing	Gymnastics	Constantly varied exercises	
Gomes, J. H. et al. (46)	Functional movements	Olympic weightlifting	Running	Rowing	Body weight movements	Squats	Push-ups
Browne, J. D. et al. (47)	Functional movements	Cardiovascular exercises			Resistance training		
Ben-Zeev, T. et al. (49)	Functional movements				Strength exercises		

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477 Table 9. Exercises employed in functional fitness training programs.

Reference	Functional fitness exercises/training methods employed			
Thompson (27)	Strength training			
Tibana et al. (28)	Olympic weightlifting	Gymnastics	Cardiovascular exercises	Sprints

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480 Table 10. Skeletal muscle adaptations and exercises/training methods.

	Definition	Exercises/training methods used in the training programs
Strength	The force or torque can be developed by the muscles performing a particular joint movement (e.g., elbow flexion, knee extension) (6).	→ Traditional resistance training. → Ballistic exercises. → Plyometrics. → Olympic-style weightlifting. → Sprints and resisted sprints.
Power	The rate of performing work; the derivative of work concerning time; the product of force and velocity (6).	
Endurance	The ability to maintain either a specific isometric force, or a specific power level, involving combinations of concentric and eccentric muscular actions (4).	→ Low- and moderate-intensity continuous exercise. → Interval training variations (e.g., HIIT, RST, and SIT).
Flexibility	The intrinsic property of body tissues determines the range of motion achievable without injury (7).	→ Static, dynamic/ballistic stretching. → Proprioceptive neuromuscular facilitation stretching.

481 HIIT: High-intensity interval training; RST: repeated sprints training; SIT: sprint interval training.