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## RESEARCH ARTICLE

### THE BENEFITS OF RESISTANT TRAINING IN CHILDREN AND ADOLESCENTS

**Bruno Barros Diniz and \*Carlos Alberto Kelencz**

Centro Universitário Ítalo Brasileiro, UniÍtalo, São Paulo, Brasil

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#### ABSTRACT

The present literature review aims to discuss resistance training for adolescents. Due to some contradictions regarding the benefits of bodybuilding aimed at young people (children and adolescents), there is some resistance from parents and guardians to allow this practice. However, more recent studies have shown that resistance training for adolescents and children can contribute to increased strength and endurance. However, the most effective exercise prescription in relation to the number of repetitions remains questionable, which may exclude children and adolescents from practicing physical activities. In this case, through several references we can mention some topics to be addressed, they are: The concept of resistance and adolescent training, the physiological adaptations resulting from this type of training, in addition to the training methods applicable to this public, including in this topic the follow-up of the professionals, the variety of exercises and also the control that will be imposed on the load, number of repetitions, rest time and periodization. It is agreed with this research that muscle training should be part of a program that includes increased motor skills and adequate fitness levels, besides being always accompanied by a trained Physical Education professional.

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## INTRODUCTION

Resistive functional training is very dynamic, motivating, challenging, complex and prepares the body for a better performance in the movements necessary for everyday activities and sports. Given this, it has been a form of physical activity that has been recommended for people of all age groups, from children to the elderly, provided that they are accompanied by adequate follow-ups and adaptations to the conditions and needs of each individual. However, there are divergences arising from poorly conducted studies, which have given rise to beliefs about resistance training, especially for adolescents (Câmara and Santarém, 2006). In the specific case of children (pre-adolescents) and adolescents, it is important to consider the rapid evolution of bone, muscle and motor development. Recent studies have demonstrated that it is possible to affirm that physical activity for adolescents is highly beneficial, contradicting what has long been advocated by some medical students and even professionals in the area of Physical Education (Pontes, 2008). However, in the last decades, strength training has demonstrated that it is a safe and effective method in the conditioning of children and adolescents, when well oriented and accompanied by a trained physical education professional. Many studies have been done on the safety and efficacy of strength training for children and

adolescents, proving the acceptance and diffusion of this type of training by several organizations (Greco, 2010). Therefore, the importance of this work refers to the need to expand the knowledge of the physical education professional on the suggested topic, so that it has the necessary security to attend the adolescent public, acting in the evaluation, orientation, accompaniment and, especially, the incentive the regular practice of physical activities. There is still considerable controversy regarding the practice of resistance training for adolescents. Therefore, it is necessary for the Physical Education professional to be well informed and able to act together with this public. Additionally, adolescence is a phase of transition between childhood and adulthood, full of physical and emotional changes, which need to be considered in the planning of physical activities, especially in relation to resistance training, in order to meet the needs of these individuals. In this sense, the present study aims to address the effectiveness of functional resistance training in the maintenance and development of functional capacity, demonstrating the benefits of this practice for adolescents.

## METHODOLOGY

This is a bibliographic review study, based on books and scientific articles, available in databases such as Scielo, among other academic sites.

\*Corresponding author: Carlos Alberto Kelencz,  
Centro Universitário Ítalo Brasileiro, UniÍtalo, São Paulo, Brasil.

## Literature review

**The teenage years:** Adolescence can be characterized in many ways, both in the physical as well as in the maturational and coordinate aspects. According to Gallahue and Ozmun (2001), an individual enters adolescence at the age of eleven and this phase can last from 21 to 24 years, when he is considered an adult adolescent. In girls 'and boys' issues it is possible to characterize them in adolescence due to the growth of the hairs throughout the body, breast enlargement in the case of girls and, in boys the significant increase in muscle mass due to high levels of testosterone and GH, hormones essential for body development. The girls have as their first contact with adolescence menarche, and can be diagnosed in some cases even earlier than at age 11 (Brasil, 2008). In this period of life, the adolescent is always in search of identity, occurs the increase of anxiety and rebellion. It is also a phase where these individuals have a lot of energy, like receiving information, and want to interact and question about any proposed activity. Therefore, guidance and information are very important so that these individuals feel confident and motivated to practice bodybuilding. Gallahue and Ozmun (2008) classify as individuals adolescents in the ages of 11 to 25 years, but according to Fiorese (1989) it occurs from six to twelve years and is considered an ideal phase to obtain corporal abilities. Activities and training should aim to increase the repertoire of motor skills and not premature specialization, that is, they should favor the choice of an activity that brings satisfaction and, thus, the individual wants to continue practicing and perfecting the learning. Therefore, it is important that there is a certain freedom in the choice of activities, which can be provided that their organization takes the form of circuits, in which everyone can participate. It is also necessary to consider the different preferences in the physical and sports activities between girls and boys, which may be related to the phase of physical, motor, emotional and maturational development.

Regarding the chronological age of the boys, an increase in the testosterone levels with the advancement of the age can be noticed. Butler *et al.* (1989) apud Tourinho Filho and Tourinho (1998) evaluated 84 boys aged 10 to 15 years, and verified a progressive increase in salivary testosterone levels. These data indicate that boys are already fully capable of reproductive functions. Although they are in adolescence, the difference in strength and coordination between boys and girls is very great, so in resistance training it is recommended to make adaptations and variations so that this practice becomes even more beneficial and safe. In addition, one should consider the age differences between the same genders, so that the activities are beneficial. In view of the above, it is fundamental that physical education professionals know the profile of the adolescent public, so that the incentive to practice regular physical activities presents positive results. For this, it is important that they know different modalities, and are able to choose an activity that pleases them and that they feel the desire to continue practicing regularly. In the case of adolescents with an interest in resistance training, it is important to carry out a detailed evaluation in order to tailor activities to achieve beneficial results.

## The Resistance Training

Resistance training encompasses any exercise that causes muscles to contract against an external resistance with the goal of increasing strength, tone, mass and / or resistance. In

external resistance can be used dumbbells, body weight, bricks, water bottles, or any other object that causes muscles to contract against resistance. According to Santarém (2009), the resisted activity is every movement in which the individual overcomes the resistance imposed by something, be it walking, pulling, pushing. The exercises commonly used in resistance training have predominance of anaerobic energy metabolism and are classified as isotonic, this is why muscle contractions usually occur with more than 40% of the activated muscle fibers, above the anaerobic threshold, whose correspondence in percentage of activated fibers goes from 30% to 40% (Santarém, 2009).

There are several types of resistance exercises, as Weil (2013) suggests,

- a) Olympic lifting - athletes lift weight overload, as you only see in the Olympics;
- b) power survey - a competition in which athletes perform squatting, ground lifting and bench press
- c) weight lifting - a sport in which athletes lift weights -

## Usually less than six replicates.

When the individual lifts weights in the gym in order to become stronger, more or more toned, he is performing resistance exercises. Occasionally the term "strength training" associated with weight lifting is also used. Technically, it is incorrect to refer to resistance exercises such as bodybuilding. Instead, strength training should be described as a resistance exercise that promotes strength development and / or related physical abilities (Weil, 2013). The American College of Sports Medicine (ACSM) recommends that resistance training should be progressive in nature (eg follow the principle of progressive overload), individualized, and provide a stimulus for all major muscle groups (chest, back, shoulders, arms, abdominals and legs). They recommend that beginners do a set of eight to 10 exercises for the major muscle groups, from eight to 12 repetitions, two to three days a week (multiple set programs can provide greater benefits if time permits). For older and more fragile people (approximately 50-60 years of age or older), it is suggested to perform series with 10-15 repetitions (WEIL, 2013). Gradually, the load can be increased, this is what is called the principle of progressive overload, which is universally accepted as the model that promotes the greatest gains in strength (Weil, 2013).

To follow this model for the development of muscle tone and strength, one should lift weights that are heavy enough to create muscle fatigue by performing 10 to 12 repetitions daily. Then, when such an activity is easily performed by the performer, the intensity of the exercise should be gradually increased and the individual should perform the exercise at this new intensity until he can do it again for up to 10 to 12 repetitions. The intensity can be increased whenever you can reach 10 or 12 repetitions. Normally, each time the intensity is added to the activities, the individual performs fewer repetitions because it is heavier, but then with the adaptation of the tissues involved (i.e., skeletal muscles), he / she will be able to perform more repetitions (Weil, 2013). For many years the use of resistance training to increase muscle mass and strength in pre-adolescents and adolescents, boys and girls, was considered a highly controversial subject. Boys and girls were discouraged from using free weights for fear that this could hinder them and prematurely disrupt the growth process.

In addition, many scientists speculated that resistance training would have little or no effect on the muscles of preadolescent boys because six levels of circulation of androgen hormones were still low. Fortunately, many studies were conducted involving pre-adolescents and adolescents who participated in resistance training programs. On these studies, Kraemer and Fleck (2006) concluded that the risk of injury was very low. In fact, resistance training can offer some protection against injury, such as by strengthening the muscles that cross the joints. The recommendation is still about adopting a conservative approach when it comes to resistance exercise prescribed for children, especially pre-teens. In current programs, resistance training for children should be prescribed in the same way as for adults.

Also, Kraemer and Fleck (2006) have established basic guidelines for the progression of resistance exercises for children, as shown below:

Recommendations for strength training in prepubescent children:

1. It should have an appropriate design to accommodate the size and degree of maturity of the pre-pubertal.
2. Must have good cost / benefit
3. It must be safe, free of defects and frequently inspected
4. It should be positioned in an area of low traffic and no obstructions with adequate ventilation and lighting.
5. Strength training should be preceded by heating and cooling
6. Focus on the concentric dynamic actions
7. All exercises should be performed through a full range of movements.
8. Competition is prohibited
9. Never be tempted to reach the maximum limits
10. Training is recommended two or three times a week for periods of 20 to 30 minutes.
11. No resistance shall be applied until an appropriate form is demonstrated. Six to fifteen equal repetitions in each set of movements, being performed from one to three repetitions per exercise.
12. The weight or resistance is increased by 0.5 to 1.4 kg, incremented after the pre-pubertal performs the exercise in good shape.

#### Program Considerations:

1. Physical exams are mandatory.
2. The child must be emotionally mature to accept training and instruction.
3. Adequate supervision by coaches who have knowledge about muscle
4. Muscle training should be part of a program that includes increased motor skills and proper fitness levels. specific problems of the prepubescent (Wilmore and Costill, 1994).

It is important to understand that the mechanisms that allow changes in strength in children are largely performed without or with small increases in muscle size. A detailed study of the mechanisms responsible for increases in prepubertal children concluded that the probable determinants of strength gains obtained are: a) better motor skill coordination and b) increased motor activation and other neurological adaptations (Wilmore and Costill Physiology of Sport and Exercise, 1994).

In addition, regular training has no apparent effect on height growth. However, it can affect weight and body composition. Generally, the regular training results are lower total body fat, higher fat free mass and overall body mass upper. According to Fleck and Kraemer (2006), in all cases, insignificant hypertrophy occurs in the initial phase of bodybuilding training.

#### Resistance Training and the Adolescent

According to Alves *et al.* (2008): "Regular physical activity during childhood and adolescence can play a role in the prevention of bone disorders, such as osteoporosis." And he goes on to say:

Impact strength training (eg, running, gymnastics, dancing, basketball, athletics) provides a greater increase in bone mineral density compared to aerobic resistance, such as in swimming and water polo. Both types of training promote bone mineral density increase in comparison to non-performance of any of these activities (Alves *et al.*, 2008). It is observed that these authors emphasize the importance of performing physical activity among children and adolescents, including impact strength training. However, they recommend mild and moderate activity for children and adolescents, and caution in conducting resistance training, as follows:

Mild to moderate physical activity has a beneficial effect on stature growth and bone development, while intense physical activity slows growth and may cause pubertal delay and decrease in skeletal mineralization. Different sports modalities do not have specific effects in the sense of increasing or decreasing the final height. What happens is a selection bias in which children of short stature are recruited for some sports (Olympic gymnastics) and tall ones for others (basketball) because of a possible better performance in the activity. Although it is a controversial subject, the practice of bodybuilding by prepubescent children is not recommended unless under specialized supervision. Since it is not possible to know if parents, coaches and teachers can supervise them, bodybuilding, although permitted, should be cautiously recommended for pre-teens. The other aerobic physical activities will be indicated depending on the age, sex, pubertal stage and health status of the child (Alves *et al.*, 2008).

#### Methods of Resistance Training for Teens

According to Faigenbaum *et al.* (1999), resistance training for groups of children / adolescents can be performed twice a week on non-consecutive days for 8 weeks. Before each resistance training session, it is recommended to perform 10 minutes of low intensity aerobic exercises and stretching (focusing on the muscle groups that will be trained). It is essential that instructions and procedures for adequate resistance training are provided and are discussed and demonstrated for children or adolescents. During instruction, teens should have the opportunity to grasp the importance of training the proper way as well as understand the benefits and potential risks associated with resistance training. Students should be instructed to record their data in training records throughout the training period (Faigenbaum *et al.*, 1999). The training records should be analyzed daily, with appropriate adjustments in intensity and volume. Each session lasts 30 to 40 minutes. During the whole training period, it is recommended to carry out the activities in groups of 6 to 10

members (Faigenbaum *et al.*, 1999). The resistance training program consists of a set of exercises performed on exercise equipment of appropriate size. Right and left limbs should be trained simultaneously. During the first week of training exercise loads should be unregulated to cause voluntary fatigue within the prescribed repetition interval. The order of the exercises is changed at each session to maximize the enjoyment of achievement for adolescents (Faigenbaum *et al.*, 1999).

## Conclusion

After analyzing and studying different forms of strength training for young people, it is possible to affirm that prejudice regarding their practice still exists, however, for lack of arguments, this issue is not solved before society, making children and adolescents away from physical activities, which contributes to the formation of new obese, diabetic and cardiopathy. In general, it is necessary to report the importance of resistance exercise with free weights, as it helps, in addition to strength, the increase of motor repertoire, body proprioception and cognitive aspects. Strength training for children and adolescents, in addition to being beneficial in the short term, can stabilize and prevent the individual for the rest of his life if he continues in training, avoiding muscular, bone, heart and respiratory injuries, among others.

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