

Research article

**CHILDREN'S ATTITUDES TOWARD VARIOUS FORMS
OF RESISTANCE TRAINING**

UDC 796.015.52-053.5

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Abstract. *Despite the belief that resistance training was dangerous or ineffective for children, the safety and effectiveness of such programs are now well documented. The goal of this study was to examine the attitudes of children toward different forms of resistance training in which they were involved. One hundred 3rd and 4th grade children served as participants (age 9.5 years). Before filling out a questionnaire, the students were involved in five different resistance exercises types: exercises with their own body weight, exercises with barbells 1 kg in weight each, exercises with elastic bands, exercises with a partner and exercises with a BOSU ball (under unstable conditions). The questionnaire with a Likert scale of 5 degrees with responses ranging from 1 (strongly agree) to 5 (strongly disagree) consisted of questions exploring attitudes and degree of motivation toward various modalities of resistance training and their use in physical education classes. All of the selected modalities were evaluated positively by the children. Over 50% of the children stated that they strongly like all of the selected resistance training modalities. Exercises on a BOSU ball were the children's first choice (51%) followed by rubber bands (15%) while exercise with body weights were their last choice (9%). Within the limitations of the study, the data show that various modalities of resistance training exercises have the potential to increase physical activity and establish healthy physical activity patterns. The desire to experience new and different activities provided a significant role towards choice of modality of resistance training.*

Key words: *attitudes, children, resistance training*

Received March 14, 2017 / Accepted September 20, 2018

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INTRODUCTION

There is a constant increase of the number of children and adolescents which are physically inactive, overweight or obese. At the same time they are demonstrating poor standards of physical fitness, deficient levels of muscular strength and inadequate motor skill competency (Lloyd et al., 2016; Cohen et al., 2011; D'Hondt et al., 2013).

Several experts have suggested that resistance training may offer observable health value to obese children and adolescents (Lloyd et al., 2016; Faigenbaum, Lloyd & Myer, 2013; Ignjatović, Stanković, Radovanović, Marković, & Cvečka, 2009; Ignjatović & Radovanović, 2013; Radovanović & Ignjatović, 2015). Resistance training is considered a form of exercise that primarily improves muscular strength and endurance. During a resistance training workout, some parts of the body or the whole body oppose the resistance provided in different ways (with body weight, gravity, bands, weighted bars or dumbbells, surface, etc.).

The use of various forms of resistance training has been a highly debated topic in the past. It has been debated whether or not children and adolescents should participate in resistance training programs. Despite the belief that strength training was dangerous or ineffective for children, the safety and effectiveness of such programs are now well documented (Lloyd et al., 2016). The positive results of the numerous studies in scientific literature over the past decade have clearly stated the benefits (Ignjatović, Radovanović, Stanković, Marković, & Kocić, 2011; Ignjatović, Marković, & Radovanović, 2012). Also, review articles (Ignjatović et al., 2009; Faigenbaum et al., 2013) and position stands of leading world fitness organizations (American Academy of Pediatrics, 2008; American College of Sports Medicine, 2006; British Association of Sport and Exercise Science, 2004; Canadian Society for Exercise Physiology, 2008; National Strength and Conditioning Association, 2009; Lloyd et al., 2014) all state that strength training can be very beneficial for children and adolescents.

Similarly, several researchers have published results of programs that target increasing physical activity as a method for reducing obesity in children (Shabi et al., 2006; Benson, Torade, & Fiatarone Singh, 2008). Apart from the effectiveness of some forms of resistance training programs on obese children and adolescents, this form of training allows participants not to feel inferior which is what usually happens with some other forms of physical activity that involves continuous effort that they are unable to stand. Willing and joyful participation of obese children and adolescents in different forms of resistance training programs can be explained by the fact that resistance training is typically characterized by short periods of physical activity interspersed with brief rest periods between sets and exercises, which is more consistent with how youths move and play, and above all, allows overweight persons to fully participate without forcing them to give up as in the majority of other physical activity exercises and physical activity games.

An increase of different motor skills is an important feature of childhood and adolescence. The key areas of interests in resistance training during childhood are related to the risk of injury, the effectiveness of training to increase strength, especially during pubertal years, and the mechanisms underlying training-induced strength gains and changes in strength during detraining.

There is a variety of different kinds of resistance training programs that are very popular among males and females of different age categories. Resistance training with free weight and machines could be considered standard and most often used in research. Recently, other

forms of resistance training are coming in the focus of interest. Resistance training with a medicine ball is an old form of training that has gained new life in the last decade and is one of the forms of resistance training and testing most frequently used with young subjects (Davis et al., 2008; Ignjatović et al., 2012). Plyometric training has also been frequently used in research involving youths in the last decade. After the early statement that plyometric training is not suitable for kids, several stands and review articles (National Strength and Conditioning Association, 2009) encouraged researchers to proceed. However, many forms of training that are widely used among adult athletes as well as sedentary subjects and seniors are not investigated in children and adolescents. There are several studies that involved different forms of resistance training: exercises on an unstable surface (Bratić, Radovanović, Ignjatović, Bojić, & Stojiljković, 2012; Radovanović, Bratić, Marinković, & Ignjatović, 2013), exercises with a Pilates ball (Ignjatović, Radovanović, & Dondur, 2008), and exercises with punching bags (Ignjatović, Veselinovic, Radovanović, & Milenković, 2007).

In spite of the fact that the majority of different resistance exercises provided significant benefits for the participant, there is still little data on the effects of different resistance training modalities in youth. Moreover, the need for exploring attitudes of youths toward different types of resistance training is even more pronounced.

METHODS

The goal of this study was to examine the attitudes of children toward the different forms of resistance training in which they were involved. These data might serve to guide teachers, parents and resistance exercise practitioners' who work with children and adolescents in developing programs to meet the changing needs of the youth they work with. Research questions included in the children's questionnaire dealt with attitudes toward resistance exercise, that is, what students think of different forms of resistance training and what kind of exercise they prefer the most.

Participants

The participants were selected from lower school physical education classes in a state primary school. All students were enrolled in regular physical education class. Students, ranging in age from 8-11, were randomly selected from the 3rd and from 4th grade to complete the exercises and questionnaire. Each class consisted of 50 students with an equal number of girls and boys in each class. This made a total sample of 100 students (50 boys and 50 girls).

Procedures

Before the questionnaire, the students were involved in five different resistance exercise types: exercises with their own body weight, exercises with barbells (weight - 1 kg each), exercises with an elastic band (yellow Theraband), exercises with a partner and exercises with a BOSU ball (under unstable conditions). For each type of exercise 3 different exercises were conducted: exercises for the leg muscle – squat; exercises for abdominal muscles – crunches, and exercises for the upper body – push-ups (for girls modified push-ups).

Assistants were involved in the data-collection, and exercise demonstrators were asked to locate a classroom teacher who was willing to allow us to come into his or her class and have the students complete different kinds of resistance exercises and the survey questionnaire. This was done to allow the students to try different forms of resistance training exercises so they could compare it with regular physical education classes and to compare different types of resistance exercises. After the students tried all five different resistance exercise modalities they completed their surveys.

Exercises

In order to present the basics of different resistance training modalities, three basic exercises were selected for demonstration: the squat, push-ups and crunches. These exercises are already familiar to children and allow a large number of variations (e.g. in pairs, with a rubber band, dumbbells or unstable surfaces). All exercises were demonstrated and performed by children in five different modalities: with their own body weight, in pairs, with dumbbell's, with rubber bands and on an unstable surface (provided with BOSU ball). All exercises were performed in two series with 4-10 repetitions according to participants' capabilities.

Questionnaire

After their class with different modalities of resistance training exercises, the students filled out a questionnaire which explained the objectives of the study and requested their cooperation. The constructs were used to organize sections of the questionnaire related to (a) demographics; (b) likes and dislikes and motivation towards different modalities of resistance training; (c) a comparison of the resistance training exercise to regular classes of physical education; (d) a comparison of the different resistance exercise modalities. Demographic information included the personal attributes of each student: gender, grade level, and age. The second section asked students about which resistance exercises they would do, and what they liked and disliked. The third part of the questionnaire compared resistance training with regular physical education classes and the last part elicited information about the students' ranking of their favorite and least favorite type of resistance training modality offered. The questionnaire included a Likert scale with 5 points with responses ranging from 1 (strongly agree) to 5 (strongly disagree), but later regrouped into 'positive', 'neutral and, 'negative' which was developed from previous studies (Wetton, Radley, Jones, & Pearce, 2013; Ignjatović, Marković, & Janković, 2015) in order to identify the attitudes and degree of motivation toward various modalities of resistance training and their use in physical education classes. A panel of pedagogy experts reviewed the questionnaires for construct validity, and a pilot test was conducted on similar populations ($N = 16$ students) for clarity of language, meaning, and reliability. A test-retest procedure was used with an established minimum reliability percentage of 80%. Items were either reworded or eliminated if they had low reliability scores. Difference in ranking of the questions and analyses by frequencies and percentages were reported. The statistical package SPSS 23 was used to insert and process the data. For comparison of the attitudes of male and female students, an independent sample t-test with a set value of statistical significance below 0.05 was utilized.

RESULTS

To compare the attitude towards different modalities of resistance exercises, the individuals were grouped according to the exercise modality (see Table 1). It is observed that for all groups there is a tendency to show a positive attitude (from 3.81, SD = 1.36 to 4.2, SD 1.23). By analyzing the differences between the average score of exercise, the unstable training exercises on a BOSU ball had the highest score (4.2), with 62% of the participants ranking it with ‘strongly like’.

Table 1 Different modality of resistance exercise and attitude scores

	Strongly dislike (1)	Mostly dislike (2)	Neither like nor Dislike (3)	Mostly like (4)	Strongly like (5)	M	SD
Exercises with body weight	13,00%	5,00%	10,00%	19,00%	53,00%	3,94	1,42
Exercises in pairs	8,00%	13,00%	12,00%	16,00%	51,00%	3,89	1,36
Exercises with dumbbells	9,00%	9,00%	12,00%	17,00%	53,00%	3,96	1,35
Exercises with rubber bands	14,00%	8,00%	11,00%	17,00%	50,00%	3,81	1,47
Exercises on BOSU ball	7,00%	5,00%	11,00%	15,00%	62,00%	4,20	1,23

On the question of how to compare and rank the modality of resistance exercise they liked the most, more than half (51%) of the student chose resistance exercises on an unstable surface provided with a BOSU ball as their choice. The second choice was resistance exercises with rubber bands (15%), followed by exercises with dumbbells (13%), exercises in pairs (12%) and at the end exercises with body weight (9%).

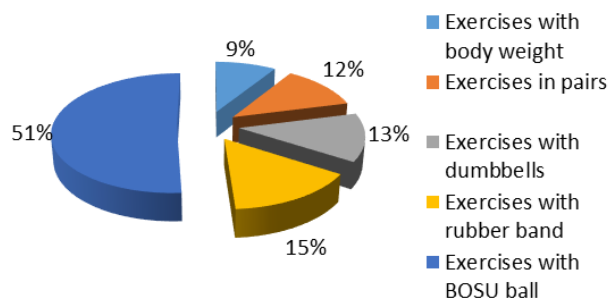


Fig. 1 Ranked answers of students’ first choice of exercise modality

When comparing resistance training exercise with regular classes, to the question: “I liked to perform different resistance training exercises more than the things I do during regular P.E. classes”, 34 % of the students reported strongly agree, and 23% reported agree, while 22 answered with disagree and 21% were undecided.

Table 2 Attitude towards different resistance training modalities between the male and female participants

Statement	Gender	M	SD	t-test	df	p
I enjoyed working exercises with my own body weight	M	3,86	1,44	-0,561	98	0,576
	F	4,02	1,40			
I enjoyed working exercises in pairs	M	3,66	1,45	-1,695	98	0,093
	F	4,12	1,25			
I enjoyed working exercises with dumbbells	M	3,84	1,36	-0,884	98	0,379
	F	4,08	1,35			
I enjoyed working exercises with rubber bands	M	3,86	1,47	0,337	98	0,736
	F	3,76	1,49			
I enjoyed working exercises with BOSU ball	M	4,10	1,26	-0,806	98	0,422
	F	4,30	1,21			

As it can be seen from Table 3, there is no significant difference in the participants' attitudes towards different resistance training modalities between the male and female respondents $p \geq 0.05$. This could mean that the respondents have the same very positive attitude towards all resistance training exercises, whether they are male or female

DISCUSSION

The main purpose of this study was to examine whether the various modalities of resistance training produce positive attitudes of children toward them. All of the selected modalities were evaluated positively by the children. Over 50% of the children stated that they strongly like all of the selected resistance training modalities. Most of them (77%; 62% strongly like and 15% like this kind of exercises) were attracted to the exercises on the BOSU ball. Exercises with body weight and exercises with dumbbells were positively rated by 72% and 70%, respectively. Finally, exercises in pairs and exercises with rubber bands were positively rated by 67%. One of the primary reasons why children are engaged with physical activity is the desire to experience different activities (Allender, Cowburn, & Foster, 2006). Exercises with a BOSU ball were definitely a modality of exercise that was new and exciting for the children. However, rubber bands exercises were also a relatively new form of exercise, but had received the most negative responses (14% answered strongly dislike).

Exercises with elastic bands gained considerable popularity as a form of resistance training among various populations. One of the reasons for this popularity lies in the possibility to generate muscle force throughout an entire range of motion and the potential for providing resistance in different planes. In this way it is possible to provide resistance to more functional movement patterns that mimic everyday activities and simple motor tasks. Exercises with elastic bands have been documented as a safe and effective strategy to improve muscle strength in various populations: youths (Coskun & Sahin, 2014), adults (Wallace, Winchester, & McGuigan, 2004), athletes (Treiber, Lott, Duncan, Slavens, & Davis, 1998; Page, 1993) and older adults (Galvao & Taaffe, 2005). The resistance exercise program using elastic bands proved to be especially safe and beneficial for the functional fitness of frail older adults (Dancewicz, Krebs, & McGibbon, 2003; Topp, Woolley, Hornyak, Khuder, & Kahaleh, 2002) and provide enough evidence for safety

and effectiveness in frail populations with a low initial level of muscle capabilities. On the other hand, a lack of fun and enjoyment (Butcher, Lindner, & John, 2002; Crane & Temple, 2015), and somewhat demanding positions during the selected exercises could be the main cause of the attitude toward this modality of resistance exercises in some children.

On the other hand exercises under unstable conditions, such as with unstable devices (a Swiss ball, BOSU ball, hemispheric and inflatable discs) have gained popularity in the past decade, and additionally, numerous studies have evaluated the role of instability in resistance training programs, but not in regular physical educational classes. The use of unstable environments has been proposed to enhance the specific effects of movement through an increased activation of stabilizers and core muscles and can, according to the concept of specificity, provide the instability that can occur with the activities of daily living, work, and athletic environments, providing additional benefits of exercises other than training on stable surfaces.

Allowing potential for a positive atmosphere, joy and fun could lead towards the continued participation with resistance exercise leading to development of fundamental movement skills, foundational strength and general athleticism (Lloyd et al., 2016; Faigenbaum et al., 2013), decrease the prevalence of overweight or obese youth (Hills, Andersen, & Byrne, 2011), and improve markers of health in obese and overweight youths (Benson et al., 2008),

Some previous studies (Dumith, et al., 2010; Fuchs et al., 1988; Sallis et al., 1998) demonstrate that males were significantly more active than females, and this association was even more pronounced in high versus moderate activity. Similarly, studies of the children's attitudes toward physical activity found that boys tend to have more positive attitudes toward more challenging physical activities with some elements of risk (Subramaniam and Silverman, 2007). In this aspect, a study (Zeng, Hipscher, & Leung, 2011) also found that boys favor weight lifting more positively than girls. Results of this study, however, indicate that there are no statistically significant differences between boys and girls in their attitudes toward any of investigated resistance training modalities (Table 2).

CONCLUSION

The findings of the current study further suggest that there are no initial barriers for inclusion of various resistance exercise modalities. The findings also suggest that resistance exercises are suitable physical activities for boys and girls. Furthermore, expert organizations are recommending activities of basic calisthenics or similar bodyweight management activities for boys and girls aged 6 to 10.

Acknowledgements. *Special thanks to all the participants for their participation, their parents, school authorities and teachers for allowing them to participate in this study, and student M. Matovic for active participation in exercise demonstration and data acquisition.*

This study was conducted under the project "Effects of applied physical activity on locomotor, metabolic, psycho-social and educational status of the population of the Republic of Serbia" No. III47015, funded by the Ministry of Science and Technology of the Republic of Serbia

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STAVOVI DECE PREMA RAZLIČITIM OBLICIMA TRENINGA SA OPTEREĆENJEM

Uprkos nekadašnjem uverenju da je trening sa opterećenjem opasan ili neefikasan za primenu kod dece, trenutno postoji puno naučnih dokaza koji govore u prilog bezbednosti i efektivnosti ovakvih programa. Cilj ove studije bio je ispitati stavove dece prema različitim oblicima treninga sa opterećenjem. Uzorak ovog istraživanja činilo je sto učenika trećeg i četvrtog razreda (starost učenika 9.5 godina). Pre popunjavanja upitnika, učenici su bili uključeni u pet različitih tipova vežbi sa opterećenjem: vežbe sa sopstvenom telesnom masom, vežbe sa jednoručnim tegovima od po 1kg, vežbe sa elastičnim trakama, vežbe sa partnerom i vežbe sa BOSU loptom. Upitnik sa petostepenom Likertovom skalom sa odgovorima od 1 (slažem se u potpunosti) do 5 (ne slažem se u potpunosti) sastojao se od pitanja koja istražuju stavove i stepen motivacije prema različitim modalitetima treninga sa opterećenjem i njihovoj upotrebi na časovima fizičkog vaspitanja. Svi odabrani modaliteti vežbanja ocenjeni su pozitivno. Preko 50% dece navelo je da im se dopadaju svi primenjeni modaliteti vežbanja sa opterećenjem. Vežbe na BOSU lopti su bile prvi izbor dece (51%), zatim elastične trake (15%), dok su vežbe sa sopstvenim opterećenjem bile njihov poslednji izbor (9%). Uprkos limitima istraživanja, podaci ukazuju da različiti modaliteti vežbi sa opterećenjem imaju potencijal za primenu u nastavi fizičkog vaspitanja kao i za povećanje opšteg nivoa fizičke aktivnosti. Deca su pokazala želju da se uključe u različite oblike vežbanja sa opterećenjem.

Ključne reči: stavovi, vežbe sa opterećenjem, učenici