Original Article

RBAFS Revista Brasileira de Atividade Física & Saúde
SOCIEDADE BRASILEIRA DE ATIVIDADE FÍSICA & SAÚDE

rbafs.org.br

Jump gymnastic at school physical education for adolescents and adults: changes and prevalence of success in health-related physical fitness

Ginástica "Jump" na Educação Física escolar para adolescentes e adultos: alterações e prevalência de sucesso na aptidão física relacionada à saúde

AUTHOR'S

Vanilson Batista Lemes[1]
Caroline Brand[1]
Arieli Fernandes Dias[1]
Adroaldo Cezar Araujo Gaya[1]
Anelise Reis Gaya[1]

1 Universidade Federal do Rio Grande do Sul. Escola de Educação Física Fisioterapia e Dança, Porto Alegre, Rio Grande do Sul, Brasil.

CORRESPONDING

Vanilson Batista Lemes
vanilson.lemes@hotmail.com
Rua Espírito Santo, nº189, apto 303, Mirim, Imbituba, Santa Catarina, Brasil. CEP: 88780-000.

DOI

10.12820/rbafs.23e0054

ABSTRACT

This study aimed to verify changes and prevalence of success in health-related physical fitness after an intervention with jump gymnastic at physical education classes for adolescents and adults according to gender. Thirty-nine adolescents and adults (20 women) were selected for convenience, aged between 15-61 years old, at a school in Charqueadas, Rio Grande do Sul, Brazil. The intervention consisted on 60 Jump gymnastic classes, three times per week in a school semester. The body mass index (BMI); waist circumference (WC); cardiorespiratory fitness (CRF); flexibility and abdominal strength were evaluated. The changes and the prevalence of success were calculated according to specific cutoff points for the individual pre- and post-test variation (Δ%; mean) and Manova analysis was adopted as comparison test for means variation between gender and variation of this groups at time. BMI have not changed (Δ = –1.17%, p = 0.123) in women, however it increased (Δ = 2.07%, p = 0.035) in men. PC have not changed (female: Δ = 0.71%, p = 0.341, male: Δ = 1.09%, p = 0.564). Abdominal strength increased (Δ = 145.47%, p = 0.001) in women but not in men (Δ = 12.82%, p = 0.411). The flexibility increased similarly in women (Δ = 16.07%, p = 0.041) and men (Δ = 17.32%, p = 0.039) and CRF increased only in women (Δ = 14.32%; p = 0.028). The individual prevalence of success was 41% in flexibility, 33% in CRF, 23% in abdominal strength, 15% in WC and only 10% in BMI. Women had stronger benefits compared to men with the Jump in physical education, mainly in abdominal strength and CRF.

Keywords: Muscle strength; Cardiorespiratory fitness; Body mass index; Intervention study; Adolescents; Adults.

RESUMO

Este estudo objetivou verificar alterações e a prevalência de sucesso na aptidão física relacionada à saúde após intervenção com ginástica "Jump" na educação física escolar para adolescentes e adultos, estratificado por sexo. Selecionou-se, por conveniência, 39 adolescentes e adultos (20 mulheres), de 15 a 61 anos em uma escola de Charqueadas, Rio Grande do Sul, Brasil. A intervenção consistiu em 60 aulas de ginástica "Jump", três vezes por semana em um semestre de educação física. Avaliou-se o índice de massa corporal (IMC); perímetro da cintura (PC); aptidão cardiorrespiratória (APCR); flexibilidade e força abdominal. As alterações e a prevalência de sucesso foram calculadas através da variação individual pré-teste para pós-teste (Δ% média) e a análise de Manova foi adotada como teste de comparação para variações das médias entre gênero e variação desses grupos no tempo. O IMC do sexo feminino não alterou (Δ = –1,17%; p = 0,123), diferentemente do masculino que aumentou (Δ = 2,07%; p = 0,035). O PC médio não alterou significativamente (feminino: Δ = –0,71%; p = 0,341; masculino: Δ = 1,09%; p = 0,564). A força abdominal feminina aumentou (Δ = 145,47%; p = 0,001) e o sexo masculino não teve alteração (Δ = –12,82%; p = 0,411). A flexibilidade aumentou similarmente no sexo feminino (Δ = 16,07%; p = 0,041) e no masculino (Δ = 17,32%; p = 0,039) e a APCR aumentou somente no sexo feminino (Δ = 14,32%; p = 0,028). A prevalência individual de sucesso foi de 41% na flexibilidade, 33% na APCR, 23% na força abdominal, 15% no PC e apenas 10% no IMC. O sexo feminino teve maiores benefícios em relação ao masculino com o Jump na educação física, principalmente na força abdominal e na APCR.

Palavras-chave: *Força muscular; Aptidão cardiorrespiratória; Índice de massa corporal; Estudo de intervenção; Adolescentes; Adultos.*

Introduction

Physical education at school and in public context is an important parameter for the development of physical activity (PA) and improvement of physical fitness and health[2,3]. A wide range of studies showed positive results from interventions in physical education classes, exercise and PA, promoting high levels of moderate to vigorous PA[4], improving physical fitness in musculoskeletal and cardiometabolic components[2,5,6] and reducing sedentary behavior[7] in children and adoles-

cents. The interventions with behavior and education approaches for a better lifestyle in general, by means of physical exercise, also succeed in improving body mass index[8]. Beyond health-related physical fitness, physical education classes are important to the global development of students[1-8].

However, physical education presents some divergent issues regarding pedagogy and teaching methodology, and due to different school populations, objectives and contexts, it could interfere as boundaries, contributing to low levels of PA and this may have negative health impacts [9,10]. Also, physical fitness is one of school physical education goals, which are relevant health markers to healthy lifestyle[1-10]. In addition, in Brazilian context the high dropout rates due to situations of vulnerability, such as poverty and the need of working, make it difficult to apply interventions with physical education for health[11]. The situations upper described can lead adolescents to become adults who need to return to school, usually during the opposite shift to their daily work, at night[11–14]. This modality of education is called in Brazil as: *"Educação de Jovens e Adultos"* or "(EJA)", in English: Adolescents and Adults Education (AAE).

This educational context requires researches regarding physical education to improve physical fitness levels and promoting of a healthy lifestyle[12,13,14]. It is particularly important because the benefits of physical exercise for adolescents and adults most of the times in vulnerable conditions can be achieved only at school[14,15]. Preview studies[11,14,15], indicated that dance and rhythmic gymnastics classes at physical education classes were capable of improving self-perception of anxiety, stress and increasing PA levels and cardiorespiratory fitness (CRF) in adolescents and adults[11,15].

According to these studies, the knowledge about specific interventions with physical fitness levels in this school context at Brazil is insufficient. It is still important to highlight that information regarding the effect of interventions on the individual values of physical fitness are limited, since most of the studies describe the "mean" effect of interventions[2,5,6,11]. Although, previous studies have shown that it is important to consider interindividual variability to physical education and training[16–18]. Therefore, considering that the education of adolescents and adults is a context in which individual differences are very important for human development at school as age and physical capacities of learning[11–15], the aim of this study was to verify changes and prevalence of success in health-related physical fitness (i.e., relevant pre- and post-test variation in these indicators) after intervention with jump gymnastic at physical education classes in adolescents and adults according to gender.

Methods

This semi-experimental research, an intervention to improve health-related physical fitness[2], with quantitative approach and was conducted in a public school from Charqueadas, Rio Grande do Sul-Brazil. It was developed an intervention with Jump gymnastic in physical education classes to adolescents and adults (*EJA* education program), carried-out at night, in a vulnerable neighborhood exposed to poverty, violence, unemployment, low educational level and placed on near a state penitentiary. Ethics and Research Committee of *Universidade Federal do Rio Grande do Sul* approved the study (1.662.821). Also, this research has been complied in accordance to Helsinki Declaration[19].

In the studied city there were four schools which offered education for adolescents and adults during the night shift. The school voluntary participant of this study was the only one of the neighborhoods which is next to a state penitentiary complex in a vulnerable zone. The population in school participant at the night shift education was composed by 74 students, divided in 4 classes and all of them were invited to participate of this intervention. These adolescents and adults were selected by non-random sample, by convenience[2,20], according interest of school, main teachers of each class and participants. Participants were invited to sign a consent agreement and a free and informed consent. The ones under 18 years old presented this document signed by parents or guardians. Considering this, 39 students from two classes accepted to participate, 20 female and 19 males, aged between 15 to 61 years. The scholar level of participants was ranged between the third year of elementary school (start alphabetization level) to ninth year. The data from the students who decided do not participate in the research were not considered, however they were submitted to the same intervention, since it was developed during physical education classes.

The intervention was carried-out in physical education classes during the first semester (March to August) of 2016 according the school proposal (Figure 1). It was composed by 60 lessons of gymnastic in mini-trampoline with music and rhythmic, choreography,

popularly called in Brazil as Jump gymnastic. These classes were applied three times a week, once with 45 minutes and twice with 30 minutes, as established by the regiment of the school institution[11,15].

The process of implementation of intervention in physical education started in 2015 with a partnership between school and donation voluntary companies, which provides 20 mini-trampolines to school. The teacher had experienced with this type of physical education activities through the previous year and major boundaries of implementation already had been minimized[15]. The intervention took place at school auditorium according to the following procedures.

When classes lasted 45 minutes, the lesson started with a conversation about healthy lifestyle, the teacher answered questions about eating habits, exercises effects on health and other trivial daily habits to help students developing a better lifestyle and body capacities. Figure 1 have information on the organization of the intervention. The classes intensity was controlled by: (1) through beats per minute (BPM) of music style and by (2) subjective perception for body efforts. Previous studies indicated that these methods were safe to control and increase the exercise's intensity over time [15]. This kind of physical education was implanted at school in 2015 and it was according with education's laws of this period[21].

Each Jump gymnastic session was composed by two parts: 1) initial part (about 10 to 15 minutes), for heating and stretching of lower and upper limb musculature, exercises to increase muscle tone, activities that stimulated the motor skills development; 2) main part (15-20 minutes), intend to perform exercises for development of physical capacities of resistance (jumping practice) and strength (through slow concentric movements and slow eccentrics), performed with the weight of the body itself, with controlled intensity according to self-perception of effort (Borg scale) and BPM of music.

Health-related physical fitness was characterized according to *Projeto Esporte Brasil* (PROESP-Br)[22] protocol, which was used in previous intervention study with adolescents and adults[2,11,22]. Body mass index (BMI), cardiorespiratory fitness (CRF), waist circumference (WC), abdominal strength and flexibility were assessed before and after intervention.

Weight was measured using a digital anthropometric scale, graduated from 0 to 150 kg, with a resolution of 0.05 kg and recorded in kilograms, using one digit after the decimal point. Height was measured using a metric tape fixed on the wall and extended from the bottom upwards, with the subject in the upright position, with feet and trunk touching the wall[2,11,22]. Then, BMI was calculated dividing body mass (in kilograms) by height (in square meters). WC was evaluated with a tape measure with 0,01 cm precision, it was placed horizontally at the midpoint between the lower edge of the last rib and the iliac crest, which was tightly wound around the body without compressing the measured region[2,11,22]. This measure was realized only once.

CRF was assessed by running and walking test in

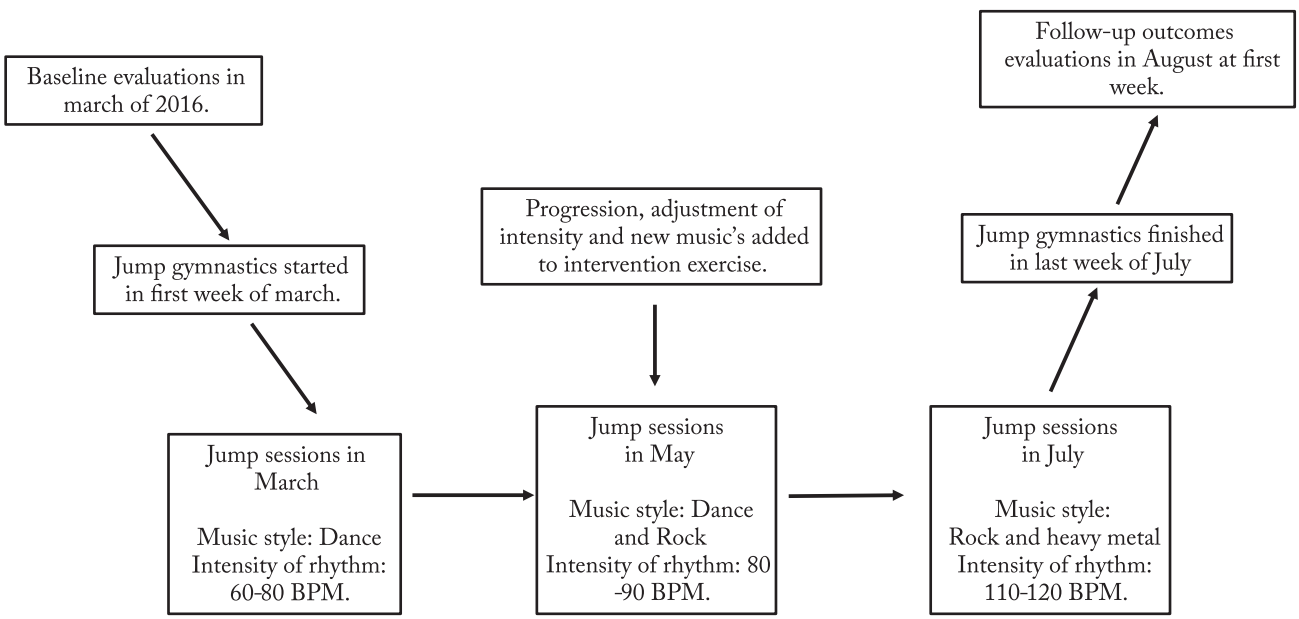

Figure 1 – Jump gymnastics intervention progression over six months. Charquedas, Rio Grande do Sul, Brazil, 2016.
BPM = beats per minute.

six minutes. The student must accomplish the greatest number of turns, running or walking, in a sports court with the perimeter marked with cones and the ground with indications of meters. The measurement of the test was noted from the number of laps performed, plus the meters in the case of those who at the end of the time did not complete a full lap, so after multiplying the number of laps by the perimeter of meters covered was obtained the estimate of CRF[2,11,22].

Abdominal strength was evaluated once, through the one-minute sit-up test, performed with the student individually in the supine position with knees flexed at 45 degrees, arms crossed over the thorax, and ankles fixated to the floor by the evaluator. At the evaluator's sign, the student flexed the trunk until he/she touched the thighs with the elbow, returning to the starting position, as many times as possible in one minute[2,11,22].

Flexibility was evaluated by sit-and-reach without a bench[2,11,22]. This test was performed with a measuring tape fixed on the ground. At the 38-cm mark on the tape, a piece of 30-cm stick tape was fixated perpendicularly. The students were barefoot, with extended knees and overlapping hands; the student individually slowly bowed and stretched out the hands as far as possible in two attempts, of which the higher one was recorded[22]. The test was applied twice and it was recorded the highest value.

Gender, age, and number of missing PE classes during the semester were evaluated during interventions through school diaries and self-reported data. The number of days that the participants practiced organized PA outside the school was also noted according to the question of the international PA questionnaire, about how many days in the last week had they practiced moderate to vigorous PA for at least 10 minutes outside of school[23].

Descriptive statistical analyses by means, standard deviation and minimum/maximal values were calculated for sample characterization. Some variables presented non-normal distribution in exploratory analysis, so Anova One Way was performed to comparisons between genders in baseline, presenting also the eta squared effect ($\varepsilon\tau\alpha^2$), this method was selected due to robust estimation and the simply possibility of $\varepsilon\tau\alpha^2$ conversion to proportion effect providing better comprehension of results. The reliability inter-subjects and inter-evaluations (pre-teste x post-test) in physical fitness variables showed strongest Cronbach alphas (CA) and intraclass correlations (ICC), respectively CA = 0.87 – ICC = 0.77 to Flexibility, CA = 0.87 – ICC = 0.78 to abdominal strength, CA = 0.97 – ICC = 0.95 to WC, CA = 0.88 – ICC = 0.78 to CRF and both values were 0.99 to BMI. Reliability indicators for PA days were CA = 0.88 and ICC = 0.79. Then, all variables included in statistical analyses indicated a good reliability[24].

The prevalence of success was calculated from the following method: (1) the variation between the individual students was performed with delta percentage effect (Δ%) calculated according to the formula: variable value at follow-up, minus the value at baseline, divided by baseline value and multiplied per 100; (2) for each outcome variable was considered a cut-point to effect Δ% individual[24,25], according to the determination of pre-test to post-test mean variation obtained in each outcome in previous studies with interventions to improve health indicators: BMI (individual effect > 4%); WC (> 5%); Flexibility, CRF and abdominal strength (> 10%)[2,5,11,26]. These method of classification was performed according to the literature that suggest this kind of analysis, when there are not specifying cut points available[24,25]. The general Δ% mean effect of intervention was adjusted for PA out of school days, gender, age and missing physical education classes, through multiple analyses of variance (MANOVA), considering the necessity of adjustment for intervenient variables, normality of Δ% mean effect, the non-significative box-test and the fact that physical fitness outcomes presenting association. Additionally, by MANOVA test, it is possible to verify the differences in some outcome variables at the same time, reducing the error by applying of statistical tests many times to each outcome. Then, all outcome variables were included in unique test to minimize errors of repeated adjusted linear models, considering a significance level of 0.05.

Results

The flow diagram to intervention subject selection and the distribution of them in each Jump physical education class, as well as, how they were included and excluded in results of this study. It is important to describe that the organization of the classes were done according to the school management in non-randomized form. Other factor that can be noticed is that 21 students weren't included in the follow-up evaluation and analyses because they left the studies at school and 9 did not authorize the data to final reports of the intervention (Figure 2).

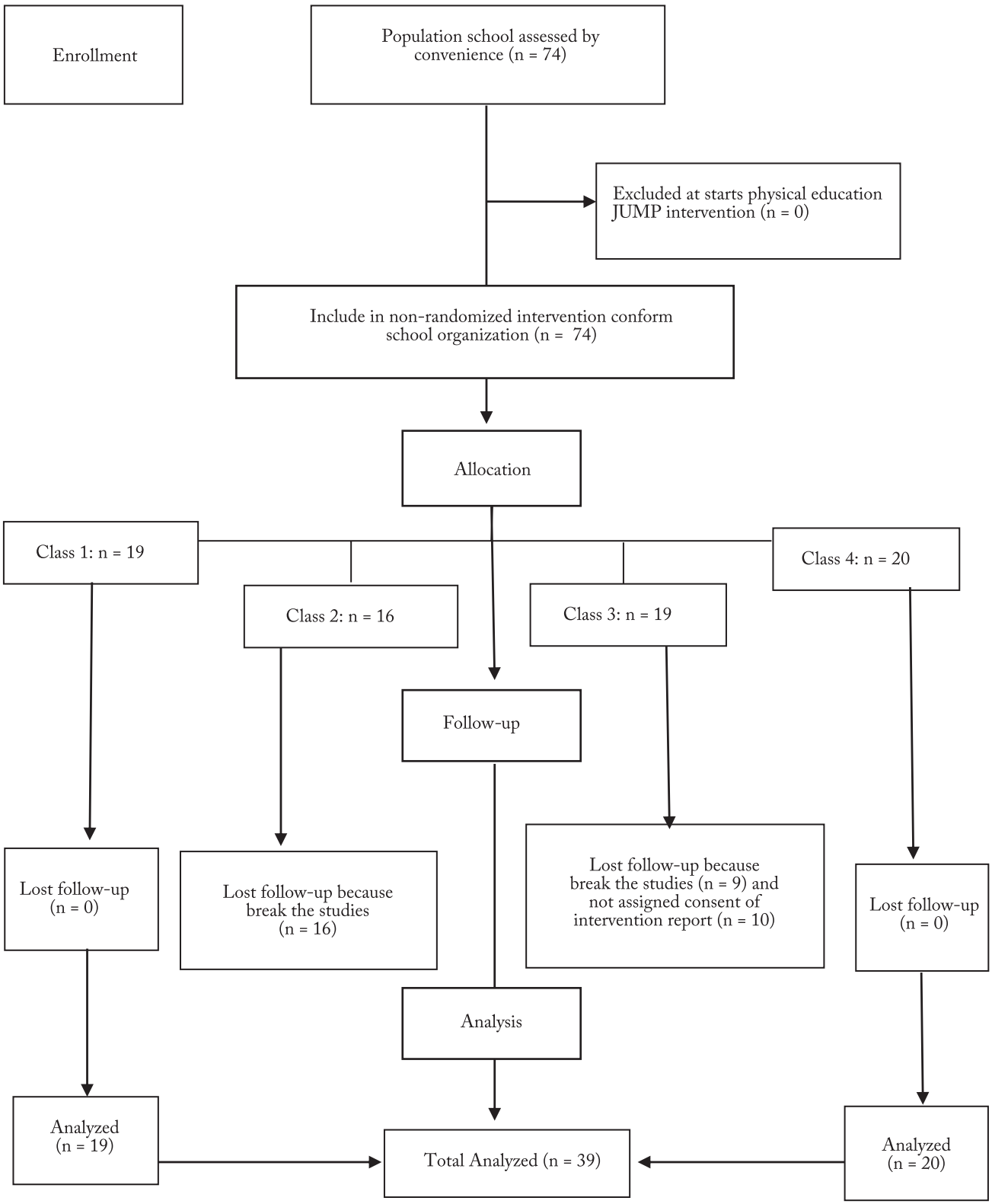

Figure 2 – Flow diagram to enrollment of intervention. Charquedas, Rio Grande do Sul, Brazil, 2016.

At baseline, males had higher values for height, abdominal strength, CRF, PA days comparing to females, and lower values of WC and BMI (Table 1).

Significant improvements were observed for flexibility and BMI among male students after intervention. On the other hand, female students had a sig-

nificant improvement in abdominal strength, flexibility and CRF. Significative differences between effects and gender was observed in abdominal strength and BMI, where, males did not present effects in abdominal strength and obtained greater values of BMI in follow-up period (Table 2).

It was found improvements of 15% in BMI, 30% in abdominal strength, 35% in flexibility, 40% in CRF and 30% in WC for female gender and 1.9%, 15.8%, 47.4%, 26.3% and 10.5%, respectively for male gender (Figure 3). Consequently, results concerning total sample (n = 39, data not shown in Figure 3) indicated that 41% of subjects improved flexibility in follow-up period, 33% presented better CRF levels, 23% increased abdominal strength, 15% decreased WC and only 10% improved BMI.

Discussion

The main findings of the present study indicated that females obtained greater mean effects in flexibility, CRF and abdominal strength. While, males did not show this, apparently the only positive and consistent mean change was a small increase in flexibility. The prevalence of success to the intervention in health-related physical fitness was: a decrease of BMI and WC and increase of CRF, flexibility and abdominal strength for females and males.

A growing body of evidences indicated that gender influences PA levels, and consequently give effects on health-related physical fitness, indicating that males are more protected in this aspect[1–3,5,6,26]. In the present study, there were gender influences when the intervention started, fact that showed a greater relation with

Table 1 – Participants characterization in baseline and gender comparison, Charquedas, Rio Grande do Sul, Brazil, 2016.

	Female (n = 20)				Male (n = 19)					
	Mean	SE	Min	Max	Mean	SE	Min	Max	p	Eta2
Missing classes (days)	25.85	3.54	4.00	52.00	22.11	3.64	2.00	55.00	0.471	0.02
Age (years)	30.40	3.54	15.00	61.00	22.21	2.48	15.00	47.00	0.070	0.09
Body mass (kg)	75.09	5.01	44.90	131.60	66.87	3.68	46.00	113.20	0.202	0.04
Height (m)	1.63	0.01	1.55	1.76	1.72	0.02	1.57	1.90	0.001	0.26
Abdominal strength (rep)	12.53	2.62	0.00	30.00	33.63	2.30	14.00	52.00	0.010	0.51
Flexibility (cm)	28.63	2.23	15.00	47.00	32.32	3.38	7.00	64.00	0.372	0.02
Waist circumference (cm)	87.52	3.60	61.50	120.00	77.02	2.75	64.00	110.30	0.035	0.13
Cardiorespiratory fitness (m)	612.00	26.07	445.00	982.00	952.68	39.41	681.00	1216.00	0.001	0.59
Physical activity (days)	0.60	0.26	0.00	3.00	2.21	0.40	0.00	5.00	0.001	0.24
Body mass index (kg/m²)	28.33	1.96	15.91	51.41	22.45	0.86	17.54	31.36	0.001	0.17

SE = standard error; Min = minimum value; Max = maximum value; p = significance level at alpha < 0.05; Ετα² = anova effect between genders effects in base-line (pre-test).

Table 2 – Mean effects (pre- and post-variation) of intervention according to gender, Charquedas, Rio Grande do Sul, Brazil, 2016.

Outcome	Gender	Δ% mean	SE	95% CI		p-(time)	p-(gender)
Body mass index (Kg/m²)	Female	-1.17	0.74	-2.42	0.09	0.123	0.006
	Male	2.07	0.76	0.78	3.37	0.035	
Abdominal strength (rep)	Female	145.47	48.53	63.01	227.94	0.001	0.036
	Male	-12.82	50.12	-97.98	72.34	0.411	
Flexibility (cm)	Female	16.07	9.20	0.44	31.70	0.041	0.927
	Male	17.32	9.50	1.18	33.46	0.039	
Cardiorespiratory fitness (m)	Female	14.32	5.76	4.53	24.10	0.028	0.385
	Male	6.79	5.95	-3.32	16.89	0.196	
Waist circumference (cm)	Female	-0.71	1.48	-3.22	1.80	0.341	0.420
	Male	1.09	1.53	-1.51	3.68	0.564	

D% mean = mean delta effect in percent; SE = standard error; 95% CI = confidence interval with 95% of probability; p-(time) = significance value difference between baseline and follow-up evaluations-(gender): significance value difference between male and female gender; Values adjusted by age, PA days and missing classes.

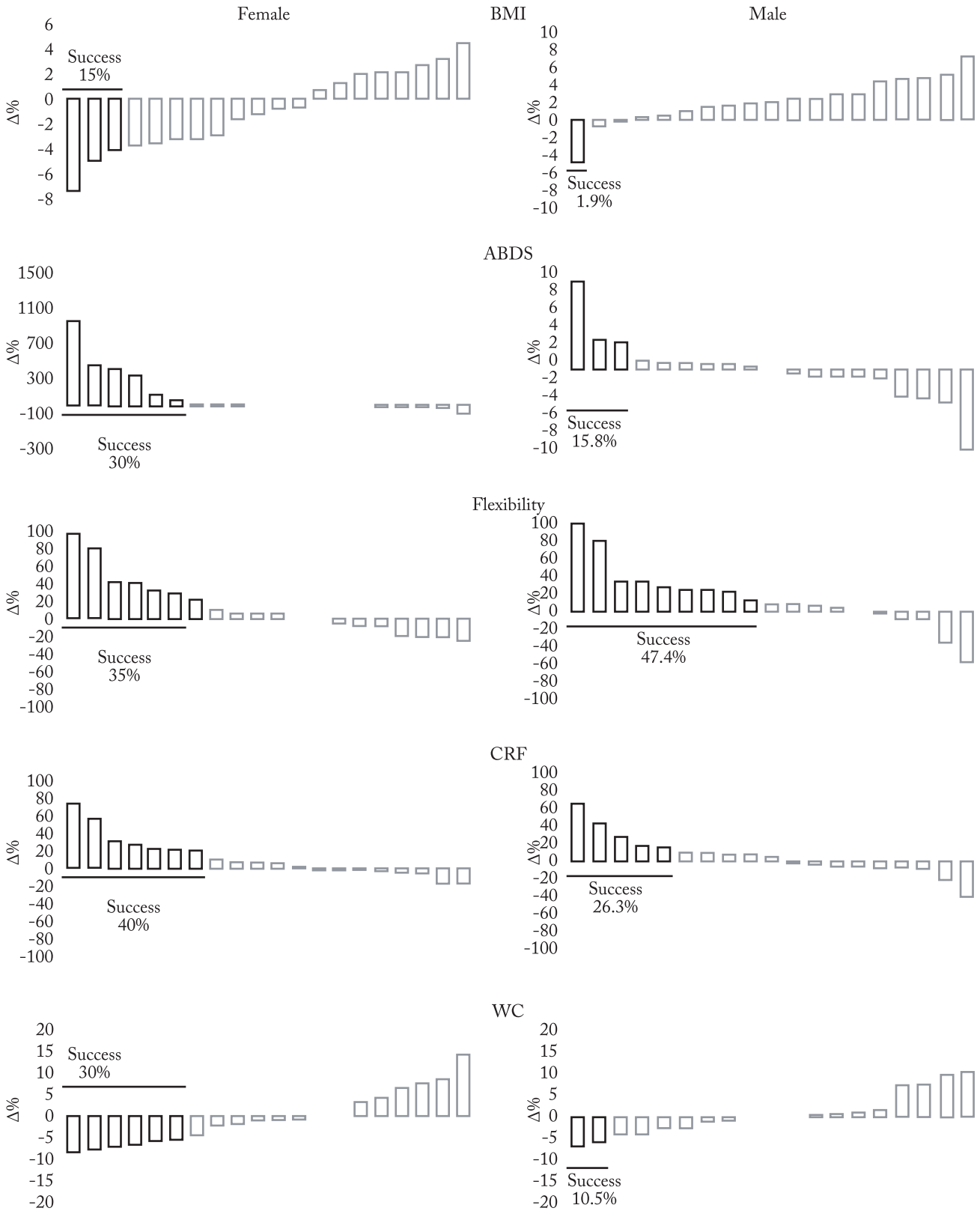

Figure 3 – Individual Prevalence of success to health-related physical fitness by gender.
Description: D% = difference individual in percentage between post-test – pre-test; ABDS = abdominal strength; Success = prevalence of success.

Δ% of individual variation. Males presented lower favorable changes than females, probably because the PA levels and intensity of training during jump gymnastic did not achieve physiological exigences from male body

biological parameters[2,5,11]. These small change in male gender could be explained due to the high levels of CRF and abdominal strength at baseline and because they were younger, comparing to females. Flexibility was the variable with higher improvements in both genders. This result was also described in some interventions studies with health indicators, showing that improvements in cardiometabolic variables, as BMI, were harder to achieve, while better results were observed in muscular health related fitness and CRF[2,27].

However, results of the present study are relevant, concerning physical education to increase physical capacities in adolescents and adults, indicating that jump gymnastics classes had positive effects for female in all health-related physical fitness levels, in cardiometabolic variables, as CRF and in muscular, flexibility and strength variables. Therefore, due to the vulnerability context and difficulties of the participants, such as studying at night and working at daytime, these results are still more relevant[11]. Mainly, when the international context indicates the urgency to consider gender differences in physical education classes[28]. In this sense, interventions proposed for female gender should consider modalities of PA, such as dance, rhythmic and gymnastics, as well as individual preferences, in order to motivate and increase enjoyment in classes[29]. The above-mentioned factors could help to understand gender differences regarding effects of intervention.

On the other hand, our results about prevalence of success to the intervention on health-related physical fitness showed that effects of Jump gymnastics varied 10% in BMI, 15% in WC, 23% to abdominal strength, 33% to CRF and 41% in flexibility in total sample. Results also presented improvements about 15% to BMI, 30% to abdominal strength, 35% to flexibility, 40% to CRF and 30% WC to female gender, and 1.9%, 15.8%, 47.4%, 26.3% and 10.5% to the same variables in male gender. These results were non-significative in differences by gender considering p-values. Nevertheless, the prevalence of success to the intervention by gender presented difference in absolute values (Figure 3).

In a clinical and pedagogic point of view, and considering that the number of subjects in the present study were only 19 males and 20 females, the fact that four females improved abdominal strength from 20% to 900% is considerable an expressive result. The same can be observed in other variables, and for male gender in individual improvements. However, we had caution about these results and it is necessary to consider that this could be a bias of selection and adherence to intervention. In fact, those students who had minus physical fitness could be more engaged in intervention process, obtaining higher changes in lower physical fitness components.

However, even then the intervention had a greater individual relevance, probably if these people did not engage in physical education classes, they would not have other place to improve physical fitness. The impact of these results could be important, in order to improve the quality of life for these people, as well as working activities and school performance. It is a consensus that physical fitness is an important health indicator and that physical education is a suitable strategy to a healthier lifestyle[1–6,26].

Our study also indicated that there were differences in individual profile (Figure 3), and this provides distinct effects in health indicators[25]. This kind of effect was not described in previous intervention studies, regarding physical education for health-related physical fitness improvements. In this sense, some authors reported only the mean effect of variation, Al-Khudairy et al.[8] found that BMI improvement was observed in a proportion of 5% to 12% in adolescents. Oliveira et al.[2] indicated 6% to 22% of increasing in flexibility, 17% to 22% in abdominal strength and 9% to 11% in CRF. In previous studies with similar sample[11], there was no favorable results in WC and in CRF was only 9.7%. Santanasto et al.[30] also suggests that improvement in mean of WC was low, about 2.3% after 12 months of intervention. The Δ% mean of male and female in our study was similar to the effects described in the literature.

However, the above mentioned studies considered only the mean effects of variation, while our approach considered interindividual variation, by calculating the prevalence of success after a physical education intervention[24,25]. It is important to mention that the mean effects, may lead to an underestimated result or an error in the interpretation of the intervention effectiveness, mainly if it is based only in p-significance value for statistical methods[2,11,24,25]. In addition, previous research showed the relevance of individual effects measures in physical education interventions, since they present a greater influence in physical fitness, mainly in CRF[16-18]. It is the mainly strength of our study, considering also, the intervention enjoyment benefits to adolescents and adults education from a good planed physical education. Other point of strength, is the possible and non-measured wellness benefits of exercise and physical education to adolescents and adults[13,14].

The present study demonstrates that it is possible improving physical fitness with simple methods of exercise sessions, which could be organized in three parts: with body warming, exercise, physical activity learning practice and a final period of muscular relax[26,27], as well as, intensity control in jump gymnastic factor that was considered although self-perception in the present study. Others studies with jump interventions sustain our results presenting improvements in exercising level[15], increasing CRF and physical fitness[2,6,11,26], however they do not present individual effects.

Some limitations should be taken into consideration. The high level of missing classes during the intervention occurred because, according to the law in Brazil, physical education at school is not mandatory for the ones who work more than six hours per day[21]. So, the engagement of participants, in hypothesis, was dependent of motivation and satisfaction with the intervention, factors that were not measured. Also, the sample size and the sample selection by convenience do not allow generalization of the results. Finally, the absence of a control group is another limitation, which had a probably boundary of inference to the present results as cause and effect. In other way, the academic strength of the method this study was that we included both kinds of intervention effect, considering a "mean term" and the interindividual variability, which has not been investigated in relation to health-related physical fitness in adolescents and adults. Also, we highlight that there are few studies developed on this educational vulnerability context[12-15].

In conclusion, some subjects obtained important changes in flexibility, CRF, abdominal strength and WC. Female gender had stronger benefits compared to males with the Jump in physical education, mainly in abdominal strength and CRF. Also, there was a high prevalence of success from the intervention on health-related physical fitness, mainly, in CRF, flexibility and abdominal strength. These results suggest that the intervention in physical education was effective for improving health-related physical fitness among adolescents and adults students from night-shift education.

Interest Conflicts

The authors declare no conflict of interest.

Financing

The authors Brand C, Dias AF and Gaya ACA receive scholarships from the Coordination for the Improvement of Superior Education Personnel (CAPES) and the National Council for Scientific and Technological Development (CNPq).

Authors Contributions

Lemes VB, participated in the initial conception of the study, writing, was responsible for literature search, data collection and critical review of the text. Brand C, participated in the initial conception of the study, writing, was responsible for literature search, and critical review of the text. Dias AF, participated in the initial conception of the study, writing, was responsible for literature search, and critical review of the text. Gaya ACA, participated in the initial conception of the study, writing, was responsible for literature search, and critical review of the text. Gaya AR, participated in the initial conception of the study, writing, was responsible for literature search, and critical review of the text.

References

1. Langford R, Bonell CP, Jones HE, Pouliou T, Murphy SM, Waters E, et al. The WHO health promoting school framework for improving the health and well-being of students and their academic achievement. Cochrane database Syst Rev. 2014;4.
2. Oliveira LCV, Braga FCC, Lemes VB, Dias AF, Brand C, Mello JB, et al. Effect of an intervention in physical education classes on health related levels of physical fitness in youth. Rev Bras Ativ Fis Saúde. 2017;22(1):46-53.
3. Reed JL, Prince SA, Cole CA, Fodor JG, Hiremath S, Mullen K-A, et al. Workplace physical activity interventions and moderate-to-vigorous intensity physical activity levels among working-age women: a systematic review protocol. Syst Rev. 2014;3:147.
4. Dallolio L, Ceciliani A, Sanna T, Garulli A, Leoni E. Proposal for an enhanced physical education program in the primary school: evaluation of feasibility and effectiveness in improving physical skills and fitness. J Phys Act Health. 2016;13(10):1025-34.
5. Giannaki CD, Aphamis G, Tsouloupas CN, Ioannou Y, Hadjicharalambous M. An eight week school-based intervention with circuit training improves physical fitness and reduces body fat in male adolescents. J Sports Med Phys Fitness. 2016;56(7–8):894-900.
6. Seabra AA, Katzmarzyk P, Carvalho MJ, Seabra AA, Coelho-E-Silva M, Abreu S, et al. Effects of 6-month soccer and traditional physical activity programmes on body composition, cardiometabolic risk factors, inflammatory, oxidative stress markers and cardiorespiratory fitness in obese boys. J Sports Sci. 2016;34(19):1822-9.
7. Fairclough SJ, McGrane B, Sanders G, Taylor S, Owen M, Curry W. A non-equivalent group pilot trial of a school-based physical activity and fitness intervention for 10-11 year old english children: born to move. BMC Public Health. 2016;16(1):1-14.
8. Al-Khudairy L, Loveman E, Colquitt JL, Mead E, Johnson RE, Fraser H, et al. Diet, physical activity and behavioural interventions for the treatment of overweight or obese adolescents aged 12 to 17 years. Cochrane Database Syst Rev. 2017;6.
9. Knopp D, Prat IA, Azevedo MR. Intervenções escolares de médio e longo prazo para promoção de atividade física: Revisão sistemática. Rev Bras Ativ Fís Saúde. 2014;19(2):142-52.

10. Kremer MM, Reichert FF, Hallal PC. Intensidade e duração dos esforços físicos em aulas de educação física. Rev Saude Publica. 2012;46(2):320-6.

11. Lemes VB, Fochesatto CF, Vian F, Mello JHP, Caporal GC, Moreira RB, et al. Efeitos da educação física sobre indicadores de saúde cardiometabólica em jovens e adultos com diferentes ocorrências de estresse. Cien Conhecimento. 2017;11(2):46-56.

12. Haddad S. A ação de governos locais na educação de jovens e adultos. Rev Bras Educ. 2007;12(35):197-211.

13. Carvalho RM. Educação Física na Educação de Jovens e Adultos. Rev Lugares Educ. 2013;3(5):37-49.

14. Denti J, Vargas Â. A influência da dança de rua no nível de ansiedade das mulheres que frequentam o Ensino de Jovens e Adultos - EJA da Escola Estadual Cardeal Roncalli - Frederico Westphalen - RS- Brasil. FIEP Bull. 2013;83:628-30.

15. Lemes VB, Brand C, Dias AF, Moreira RB, Gaya ACA, Gaya AR. Efeito das aulas de ginástica escolar nos níveis de atividade física: jump na educação de jovens e adultos (EJA). Rev Bras Prescrição e Fisiol do Exerc. 2017;11(70 Suppl 1):863–70.

16. Álvarez C, Ramírez-Campillo R, Ramírez-Vélez R, Izquierdo M. Effects and prevalence of nonresponders after 12 weeks of high-intensity interval or resistance training in women with insulin resistance: a randomized trial. J Appl Physiol. 2017;122(4):985–96.

17. Montero D, Lundby C. Refuting the myth of non-response to exercise training: 'non-responders' do respond to higher dose of training. J Physiol. 2017;595(11):3377-87.

18. Bouchard C, Blair SN, Church TS, Earnest CP, Hagberg JM, Jenkins NT, et al. Adverse metabolic response to regular exercise: Is it a rare or common occurrence?.2012;7(5).

19. Association WM. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191-94.

20. Gaya A. Projetos de Pesquisa Científica e Pedagógica.O desafio da iniciação científica. Belo Horizonte: Instituto Casa da Educação Física, 2016.

21. Brasil. Lei 9.394: Estabelece as diretrizes e bases da educação nacional [online]. Brasília; 1996. Disponível em: http://www.planalto.gov.br/ccivil_03/Leis/L9394.htm

22. Gaya A, Gaya A. PROESP-Br Manual de testes e avaliação. Porto Alegre: Editora Perfil, 2016.

23. Matsudo S, Araújo T, Matsudo V, Andrade D, Andrade E, Oliveira LC, et al. Questionário internacional de atividade física (IPAQ): estudo de validade e reprodutibilidade no Brasil. Rev Bras Ativ Fis Saúde. 2012;6(1)5-18.

24. Hopkins WG. Mesaures of reliability in sports medicine and science. Sport Med. 2000;30(1):1–15.

25. Álvarez C, Ramírez-Campillo R, Ramírez-Vélez R, Martínez C, Castro-Sepúlveda M, Alonso-Martínez A, et al. Metabolic effects of resistance or high-intensity interval training among glycemic control-nonresponsive children with insulin resistance. Int J Obes. 2018;42(1):79-87.

26. Minatto G, Barbosa Filho VC, Berria J, Petroski EL. School-Based Interventions to Improve Cardiorespiratory Fitness in Adolescents: Systematic Review with Meta-analysis. Sport Med. 2016;46(9):1273–92.

27. Ardoy DN, Fernández-Rodríguez JM, Ruiz JR, Chillón P, España-Romero V, Castillo MJ, et al. Mejora de la condición física en adolescentes a través de un programa de intervención educativa: Estudio EDUFIT. Rev Esp Cardiol. 2011;64(6):484-91.

28. Timken G, McNamee J, Coste S. 'It doesn't seem like PE and I love it': Adolescent girls' views of a health club physical education approach. Eur Phys Educ Rev. 2017;25(2).

29. Mitchell F, Gray S, Inchley J. 'This choice thing really works … ' Changes in experiences and engagement of adolescent girls in physical education classes, during a school-based physical activity programme. Phys Educ Sport Pedagog. 2012;20(6):593-611.

30. Santanasto AJ, Newman AB, Strotmeyer ES, Boudreau RM, Goodpaster BH, Glynn NW. Effects of changes in regional body composition on physical function in older adults: a pilot randomized controlled trial. J Nutr Health Aging. 2015;19(9):913-21.

Received: 21/11/2018
Approved: 24/03/2019

Quote this article as:

Lemes VB, Brand C, Dias AF, Gaya ACA, Gaya AR. Jump gymnastic at school physical education for adolescents and adults: changes and prevalence of success in health-related physical fitness. Rev Bras Ativ Fís Saúde. 2018;23:e0054.. DOI: 10.12820/rbafs.23e0054