

## ORIGINAL ARTICLE

# Effects of two types of low impact physical training on screen time among overweight adolescents



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## Abstract

**Introduction:** The time that adolescents spend in front of some screen as TV, computer, video games and mobile phones, has been considered a risk factor for obesity and non-communicable chronic diseases.

**Objective:** To analyze the effectiveness of two types of low impact training on the screen time and the BMI of overweight adolescents.

**Methods:** Forty-seven adolescents were allocated into three groups: control group (CG); water aerobics group (WG); and rebound training group (RG). The three groups had a weekly session of nutritional guidance; additionally, WG and RG trained 12 weeks with three weekly sessions ranging between 24 and 32 minutes, according to the stage of the training periodization with water aerobics and rebound classes, respectively. Anthropometric measurements were performed, and screen time through a questionnaire created for this study in order to identify the amount of hours that adolescents passed in front of a screen. The questionnaire was carried out before and after the training period, as well as anthropometric assessments.

**Results:** There was no difference pre and post-intervention in screen time for the three groups, however, there was a decrease in BMI in both exercise groups of the pre-training period for post-training.

**Conclusion:** There was no reduction of the screen time, however the BMI decreased in the exercise groups.

**Keywords:** adolescents, obesity, screen time, hydrogymnastic, rebound training

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## ■ INTRODUCTION

A recent study showed that there are over two billion obese people around the world, while in 1980 there were 857 million<sup>1</sup>, including children and adolescents<sup>2</sup>. This increase in the prevalence of obesity in childhood and adolescence has exacerbated the emergence of chronic, non-communicable chronic diseases obesity-associated<sup>3</sup>, while the risk of obesity accompanying the individuals until adult life decreases their life expectancy<sup>4</sup>.

There are several causes to the emergence of obesity. It can be from endogenous origins (related to genetic, neuropsychological, endocrine and/or metabolic components), which are responsible for at least 5% of cases; or from exogenous origin (influenced by external factors of behavioral, dietary and/or environmental origin), which are responsible for most cases<sup>5,6</sup>. Therefore, life habits such as low levels of physical exercise and inadequate diet, associated with a sedentary lifestyle, are the most referred causal factors in the literature<sup>7-11</sup>.

Increasing rates of technology use have direct relationship with the increase of sedentary lifestyle rates, a risk

behavior that can cause serious damage to health<sup>12</sup>. The increase in the prevalence of the sedentary lifestyle, mainly due to the proliferation of technology within the routine of the population, with the increasingly exacerbated use of cell phones, videogames, television and computer, in combination with a continuously less healthy diet and an inefficient physical education in the schools, are issues that deserve attention<sup>13</sup>.

This time spent with technology use is known as screen time and, according to some studies, has a relationship with obesity in adolescence<sup>14-16</sup>, since it is considered a sedentary activity in which the energy expenditure is minimal.

Screen time can be considered as a modifiable risk factor, related to lifestyle and the occurrence of obesity. Decreasing the sedentary lifestyle can lead to a reduction in body mass index (BMI): thus, even if screen time is not altered, physical inactivity and sedentary lifestyle behaviors can be changed<sup>17</sup>.

Therefore, the aim of this study was to analyse the efficiency of two types of low impact physical training on screen time and BMI in overweight adolescents.

## ■ METHODS

### Criteria

The sample was selected in a non-random way, by volunteers. The sample was selected by means of advertisements in large circulation newspapers of the city of Porto Alegre (Diário Gaúcho, Jornal do Comércio, Metro e Zero Hora), and in schools near the place where the interventions were held.

All parents, or legal guardians, of the adolescents who agreed to participate in the study signed a free, and informed, consent form in the first meeting, the adolescents also signed the consent form.

Forty-seven adolescents aged between 10 and 19 years old, of both sexes, who were overweight or obese, in addition to presenting waist/height ratio greater than 0.50, were included in the study. Nutritional status was defined according to the BMI by age and sex, as proposed by the World Health Organization (WHO) for adolescents aged between 10 and 19 years old, and the 85 and 97 percentiles were adopted as cut-off points to identify overweight and obese adolescents, respectively<sup>18</sup>.

Exclusion criteria were: pregnancy throughout the training, disability preventing physical exercise practice, and use of medication that could interfere in the present study results, such as medication for cholesterolemia control or for hormonal and diuretic treatments. Those adolescents who achieved less than 80% exercise frequency throughout the physical training period were also excluded from the analysis.

Randomisation sequence, in parallel, was generated by the online system <https://www.randomizer.org>, and the sample was stratified by sex in each group after the accomplishment of all pre-intervention assessments.

### Data collection

Data collection was performed at the School of Physical Education, Physiotherapy and Dance of the Federal University of Rio Grande do Sul (ESEFID/UFRGS), always in the afternoons.

All participants were submitted to anthropometric assessments of body mass and height, for further calculation of

the BMI, as well as verification of sexual maturation stage and screen time, before and after the 12 weeks of the intervention period.

Screen time assessment was performed by means of a questionnaire created for the present study, based on instruments used in the literature, in order to identify the number of hours that the adolescents spent in front of a screen – television, computer, videogame, and cell phone. The questionnaire used can be obtained from the website: <http://www.robertocosta.com.br/si/site/0013>.

### Intervention

The 47 adolescents were randomly distributed into one of three interventions. One group performed 12 weekly sessions of nutritional orientation (NO), as well as participated in a social network with the aim to stimulate them with advice about healthy habits (CG). The other two groups, in addition to carrying out the same weekly orientation program, performed three weekly sessions of water aerobics (WG) or rebound (RG) classes, both divided into warm up, an aerobic main part, and relaxation, for 12 weeks, training on the same schedules, at the same time, with the same teacher.

The study was approved by the Ethics Committee in Research of the Clinicas Hospital of Porto Alegre (HCPA), under the number 14-0485.

### Statistical Analysis

Baseline descriptive statistical analysis, with mean and standard deviation of the variables of interest, was performed, and the comparisons between sexes were performed by means of Student's t-test for independent samples.

For analysis of screen time data, Generalized Estimating Equations (GEE) were used for comparisons between groups and times, as well as group\*time interaction, and Bonferroni post hoc test was used for verification of the differences.

The analyses were performed using SPSS package version 20.0, and the statistical significance adopted was  $\alpha = 0.05$ .

**RESULTS**

The intervention program had 47 adolescents. Baseline comparison between the sexes for variables in sample characterization was performed. There were no significant differences; thus, further analyses were conducted without stratification by sex (Table 1).

After 12 weeks of intervention, there was no

difference in screen time between groups from pre-intervention to post-intervention, or between the times for the three groups, for both weekdays and weekend days; however, it is important to highlight the reduction found in the BMI of the groups that performed 36 sessions of water aerobics or rebound training (Table 2).

**Table 1:** Sample characterization expressed in means + standard deviation

	Total (n = 47)		Male (n = 20)		Female (n = 27)		p
Age (years)	13.5 ± 2.3		13.1 ± 1.9		13.8 ± 2.5		0.229
Body mass (kg)	81.3 ± 20.2		83.9 ± 25.5		89.3 ± 15.3		0.478
Height (cm)	158.8 ± 9.5		160.1 ± 13.2		157.8 ± 5.5		0.457
Pubertal Stage	B/G	P	G	P	G	P	
	3 ± 1	4 ± 1	3 ± 1	3 ± 1	4 ± 1	4 ± 1	

B = breast size, G = genitals size, P = pubic hair.

**Table 2:** Comparison of the inter and intragroups means for body mass index and screen time

	Group	Pre (standard error)	Mean Post (standard error)	Mean Group	Time Group	Group* Time
BMI	Control (n = 11)	30.1 (1.6)	31.2 (1.7)			
	Water (n = 18)	32.8 (1.3)	30.9 (1.3) *	0.457	0.006	0.005
	Rebound (n = 18)	31.0 (1.3)	29.7 (1.2) *			
STDW	Control (n = 11)	8.4 (1.1)	8.8 (1.4)			
	Water (n = 18)	6.3 (1.1)	6.0 (1.2)	0.247	0.463	0.424
	Rebound (n = 18)	6.2 (1.0)	7.4 (1.2)			
STWD	Control (n = 11)	10.5 (1.2)	8.9 (1.4)			
	Water (n = 18)	6.5 (1.1)	6.3 (0.8)	0.066	0.415	0.593
	Rebound (n = 18)	8.2 (1.0)	8.4 (0.9)			

BMI = Body Mass Index; STDW = screen time during the week – hours per day during the week; STWD = screen time during the weekend. \* Difference (p<0.05).

**DISCUSSION**

The results found that screen time in the three intervention groups, which were above six hours for both weekdays and weekend days, were much greater than the limits of < 2 hours indicated in the literature<sup>19</sup>. Nevertheless, results greater than those indicated here were found in other studies recently performed<sup>20-22</sup>.

Nemet *et al.*<sup>23</sup> also investigated the effects of 12 weeks of intervention and nutritional counseling, with subsequent follow up at one year, evaluating 26 obese adolescents. There was no reduction in screen time after the 12 weeks. The intervention was performed by means of activities that varied in duration and intensity throughout the program, especially designed with games to encourage enthusiasm and participation of the subjects. Although the three month intervention did not achieve screen time reduction, it resulted in a significant reduction in BMI for the exercise group participants, as in the present study. But it is worth mentioning that, after one year of follow up, there were significant differences in both intervention and control groups regarding screen time, demonstrating that the intervention provoked lifestyle changes in the long-term.

With a longer intervention time of 24 weeks, the

study of Maddison *et al.*<sup>24</sup> did not show a significant effect either in screen time or in the BMI of the overweight adolescents. This intervention was based on physical activities and diet carried out at home, on the sedentary behavior of the whole family, through home visits and incentives for both physical activity practice and reduction of screen time. The intervention did not present a periodised physical exercise program, demonstrating that both professional orientation and adequate training periodisation are fundamental in relation to exercise.

On the other hand, the 12 week study of Faith *et al.*<sup>25</sup> showed effective results in the reduction of screen time, with an innovative intervention. According to the training protocol, both experimental and control groups should pedal on a cycle ergometer; however, during the period that the experimental group could maintain exercise at an intensity equivalent to 50% of their VO<sub>2</sub>max, an automatic dispositive kept a television on, stimulating them to keep exercising at the desired training intensity. Besides achieving reduction in screen time in the experimental group, they also reduced BMI, unlike the control group which had no requirement of training intensity and increased BMI, even with exercise.

The study of Decelis *et al.*<sup>26</sup> reinforces our findings, providing evidence that European adolescents also spend more than two hours in front of the screen. As the adolescents spend most of their day in school, it is important that in these moments they are stimulated and oriented to perform physical activities to reduce sedentary lifestyle and obesity levels, given that in the current days it is very hard to reduce screen time, due to technological advances and conveniences.

Barros *et al.*<sup>27</sup> conducted an intervention with overweight or obese schoolchildren with a computer game called PEGGO for obesity control. The results showed that this game, which makes the participants make movements and perform physical exercise in order to meet the objectives, reduced the BMI of all the participants. That is, this study demonstrates that even if the adolescents do not reduce screen time, games that stimulate them to move around and spend energy can elicit reduction in BMI and improve physical conditions, besides stimulating teenagers to practice some physical activity, even if their screen time does not decrease.

However, awareness and education by means of information are fundamental<sup>28,29</sup>. Although not specifically about screen time, the nutritional education classes attended by the three groups were comprised of general healthy habits, besides specific nutrition issues, aiming to raise questionings about the acquired habits and those that should be followed. In this way, only the information was

not enough, since the CG did not reach any improvement. It seems that exercise is essential in the reduction of cardiovascular risk factors, as occurred with WG and RG.

Therefore, the focus for control of cardiometabolic risk factors is fundamental in order to, at least, counterbalance the negative effects of physical inactivity in front of the screen<sup>30,31</sup>. Thus, physical exercise practice is paramount in BMI reduction, as achieved in the present study.

For the main outcome, screen time reduction, the expected result was not found. This, in fact, is difficult in this age group, but the present study demonstrated that with an adequate training periodisation it was possible to achieve reduction of the BMI in overweight adolescents, which can positively impact reduction of cardiometabolic risk factors in this sample, even without reducing screen time.

The present study has some limitation, such as the absence of a probabilistic sample, which makes extrapolation of the results for other adolescents groups difficult. Nevertheless, the random allocation used for the formation of the groups softens such limitation.

One point that deserves to be highlighted is the use of two motivational exercise modalities for obese adolescents, which besides reducing the impact on the joints, has an extremely playful character, allowing greater adherence to the intervention.

## CONCLUSION

Therefore, considering that the interventions with these exercise modalities made these adolescents more physically active, in addition to contributing to BMI reduction, the present study results can contribute to the prescription of exercise programs for overweight adolescents.

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## Resumo

**Introdução:** O tempo que adolescentes passam em frente a algum tipo de tela como TV, computador, videogames e celulares, tem sido considerado fator de risco para a obesidade e doenças crônicas não transmissíveis.

**Objetivo:** Analisar a eficiência de dois tipos de treino de baixo impacto sobre o tempo de tela e sobre o IMC de adolescentes com excesso de peso.

**Método:** Foram alocados 47 adolescentes em três grupos: controle (GC); hidroginástica (GH); e jump (GJ). Os três grupos tiveram uma sessão semanal de orientação nutricional; além disso, o GH e GJ treinaram 12 semanas com três sessões semanais variando entre 24 e 32 minutos, conforme fase da periodização do treinamento, com aulas de hidroginástica e jump, respectivamente. Foram realizadas avaliações antropométricas e do tempo de tela por meio de questionário criado para o presente estudo, a fim de identificar a quantidade de horas que os adolescentes passavam em frente de uma tela. A aplicação do questionário foi realizada pré e pós-período de treinamento, assim como as avaliações antropométricas.

**Resultados:** Não houve diferença pré e pós-intervenção no tempo de tela para os três grupos, no entanto, houve redução no IMC em ambos os grupos de exercícios do período pré para o pós-treinamento.

**Conclusão:** Não houve redução do tempo de tela, entretanto o IMC diminuiu nos grupos de exercícios.

**Palavras-chave:** adolescentes, obesidade, tempo de tela, hidroginástica, jump

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