Recreational Physical Activity Online Decrease Obesity on School Children: A Pilot Study

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Abstract

Objective

To determine the effects of recreational physical activity mediated by technology on the body composition of six- to nine-year-old children. Childhood obesity is a public health problem associated with the development of cardiovascular disease (CVD) and which was exacerbated during the COVID-19 lockdowns, given the restrictions on going to school and participating in group games, among others.

Methods

A quasi-experimental intervention study included 27 schoolchildren (12 boys and 15 girls) with an average age of 6 from an educational establishment during who received three 60-minute online sessions of recreational physical activity per week for 20 weeks.

Results

Medical tests were carried out prior to the intervention, which found that 13.3% of girls were overweight and 40% obese, while 6.7% of boys were overweight and 41.6% obese. After the interventions, there was an average weight reduction of 1.7 kg ($p = 0.16$), while there were also reductions in the proportion of the participants suffering from overweight and obesity, body fat percentage (0.9 percentage points; $p = 0.4$) and abdominal circumference (1.01 cm; $p = 0.63$).

Conclusion

The interventions mediated by technology had a positive impact on anthropometric measurements, promoting healthy practices and physical exercise during lockdown.

Introduction

The World Health Organization (WHO) defines obesity and overweight as an abnormal or excessive accumulation of fat that can be harmful to health [1]. Obesity affects children and the prevalence is estimated to be approximately 41 million individuals under 5 years of age. Children with obesity have a high probability of suffering from non-communicable diseases such as cardiovascular diseases (CVD) and/or type 2 diabetes mellitus in the future [1], and according to the WHO, by 2025 there will be more children with obesity than underweight children, given that the rate of childhood obesity has been increasing exponentially since 2000 [1]. Additionally, in the year 2020, the Covid-19 pandemic accelerated this process, as many children were confined to their homes for nearly two school years. This is important because, infancy and childhood, followed by consumption of foods rich in carbohydrates, fats and salts,
and poor in micro- and macronutrients are associated with this problem, sedentary lifestyles and low levels of physical activity are risk factors that can exacerbate the development of childhood obesity [1].

For this reason, preventing overweight and obesity is an important objective in public health interventions. Adults often have little time available to perform these activities or to take children to engage in physical activity, which leads to infants spending many hours in front of various electronic devices, predisposing them to become sedentary in the future. A subtle difference during lockdowns was that there was time available but access to spaces was limited, among other factors [2–4].

The general recommendation is that children and young people between 5 and 17 years of age should perform at least 60 minutes of moderate or vigorous physical activity daily, especially aerobic exercise [1]. There is evidence that physical activity interventions in children aged 6 to 12 years reduce BMI better than dietary restrictions alone [5], [6]. Frequent physical activity substantially improves the physical fitness and health status of children and young people, giving them better cardiorespiratory fitness, greater muscular endurance, lower body fat and decreased risk of metabolic diseases [7]. During the confinement there were restrictions on the use of public spaces, which decreased the physical activity of the children, who were among the most affected by the closure of schools.

Physical recreational activities based on games help to integrate different forms of participation, empathy and leadership, becoming a social experience which creates challenges, hobbies, interests, sense of belonging and integration [8]. This motivates the participants to engage more in physical activity and performing it through virtual channels and video conferences turned out to be a palliative alternative. Therefore, the objective of this study was to determine the effects of recreational physical activity using communication technology on the body composition of six-year-old children.

**Methods**

A quasi-experimental intervention study was conducted with tests before and after a 20-week set of online recreational physical activity sessions using traditional games. This was the pilot test, so a convenience sample was taken of 27 school children with an average age of 6 years old from the first grade of a public educational. All the children included met the inclusion criteria (aged between 6 and 9 years, active students enrolled in the educational institution with signed informed consent, clinically healthy according to the criteria of the Spanish Clinical Guide for Cardiovascular Evaluation of children, prior to sports practice [9] and at least 95% attendance of the virtual sessions with Google Meet platform mostly via pc and a few smart phones) and didn't meet the exclusion criteria (children already in elite sports teams and those with musculoskeletal pathologies) (Fig. 1).

This project was approved by the Ethics Committee of xxxx and is part of the macroproject registered at clinicaltrials.gov with registration number NCT05294601, approved by the Ethics Committee of xxxxxxxx.

Prior to the interventions, informed consent and assent was signed by parents and guardians. Subsequently, each participant was assessed according to the criteria of the Spanish Clinical Guide for
Cardiovascular Assessment of children prior to sports practice, which included anamnesis, physical examination, anthropometric measurements and vital signs [9], [10]. Baseline physical activity was assessed using a pedometer on the right hand during waking hours, and guardians reported the number of steps taken each night, in order to classify them as having a sedentary, moderate or high level of activity [10].

To determine the participants’ anthropometrics, body weight was measured using a Tanita Bf 689® scale, while height was measured with a measuring rod. BMI (kg/m²) and BMI-for-age percentile were determined according to Quetelet’s equation [11]. To determine total body fat, skinfolds (triceps, biceps, subscapular and suprailiac) were measured with a Lange caliper) [10], [12], and then the Slaughter formula [12] and the Westrate and Deurenberg equation were applied to determine body composition. The abdominal circumference (AC) was established by direct measurement between the iliac crests and the lower costal margin with the child in a standing position and at the end of an unforced exhalation. The waist circumference (WC) was measured horizontally across the femoral trochanters. The waist-to-height ratio (WHtR) was calculated using the abdominal circumference and height; it served to differentiate between gynoid and android obesity and to estimate cardiovascular risk.

The intervention implemented was recreational physical activity based on traditional games through online sessions with Google Meet platform synchronously, during the sessions all the cameras were kept on to verify the participation of the children and to maintain the motivation of the activities and the sessions were recorded to make verification, which were carried out within the school hours and were totally directed by a physical education teacher. three times a week for a period of 20 weeks, led by a sports and physical activity graduate with experience in the pediatric population.

Each session lasted 60 minutes, based on the study by Macias-Cervantes et al. [10], which was supervised by two researchers. The aim was to maintain an average number of steps/day of at least 2,500 steps [10]. At the end of the 20-week period, the variables were re-evaluated and then compared and analyzed (pre-test/post-test); physical activity was also recalculated with the Pedometer, in order to verify the level of physical activity achieved during the interventions.

The quantitative variables were described using measures of central tendency and dispersion, and the qualitative variables using proportions. The Shapiro-Wilk test was used to determine if the behaviors of the variables is normal, and the intra-group comparison of means before and after the intervention was carried out by means of the Levene test. The hypothesis tests applied include the Mann-Whitney U-test, the Student T-test, the Fisher test and the Wilcoxon Signed Rank Test. All the calculations were made with a significance level of 5% (α = 0.05) together with 95% confidence intervals.

Results

The present study included 12 boys and 15 girls, with average ages of 6.5 ± 0.9 years in boys and 6.4 ± 0.91 years in girls. No significant statistical differences were found by sex in the anthropometric characteristics, as the percentage of fat mass the mean in boys was 18.7 ± 5.3 and in girls 19.8 ± 4.2 (p =
0.55), with no statistically significant differences. However, it was seen that boys had more kilograms (kg) of muscle mass than girls (p = < 0.001).

The average weight was 27.8 ± 8.5 kg in boys vs. 28.2 ± 9.8 kg in girls (p = 0.93), and the average height in boys was 122 ± 8.6 cm and in girls 120.1 ± 8.1 cm (p = 0.4). It should be noted that, using BMI by percentiles, 53.3% of girls were classified as overweight and obese (13.3% and 40% respectively) while 48.3% of boys were overweight and obese (6.7% and 41.6% respectively). No significant differences by sex were found (p = 0.5) in the estimation of central obesity and cardiovascular risk (Table 1).
## Table 1
Pre-intervention anthropometric characteristics in the study group of children aged 6–9 years.

<table>
<thead>
<tr>
<th></th>
<th>Boys (n = 12)</th>
<th>Girls (n = 15)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age in years</strong> (mean ± S.D.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.5 (0.9)</td>
<td>6.4 (0.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Height in cm</strong> (mean ± S.D.)</td>
<td>122 (8.6)</td>
<td>120.1 (8.1)</td>
<td>0.41a</td>
</tr>
<tr>
<td><strong>Height-for-age percentile (%)</strong></td>
<td>2 (16.6)</td>
<td>3 (20)</td>
<td>0.62b</td>
</tr>
<tr>
<td>Tall for their age</td>
<td>10 (83.3)</td>
<td>12 (80)</td>
<td></td>
</tr>
<tr>
<td>Average size</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Short for their age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight in kg</strong> (mean ± S.D.)</td>
<td>27.8 (8.5)</td>
<td>28.2 (9.8)</td>
<td>0.93a</td>
</tr>
<tr>
<td><strong>Weight-for-age percentile (WHO) (%)</strong></td>
<td>3 (25)</td>
<td>1 (6.6)</td>
<td>0.15b</td>
</tr>
<tr>
<td>15th</td>
<td>1 (8.3)</td>
<td>7 (46.7)</td>
<td></td>
</tr>
<tr>
<td>50th</td>
<td>4 (33.3)</td>
<td>3 (20)</td>
<td></td>
</tr>
<tr>
<td>85th</td>
<td>4 (33.3)</td>
<td>4 (26.6)</td>
<td></td>
</tr>
<tr>
<td>97th</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BMI-for-age percentile (%)</strong></td>
<td>1 (8.3)</td>
<td>0 (0)</td>
<td>0.78b</td>
</tr>
<tr>
<td>Underweight</td>
<td>4 (33.3)</td>
<td>7 (46.7)</td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>2 (6.7)</td>
<td>2 (13.3)</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>5 (41.6)</td>
<td>6 (40)</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Body fat percentage (Slaughter)</strong></td>
<td>18.7 (5.3)</td>
<td>19.8 (4.2)</td>
<td>0.55a</td>
</tr>
<tr>
<td>(mean ± S.D.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Muscle mass in kg (Poortmans)</strong></td>
<td>13.0 (4.3)</td>
<td>8.8 (2.6)</td>
<td>0.001</td>
</tr>
<tr>
<td>(mean ± S.D.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average resting heart rate (mean ± S.D.)</strong></td>
<td>88.3 (6.7)</td>
<td>90.5 (8.3)</td>
<td>0.46*</td>
</tr>
<tr>
<td><strong>Average systolic blood pressure in mmHg (mean ± S.D.)</strong></td>
<td>101.2 (12.4)</td>
<td>106.9 (13.6)</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>Average Diastolic blood pressure (mean ± S.D.)</strong></td>
<td>68.2 (7.9)</td>
<td>71.1 (4.6)</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Abdominal circumference in cm (mean ± S.D.)</strong></td>
<td>61.7 (10.0)</td>
<td>60.3 (8.2)</td>
<td>0.71*</td>
</tr>
</tbody>
</table>

Mann-Whitney U-test, aStudent T-test, b Fisher test
Boys (n = 12) | Girls (n = 15) | p
---|---|---
Central obesity Yes | 5 (41.6) | 7 (46.6) | 0.48<sup>b</sup>
Cardiovascular risk Yes | 5 (41.6) | 7 (46.6) | 0.45<sup>b</sup>
Brachial circumference in cm (mean ± S.D.) | 19.6 (3.3) | 18.8 (2.5) | 0.50<sup>b</sup>
Arm circumference in cm (mean ± S.D.) | 18.5 (3.4) | 17.5 (2.4) | 0.31
Thigh circumference in cm (mean ± S.D.) | 34.6 (7.4) | 33.9 (5.4) | 0.96
Calf circumference in cm (mean ± S.D.) | 27.0 (3.9) | 25.5 (3.9) | 0.12
Biceps skinfold in mm (mean ± S.D.) | 9.4 (4.4) | 10.1 (3.3) | 0.30
Triceps skinfold in mm (mean ± S.D.) | 10.8 (3.4) | 12.1 (3.2) | 0.32
Suprailiac skinfold in mm (mean ± S.D.) | 9.2 (3.8) | 11.4 (4.2) | 0.42
Subscapular skinfold in mm (mean ± S.D.) | 8.8 (3.0) | 9.6 (3.4) | 0.48
Anterior thigh skinfold in mm (mean ± S.D.) | 12.3 (4.1) | 13.4 (3.1) | 0.21
Medial calf leg skinfold in mm (mean ± S.D.) | 9.9 (4.5) | 11.4 (3.4) | 0.12
Waist-hip ratio elevated (1) | 2 (16.6) | 11 (73.3) | 0.006<sup>b</sup>
normal (=) | 10 (83.3) | 4 (26.6) |

Mann-Whitney U-test, <sup>a</sup>Student T-test, <sup>b</sup>Fisher test

After 20 weeks of intervention, compared to the baseline values, a significant increase of 1.92 ± 0.35 cm in mean height (p = 0.0001) and a reduction of 1.7 ± 5.9 kg in participants' weight (from 28.05 kg pre-test to 26.3 kg post-test; p = 0.16) was found. Other results include a reduction in the percentage of participants classified as overweight and obese based on their BMI (from 55.55% pre-test to 25.93% post-test) after the intervention (7.41% vs 18.52% respectively; p = 0.16), and a decrease in mean abdominal circumference (-1.01 cm) (p = 0.63), but these were not statistically significant.

The thigh circumference measurement showed a significant reduction (2.1 ± 0.8 cm) (p = 0.02), similar to the suprailiac skinfold, which decreased on average by 1.5 ± 3.9 mm (p = 0.04). Body fat percentage decreased by 0.9% ± 6.2 (from 19.3 to 18.4%; p = 0.4) after the physical activity sessions (Table 2).
Table 2
Anthropometric measurements before and after the intervention in the study group.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
<th>Δpre/posttest</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N = 27</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Height in cm (mean ± S.D.)</strong></td>
<td>121 (8.2)</td>
<td>123 (7.9)</td>
<td>+ 1.92 (0.35)</td>
<td>0.0001</td>
</tr>
<tr>
<td><strong>Weight in kg (mean ± S.D.)</strong></td>
<td>28.0 (9.15)</td>
<td>26.3 (8.0)</td>
<td>-1.7 (5.9)</td>
<td>0.16 a</td>
</tr>
<tr>
<td><strong>Weight-for-age percentile (%)</strong></td>
<td>0 (0)</td>
<td>1 (3.7)</td>
<td>N/A</td>
<td>0.61</td>
</tr>
<tr>
<td>P 3</td>
<td>4 (14.8)</td>
<td>4 (14.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P15</td>
<td>8 (29.6)</td>
<td>12 (44.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P50</td>
<td>7 (25.9)</td>
<td>5 (18.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P85</td>
<td>8 (29.6)</td>
<td>5 (18.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P97</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BMI-for-age percentile (%)</strong></td>
<td>1 (3.7)</td>
<td>2 (7.41)</td>
<td>N/A</td>
<td>0.16 b</td>
</tr>
<tr>
<td>Underweight</td>
<td>11 (40.7)</td>
<td>18 (66.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>4 (14.8)</td>
<td>2 (7.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>11 (40.7)</td>
<td>5 (18.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Body fat percentage (Slaughter)</strong></td>
<td>19.3 (4.7)</td>
<td>18.4 (1.0)</td>
<td>-0.9 (6.2)</td>
<td>0.41</td>
</tr>
<tr>
<td>(mean ± S.D.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Muscle mass in kg (Poortmans)</strong></td>
<td>10.67 (0.7)</td>
<td>10.14 (0.6)</td>
<td>-0.53 (0.3)</td>
<td>0.17 a</td>
</tr>
<tr>
<td>(mean ± S.D.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Abdominal circumference in cm (mean ± S.D.)</strong></td>
<td>60.9 (1.7)</td>
<td>59.9 (1.7)</td>
<td>-1.01</td>
<td>0.63 a</td>
</tr>
<tr>
<td>Central obesity</td>
<td>12 (44.4)</td>
<td>9 (33.3)</td>
<td>N/A</td>
<td>0.21 b</td>
</tr>
<tr>
<td>Cardiovascular risk</td>
<td>12 (44.4)</td>
<td>9 (33.3)</td>
<td>N/A</td>
<td>0.21 b</td>
</tr>
<tr>
<td>Waist-hip ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>elevated (1)</td>
<td>14 (51.8)</td>
<td>16 (59.2)</td>
<td>N/A</td>
<td>0.31 b</td>
</tr>
<tr>
<td>normal (=)</td>
<td>13 (48.1)</td>
<td>11 (40.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average systolic blood pressure in mmHg (mean ± S.D.)</strong></td>
<td>104.4 (2.5)</td>
<td>101.7 (2.2)</td>
<td>-2.6 (2.6)</td>
<td>0.36 a</td>
</tr>
</tbody>
</table>

* Student t-test for paired samples, a Wilcoxon signed-rank test, b Fisher test
Prior to the interventions, girls had a higher percentage of body fat than boys, as opposed to the muscle mass, which was higher in boys. After the intervention, a greater reduction in body fat percentage was observed in boys compared to girls, with no statistically significant difference. Muscle mass in girls changed, while for boys the figures mean that there were no statistically significant results (Table 3).

Table 3

<table>
<thead>
<tr>
<th></th>
<th>Girls Pre-test</th>
<th>Post-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body fat</strong></td>
<td>19.8 (4.2)</td>
<td>19.3 (5.2)</td>
<td>0.61</td>
</tr>
<tr>
<td><strong>Muscle mass</strong></td>
<td>8.7 (2.6)</td>
<td>8.0 (1.9)</td>
<td>0.42</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Boys Pre-test</th>
<th>Post-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body fat</strong></td>
<td>18.7 (5.3)</td>
<td>17.2 (6.2)</td>
</tr>
<tr>
<td><strong>Muscle mass</strong></td>
<td>13.0 (4.3)</td>
<td>12.7 (3.3)</td>
</tr>
</tbody>
</table>

Discussion
This quasi-experimental pilot study included 12 boys and 15 girls with an average age of 6.5 years old, with assessments before and after 20 weeks of interventions (virtual sessions of recreational physical activity of moderate intensity, with three 60-minute sessions per week), where they performed suitable recreational activities for their age, similar to the study by Macias et al. [10] According to Sothern et al. [13] activities of moderate intensity and of an unstructured nature such as skipping, or playing with a ball, pillow or other materials present in their homes, which are fun and easy to do [13], can contribute to the prevention of chronic diseases and provide benefits in the general health of children and young people. Part of the objectives of this study was to keep children active during the lockdowns resulting from the COVID-19 pandemic.

The anthropometric measurements before the intervention were not statistically significant in relation to the sex of the participants, which is consistent with the studies of some authors such as: Urquidez et al. [14], who studied 40 girls and 39 boys and found no significant differences by sex in anthropometric variables such as weight, height and BMI percentiles; the group assessed by Delgado et al. [15], which found no anthropometric differences at the start of the programme (p ≥ 0.05); and the study by Espinoza et al. [16], who found no differences by sex before starting 28-week interventions based on High Intensity Interval Training (HIIT) with 274 children aged 7 to 9. In our study, the body fat percentage was higher in girls (19.8%) than in boys (18.75%), while the percentage of muscle mass was higher in boys (13%) than in girls (8.7%), findings that were also described in others study [17].

In the pre-intervention tests, it was found that, based on BMI percentiles, 53.3% of girls were classified as overweight (13.3%) and obese (40%), while 48.3% of boys were classified as overweight (6.7%) and obese (41.6%). This is similar to the results of the study by Poveda et al. [18], who found that girls had higher average BMI and triceps fold; but contrary to the work of Busch et al. [19], in which the prevalence of overweight and obesity was higher in males.

After 20 weeks of interventions, a number of variations in anthropometric parameters were found. There was a reduction of 1.7 ± 5.9 kg (p = 0.16) in the weight of the participants, a decrease in abdominal circumference of 1.01 cm (p = 0.63) that was non-significant, unlike the study of Patiño et al. [20], which included 7 boys and 2 girls whose decrease after an exercise program was significant (90.5 ± 11.0 to 88.1 ± 9.9 cm; p = 0.008). Furthermore, a decrease in the of participants classified as overweight and obese percentage (from 14.8% pre-test to 7.4% post-test and 40.7% pre-test to 18.52% post-test respectively; p = 0.16) was detected. In contrast to the findings of Stupar et al., wherein anthropometric changes were not observed in the intervened group [21] in describing a slight decrease in obesity (4.2%) and overweight (1.8%) in the group following interventions carried out at school. Likewise, the study by Urquidez et. al. [14] made anthropometric evaluations in 3 schools (n = 80) during 6 months with educational sessions (theoretical and practical) of physical activity, and found significant differences in the decrease of 0.9% in BMI-for-age and an increase in the knowledge of recreational physical activities (from 24–45.1%; p = 0.026), which is important when implementing strategies for the prevention of future diseases in the child population. It is important to clarify that children should not lose weight, but rather the diet should be planned so that there is no increase, and the BMI adjusts as height naturally increases;
a significant reduction in weight is a warning sign of malnutrition. Similar results were obtained in the study by Espinoza et al. which found significant differences in BMI with a decrease in the overweight group (20.01 ± 1.88 kg/m² at baseline versus 19.00 ± 2.02 kg/m² after HIIT, p < 0.001) and obese group (24.12 ± 2.66 kg/m² at baseline versus 23.23 ± 3.23 kg/m² after HIIT, p < 0.001), in addition to a significant decrease in the prevalence rate of obesity in the schoolchildren (from 66.4–49.6%, p < 0.001).

However, the study by Shamah et al. [22] with 60 schools (30 intervention and 30 control) and a participation of 1020 children over a period of 6 months, did not observe a decrease in body weight, while the BMI was maintained and the estimated probability (EP) of obesity in the intervention schoolchildren between the beginning and the end decreased by 1 percentage point (initial EP = 11.8%, 95% CI: 9.0-15.2; final EP = 10.8, 95% CI 8.4–13. Also included is the study by Pino et al. which gave 153 schoolchildren (aged 7–10 years) HIIT sessions for 12 weeks, showing non-significant reductions in participants' BMI (p = 0.709 in children aged 7–8 years and p = 0.086 in children aged 9–10 years); and the meta-analysis by Harris et al. that selected 18 controlled clinical trials with pre- and post-test BMI data with a total sample of 18,141 schoolchildren, and showed that BMI did not significantly improve after extracurricular physical activity interventions (weighted mean difference − 0.05 kg/m², 95% CI -0.19 to 0.10), nor were there consistent changes in other measures of body composition.

Even so, different studies [23–25] agree on the same point: although the results are not significant, there is evidence of a decrease in weight in the groups intervened with physical activity, and as an effect a decrease in BMI itself. This has a positive impact on the anthropometric measures of the schoolchildren and, considering the contribution by Steinberger et al. [26] which reports that a high BMI during adolescence implies a 35% chance of being overweight or obese by the age of 35, leading to the progression of chronic diseases, such interventions end up being beneficial for the health of this population.

Incidentally, these results could be attributable to the length of the intervention. The study by Blüher et al. [27] also shows no statistically significant reduction in BMI (p = 0.96) after 6 months of starting a HIIT programme in overweight schoolchildren. However, the authors insist that in order to obtain weight modifications with HIIT programmes, long and sustained interventions over time are necessary. It is also worth considering the findings of Poveda et al. [18], who state in their study (1593 schoolchildren) that physical activity per se was not significantly associated with BMI (p = 0.145), suggesting that sex is the biological determinant of body adiposity and not only the level of physical activity.

The limitations of this study were not studying the nutritional behaviors of the participants along with the interventions, and not providing nutritional education that included children and their families, so it was not possible to evaluate the influence of these variables on the results. Other improvements could be separating a control group vs an intervention group, in order to analyze the variables by sex after the interventions and not only before it. It is also worth noting that this is only a pilot study, and we hope to continue with a large-scale project which might provide more statistically significant results. The authors have no conflict of interest to declare.
Conclusion

The effect of 20 weeks of interventions with recreational physical activities in 6-year-old schoolchildren was a decrease in weight, in the percentage of overweight and obese participants (from 55.55–25.93% combined), in abdominal circumference (1.01 cm; p = 0.63), and an increase in height (1.92 cm; p = 0.0001). Therefore, it can be affirmed that their practice in this population has a positive influence on anthropometric measures, even though the differences were not significant.

How might this information affect nursing practice?

In this publication, emphasis is placed on the importance of supervised physical exercise, its effects on anthropometry, and the possibility of creating virtual or technology-mediated spaces to enhance adherence to physical exercise among children and adolescents. This has implications for nursing practice as it generates new opportunities for interdisciplinary work at the school level, not only in monitoring children’s health but also as an active part of an interdisciplinary group focused on health prevention and promotion within schools.

Declarations

Conflicts of interest statement

The authors have no conflicts of interest regarding the present work.

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Author contributions

CYRT and MHM participated in the design of the research, NCC, MCR, JSZ and MM participated in the implementation of the pilot project and CYRT performed the statistical analysis, all authors collaborated and contributed the final manuscript.

References


Figures
Figure 1

Methodology flowchart