

Outdoor Physical Activity: A Training Method for Learning in an Experiential and Innovative Way

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Published online: July 31, 2023

(Accepted for publication July 15, 2023)

DOI:10.7752/jpes.2023.07225

Abstract

Purpose. Regular physical activity has significant benefits for physical, mental, and psychosocial health for all age groups, in particular it is essential for younger's growth and development. Therefore, to explore self-esteem as mediator between physical activity and academic performance in overweight schoolgirls, based on the assumption that high self-esteem encourages high performance. Moreover, it was aimed to find out the relationship between BMI and academic performance, starting from the premise that high self-concept led students to achieve academically, as they proved optimistic feelings for themselves on account of previous achievements obtained. **Methods.** 140 schoolgirls (14-15 years) were involved in the experimental group (n = 70) which carried out a cardio-dance program, or a control group (n = 70). A battery of standardized assessment motor tests (Standing long jump test, Harvard step test, Sit and reach test, and Butt kicks test), and Rosenberg self-esteem scale were administered at baseline and after training. BMI was used as indicator of correlation with body fat and academic achievement. Academic performance had been measured through scholastic grades. **Results.** In comparison to the control group, experimental group's self-esteem scores were higher after the intervention. They also reported considerably lower BMI as consequence of the intervention. Students who improved self-esteem and were also those who reported best grades ($p < 0.001$). **Conclusions.** The results indicated that physical activity, self-esteem and academic performance were positively related. Specifically, self-esteem appears to play a meaningful role as a between physical activity and academic performance. Moreover, findings showed that BMI may affected academic performance.

Key words: learning, education, physical education, school.

Introduction

Regular Physical Activity (Pa) has meaningful health benefits for all age groups. Specifically, it is essential for various aspects of younger's physical and mental health and contributes to psychological well-being and promotes the development of a positive self-concept (Stensel, Hardman, & Gill, 2021). It also plays a vital role in physical, social and emotional development, as it provides ample opportunities to acquire and practice new skills in many different areas of life.

In recent years, society has witnessed serious consequences due to the lack of PA among younger. Sure enough, even if it is providing different health benefits, several adolescents do not respect the levels of PA suggested by the World Health Organization (WHO, 2020). Sedentarism during the evolutionary age affects physical, cognitive and brain health. A growing body of research, support the idea that low levels of PA are linked with limited cognitive ability and, as a result of, poor school performance (Chaddock, Pontifex, Hillman, & Kramer, 2011). The processes behind the positive impact of physical activity on academic achievement as a consequence the increased levels of PA are still far from being fully understood. PA is presumed to improve cognition and school performance through multiple pathways, including physiological and psychological factors, such as increasing attention, concentration and memory, building strong self-esteem and developing feelings of perceived self-efficacy (Pontifex et al., 2019). PA therefore plays an essential role in physical, social and emotional development, as it offers ample opportunities to acquire and practice new skills in many different areas of life and is able to promote the development of a positive self-concept, which, in turn, could have positive effects on school performance.

These are all factors that affect the improvement of classroom behavior as well as school performance. Physical activity is, in fact, able to prepare the brain for learning, putting it in an optimal condition for learning (Olivieri, 2016). Similarly, a sedentary lifestyle and excessive body weight would appear to be associated with elevated difficulties to concentrate and progress in learning, due to a decline in academic performance. Without motor activity conducted through a positive relationship with the surrounding environment, an individual's cognitive and social development would be severely compromised. If the experiences of the individual through movement are rich and different, more neuronal connections can be created and, consequently, more new skills

the individual can learn (Barbosa et al., 2020.). Numerous studies suggest that cognitively engaging motor activity, i.e. those activities that adhere to a qualitative approach, can improve cognitive function. According to Tomporowsky and Pesce (2019) this happens, plausibly, because qualitative physical activities that intentionally include problem-solving demands and lead to the acquisition of declarative and procedural knowledge, as well as immediate response strategies, could lead to the long-term development of abilities to exercise control over thinking and actions.

According to Vazou et al. (2019), motor activity is able to have a positive influence on intellectual performance as many motor tasks are cognitively engaging. In particular, activities performed in a group encompass a great variety of cognitive demands that the individual must put in place in order to perform the required motor task (da Silva et al., 2010). Specifically, open-skills sports characterized by specific situations of contextual interference, allow the learning of new skills to occur more quickly and in a more lasting and reinforced manner (Fu, Wang, Leung, & Hu, 2023). Presumably, this occurs because the subject's processing of information becomes more complex and demanding, leading to a higher degree of cognitive learning (Adi, 2023). In high-performance motor and sporting activities, cognitive qualities are required that require speed of response to stimuli, high memorization and rapid change of action in relation to situational changes, as well as temporal and motor anticipation skills. This complex of cognitive activities required by motor and sporting activity allows for a restructuring of brain maps and an improvement in mental functionality such that the learning experience is strengthened and enriched (Nolte, & Roux, 2023). Motor and sports activity is, therefore, capable of stimulating the creation of new neuronal connections and reorganizing cortical maps to such an extent that learning processes become an effective and rewarding experience. In this sense, motor activity with cognitively engaging tasks is capable of inducing and emphasizing cognitive processes and is an effective tool for achieving full cognitive potential (Soto-Sánchez et al., 2023).

According to Kantomaa and colleagues (2013), low levels of PA and overweight status may mediate the association between motor function and school performance in adolescents. The authors state that a downward spiral of excessive sedentary behavior, body fat and poor motor skill development can significantly impair children's cognitive and school performance. In a recent study, Mohd Samsudin, Yusof and Aiman (2019) confirm that obese girls with sedentary lifestyles exhibit low levels of school performance. Conversely, good levels of physical fitness would seem to have a positive impact on the girls' cognitive and psychosocial abilities with a significant improvement in mood and self-esteem, observed especially during school. An important factor in the relationship between PA, body weight and school performance is self-esteem. In fact, a higher general self-concept is also associated with a higher school self-concept, which positively affects performance in terms of improved grades. In this context, a cardio-dance training program such as Zumba is capable of numerous health benefits (Chavarrias, Carlos-Vivas, Pérez-Gómez, 2018). It aids in weight loss by improving the Body Mass Index (BMI) in overweight women and is also an excellent means of promoting the development of psychological well-being and physical self-perception (Domene, Moir, Pummell, Knox, Easton, 2016; Fernández-Bustos, Infantes-Paniagua, Cuevas, & Contreras, 2019).

In this study, it was hypothesized that Zumba, which combines different Latin musical rhythms and is practiced in groups, facilitates intrinsic motivation. This may be why previous Zumba intervention studies indicated that adherence to the exercise program was high (Rahayu, Damayanti, & Ruhayati, 2020). The choice of an outdoor setting is due to the fact that exposure to nature can elicit positive psychological states, such as lower psycho-physiological stress (Lachowycz, 2011). Thompson Coon et al. (2011) analyzed the impact of natural versus indoor PA on mental and physical well-being, health-related quality of life and long-term adherence to PA in 11 studies. The authors reported the beneficial effects of natural environments for a number of psychological outcomes, such as revitalization, positive involvement, tension, confusion, anger, depression and energy. There was also evidence of increased enjoyment and satisfaction in doing outdoor activities by participants who expressed a willingness to continue repeating the positive experience. Similarly, Lachowycz, and colleagues, in a 2011 systematic review, examined the relationship between physical activity carried out in natural environment and obesity.

They showed that there is a significant association between the two factors examined. However, the underlying mechanism linking the practice of outdoor motor activities to such psychological outcomes is still unclear. Possible explanations have included evolutionary perspectives, aroused feelings of connection with nature, and visual recognition of characteristic elements such as the color green (Pasanen, Tyrväinen, & Korpela, 2014). Given the predominance of approaches in which improvements in academic performance are explained by changes in brain function and brain structure due to PA, this work explored the role of self-esteem in mediating the relationship between PA, BMI and academic performance. Indeed, the purpose of the present paper was to (i) Analyze how the relationship between self-esteem and PA can influence school performance in overweight female students, based on the assumption that high self-esteem encourages high performance; (ii) An attempt was also made to analyze the relationship between BMI and school performance, based on the assumption that a high self-concept induces students to achieve better school results, as they are able to experience feelings of optimism towards themselves derived from previous positive results in the practice of physical activity.

Methods

Study design

This study was a randomized controlled trial designed to explore the mediating role of a school-based PA program on self-esteem, weight status, and academic achievement of high school female students. The study was performed in a high school and participants were involved in a PA program conducted in a natural (outdoor) environment based on cardio-dance. Therefore, the intervention program comprised 36 lessons of moderate to vigorous aerobic exercise (MVPA) for the intervention group and a regular physical education class conducted in the gymnasium for the control group. Both interventions consisted of 3 weekly 60-minute physical activity sessions conducted outside school hours. Evaluations were carried out before and at the end of the intervention programs.

Sample

Participation in this experiment was on a voluntary basis and all first- and second-year students were invited to participate. The girls had an average age of 14-15 (14.57 ± 0.52) years and came from different classes of the same school. To be included in the study, participants had to be girls, have a high BMI, be able to complete an aerobic exercise session of moderate to vigorous intensity and be able to abstain from any physical activity outside the parameters of the study protocol during the days of the program.

143 female students fulfilled the inclusion criteria and were invited to participate in the trial. Of the recruited female students, 140 agreed to be involved in this research and completed the pre- and post-test assessments, 3 female students dropped out due to personal problems. An e-mail was sent to the participants to notify them of their inclusion in the study. Subsequently, a second e-mail was sent to the parents of all female students, urging them to attend a briefing during which the objectives of the trial were highlighted and informed consent was produced by all parents. Afterwards, all subjects were randomly assigned to one of the two programs (EG $n = 70$; CG $n = 70$). Researchers ensured the anonymity of all participants and the study was conducted from October 2022 to December 2022 and respected the Declaration of Helsinki.

Procedures

One week before the start of the research protocol, all participants were invited to attend a briefing specifically designed to provide information on the program. It also served to test the participants' motivation. Each student was assessed for anthropometric measurements and her BMI was calculated in order to place each student according to her weight category.

After the BMI assessment, the researchers randomly assigned the participants to one of the two program conditions. In addition, standardized motor assessment tests were used to determine each student's initial level of physical performance. Finally, two cognitive tests were administered to examine self-esteem and school performance. The study participants were tested individually and performed each test in the same order, at the same time of day and under similar test conditions. They completed the evaluations two days before and immediately after the trial to enable the impact of the physical activity program to be assessed. All assessments and physical activity programs were designed, supervised, and carried out by two physical education teachers, and they were performed before and after the PA programs.

Measures

Anthropometric measurements

A standard protocol was followed, and professional instruments were used to perform the anthropometric assessments (Weiner, & Lourie, 1981). Height and weight measurements were performed in a room where the privacy of the participants was guaranteed. The students took the measurements three times, and the verifications were always performed by the same experienced researcher to avoid errors. The participants were weighed using a portable medical floor scale with an accuracy of 0.1 kg (Charder's MS6121R, Charder Electronic Co., Taiwan). A wall-mounted digital stadiometer was used to measure height to the nearest 0.1 cm (Charder's HM200D, Charder Electronic Co., Taiwan). To calculate the body mass index, Height and weight measurements were used (BMI) (kg/m^2) (Cole, Bellizzi, Flegal, & Dietz, 2000). The percentile formula and International BMI Cutoff Points were used to calculate BMI, in order to classify students based on weight status (Cole, & Lobstein, 2012).

Motor testing

The fitness assessments involved the performance of four motor tests: Standing long jump test (Eurofit, 1993), Harvard Step test (Brouha, Health, & Graybiel, 1943), Sit and reach test (Mayorga-Vega, Merino-Marban, & Viciano, 2014). These tests were chosen because they are easier to perform, take little time, and require simple equipment (Krishnan, Sharma, Bhatt, Dixit, & Pradeep, 2017), which is why they are perfect for school use. These tests were used before and after the intervention programs.

Rosenberg Self-Esteem scale

The Rosenberg Self-Esteem (Rosenberg, 1965) measures global self-esteem, assessing both positive and negative feelings. It is a 10-item scale, and responses are on a 4-point Likert scale (from "strongly agree" to "strongly disagree"). Scores range from 0 to 30. Scores between 15 and 25 are in the normal range; scores below 15 indicate low self-esteem.

School Achievements

The evaluation of academic performance was carried out over 2 quarters of the same school year. School performance was measured as the cumulative of the grade point average.

Physical Activity Program

The classes consisted of Zumba training for the intervention group and a regular non-specific physical education class with teacher-selected activities aimed at achieving general psycho-physical well-being for the control group. The Zumba Fitness exercise was performed three times a week during extracurricular afternoon hours. Each Zumba workout (60 minutes) contained the basic principles of Zumba exercise: warm-up, main part of the workout (Zumba party section), de-fatigue and stretching (Perez & Greenwood-Robinson, 2009). The intensity of the exercise was determined by the time of music that changed during the training sessions. The warm-up included basic dance steps with a gradually accelerating music time (120-135 bpm). In the second part of the warm-up, muscle toning exercises were performed with soft intensity through dance variations and free-body exercises (time 125-140 bpm). The total warm-up time was 10 minutes (time 120-140 bpm). The main part of the Zumba training was performed with 8-10 Zumba fitness tracks. The intensity of the choreography and dance movements was created in accordance with the changing time of music (tempo between 140-160 bpm).

All Latin American dance choreographies (merengue, salsa, samba, belly dance, cha cha cha, tango, etc.) with their differences in character and movement dynamics provided the dosage of exercise intensity.

Each dance lasted 3-5 minutes, with breaks of 15-30 sec. The aim was to get the participants to enjoy music and dance while practicing at the same time. The de-fatigue contained dance movements with soft music that were intended to induce mental and physical relaxation. Stretching was performed for muscle relaxation as well as to prevent muscle soreness and increase body flexibility. No jumping or squatting was allowed, and all movements could be performed standing, sitting or lying down (music time -100 bpm).

Statistical Analysis

We carried out statistical analyses using IBM SPSS version 25.0 (IBM, Armonk, NY, USA). We presented data as group mean (*M*) values and standard deviations (*SD*) and checked for assumptions of normality (i.e. Shapiro-Wilk test) and homogeneity of variances (i.e. Levene test) in the data distributions. We used an independent sample *t*-test to evaluate group differences at baseline and a two-way ANOVA (group (experimental/control) × time (pre/post-intervention), with repeated measures on the time dimension, was conducted to examine the effect of the Multilateral Training on all dependent variables. When 'Group x Time' interactions reached significance, group-specific post hoc tests (i.e., paired *t*-tests) were conducted to identify the significant comparisons. Partial eta squared (η^2_p) was used to estimate the magnitude of the significant 'Time x Group' interaction and interpreted using the following criteria: small ($\eta^2_p < 0.06$), medium ($0.06 \leq \eta^2_p < 0.14$), large ($\eta^2_p \geq 0.14$). Effect sizes for the pairwise comparisons were determined by Cohen's *d* and interpreted as small ($0.20 \leq d < 0.50$), moderate ($0.50 \leq d < 0.79$) and large ($d \geq 0.80$) (Cohen, 1992). Statistical significance was set at $p < 0.05$.

Results

Both groups did not differ significantly at baseline in age, anthropometric characteristics, as well as in psychological measures ($p > 0.05$) (Table 2). Pre- and post-intervention results for all dependent measures are presented in Table 1.

Table 1 – Changes after Zumba intervention program.

	Experimental Group (n = 70)			Control Group (n = 70)		
	Baseline	Post-test	Δ	Baseline	Post-test	Δ
<i>Standing long jump test</i>	4.33 (0.95)	8 (1.92) †*	3.66 (1.34)	4.63 (0.96)	3.90 (1.06)	-0.73 (0.98)
<i>Harvard step test</i>	6.26 (1.83)	13.46 (3.44)	7.20 (2.51)	5.96 (1.93)	5.70 (1.78)	-0.26 (0.90)
<i>Sit and reach test</i>	4.77 (2.40)	9.10 (3.13) †*	4.32 (1.63)	4.95 (2.28)	3.58 (2.72)	-1.37 (1.32)
<i>Rosemberg self-esteem</i>	15.01 (2.43)	18.55 (2.54)	3.54 (4.97)	15.05 (2.14)	12.74 (1.96)	-2.33 (1.53)
<i>BMI</i>	92.11 (3.90)	89.54 (5.93)	-2.57	91.96 (4.04)	91.62 (4.02)	-0.34 (1.27)

Note: values are presented as mean ($\pm$ SD); Δ : pre- to post-training changes; †Significant 'Group x Time' interaction: significant effect of the intervention ($p < 0.001$). *Significantly different from pre-test ($p < 0.001$).

Body Max Index (BMI)

Statistical analysis revealed significant 'Time x Group' interaction for BMI ($F_{1,138} = 76.57$, $p < 0.001$, $\eta^2_p = 0.55$). The post-hoc analysis revealed a significant improvement in physical fitness ($t = 8.69$, $p < 0.001$, $d = 1.60$) in the intervention group. No significant changes were found for the control group ($p > 0.05$).

Motor tests

A two-factor repeated measures ANOVA found a significant 'Time x Group' interaction for the Standing long jump test ($F_{1,138} = 42.06$, $p < 0.001$, $\eta^2_p = 0.54$), Harvard Step test ($F_{1,138} = 529.08$, $p < 0.001$, $\eta^2_p = 0.79$), Sit and reach test ($F_{1,138} = 516.57$, $p < 0.001$, $\eta^2_p = 0.78$). Post hoc analysis revealed that the experimental group

made significant increase from pre- to post-test in nello Standing long jump test ($t = 10,95$, $p < 0,001$, $d = 1,30$), Harvard Step test ($t = 31,65$, $p < 0,001$, $d = 3,78$), Sit and Reach test ($t = 22,21$, $p < 0,001$, $d = 2,65$). No significant changes were found for the control group.

Rosemberg self-esteem scale

Statistical analysis revealed significant 'Time x Group' interaction for Rosemberg self-esteem scale ($F_{1,138} = 271,43$, $p < 0,001$, $\eta^2_p = 0,66$). The post-hoc analysis revealed a significant improvement in the score for this variable ($t = 12,70$, $p < 0,001$, $d = 1,51$) in the intervention group. No significant changes were found for the control group ($p > 0,05$).

Grade point

The execution of a two-factor repeated measures ANOVA found a significant 'Time x Group' interaction for Grade point ($F_{1,138} = 148,63$, $p < 0,001$, $\eta^2_p = 0,51$). The post-hoc analysis revealed a significant improvement in the average point in this variable ($t = 13,94$, $p < 0,001$, $d = 1,66$) in the experimental group. Non sono stati riscontrati cambiamenti significativi per il gruppo di controllo ($p > 0,05$).

Finally, Correlation Coefficient (Pearson's r) were calculated. They were performed to reveal the relationship between academic performance (expressed by the average grade point obtained over 2 quarters), self-esteem, and BMI (Fig. 1, 2). We found significant statistical correlations between the average grade point and self-esteem (Fig. 1) and between BMI and self-esteem (Fig. 2).

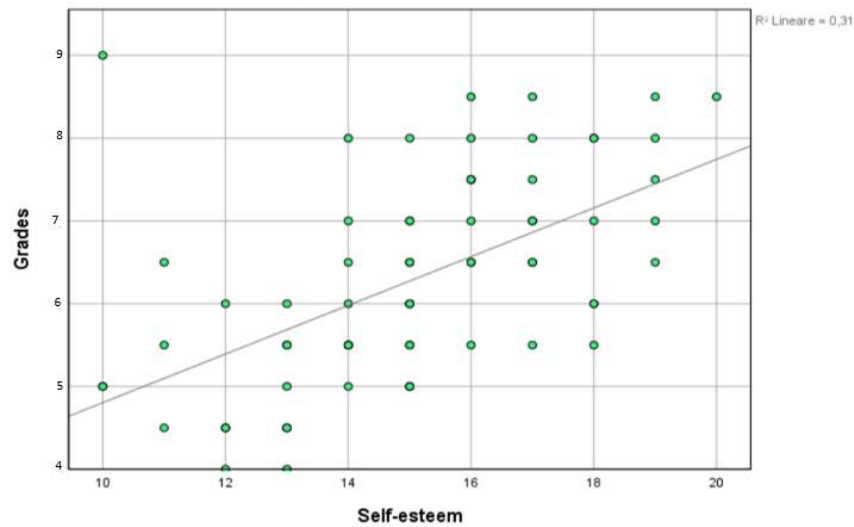


Fig. 1 - Correlation between the grade point average and self-esteem.

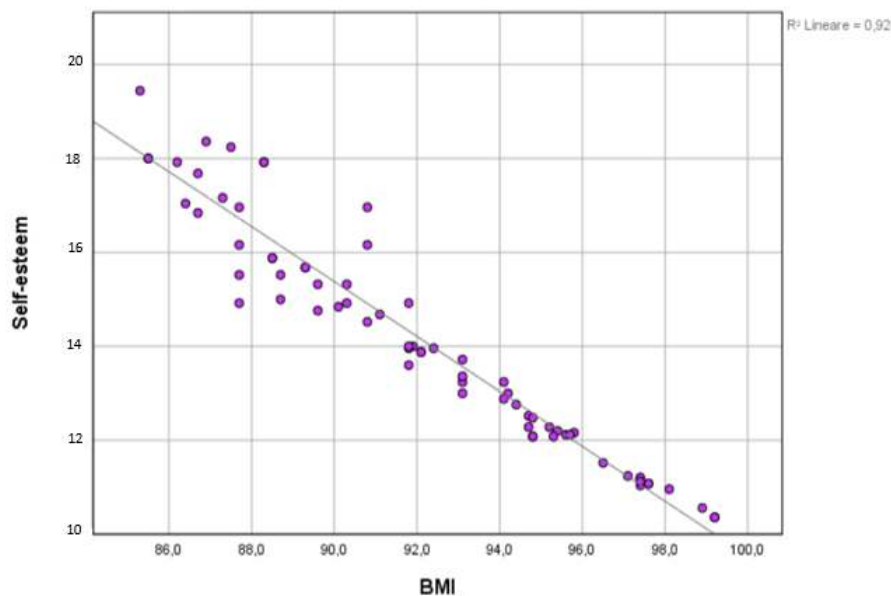


Fig. 2 – Correlation between the BMI and self-esteem.

Discussion

The aim of this work was to investigate the relationship between a 12-week physical activity intervention, self-esteem and school performance among overweight female students in a secondary school, based on the assumption that physical activity plays a crucial role as a mediating factor between self-esteem, body weight and school performance. In this work, the results show that 12 weeks of physical activity based on a Zumba dance program were effective in promoting higher academic performance and improving self-esteem. In contrast, regular physical activity classes were less effective in achieving implications that corresponded to the goals set in this study.

The results obtained from the present work therefore allow the conclusion that physical activity is an important correlation factor between self-esteem, body weight and school performance. Indeed, the first important result that could be observed concerns the increase in self-esteem as a consequence of physical activity. This result is probably due to the fact that children, in the context of physical activity, can experience various psychological mechanisms resulting from learning a new skill, which are also reinforced by the very fact that they want to successfully engage in the activity to which they are devoting their time and effort (Sember, Jurak, Kovač, Morrison, & Starc, 2020). This finding suggests that self-management strategies are a possible mechanism through which physical activity influences self-esteem (Simonton, & Layne, 2023). Another important result observed was that the girls who had better scores on the Rosenberg Self-Esteem Scale were also those who reported an improvement in BMI as well as in their school performance (in terms of school grades).

We hypothesized that this result was due to the fact that girls with high levels of self-esteem were able to be more flexible, resilient and efficient problem-solvers and focused primarily on achieving their goals and pursuing personal success rather than focusing on the difficulties they encountered (Barbosa et al., 2020).

In fact, girls who developed increased self-concept were able to develop positive behavior towards weight control. This is probably because the improved self-concept is able to direct the girls' personal actions into high-profile healthy activities and build positive behaviors that drive significant changes in eating behavior and consequently body weight (Moeini et al., 2021). Finally, girls who had been able to increase their self-esteem had better scores in their school performance in terms of grades. Learning is in fact a complex process that includes both cognitive and confidence components in one's own abilities and competences, the dynamics of which also concern the ways in which the learner independently achieves learning goals and the ways in which he or she perceives his or her own self-concept (Madden et al., 2020). Students who are able to self-regulate their learning are able to modulate their motivational processes so as to improve their academic performance. As research in this field has shown, the belief that one is able to regulate one's own learning and live up to the demands of normal school activities is instrumental in fostering academic success and promoting prosocial behavior throughout development (Swift, Johannsen, Lavie, Earnest, & Church, 2014). In addition, several evidences hypothesize that physical activity may improve students' academic performance due to the fact that they develop faster response skills to different cognitive tasks (e.g., executive function skills and task behavior) at the end of a program involving aerobic-type exercises (Donnelly, & Lambourne, 2011). Indeed, physical activity is a visible mediator of improvements in academic performance as it is able to enable the allocation of neural resources underlying performance in working memory tasks (Lahart Darcy Gidlow, Calogiuri 2019).

A large body of research has shown that individuals who engage in high levels of physical activity exhibit greater problem-solving and decision-making abilities (Rodriguez-Ayllon, 2019).

Finally, it is likely that the choice to conduct the activities in the natural environment (outdoors) could have significantly influenced the levels of involvement with the proposed activities. In fact, it is now widely recognized that exposure to nature can promote the occurrence of positive psychological states such as, for example, the reduction of psychophysiological stress (Fernandez-Busto et al., 2019). Thompson Coon and colleagues (2011) examined the effects of physical activity performed in an outdoor setting versus physical activity performed indoors on mental and physical well-being, health-related quality of life and long-term adherence to physical activity. The authors reported the beneficial effects of natural environments for a number of psychological outcomes, such as increased positive engagement and reduction of tension, confusion, anger and depression. There was also evidence of increased enjoyment and satisfaction with outdoor activities by participants who expressed a willingness to continue to repeat the positive experience. Similarly, Lachowycz, and colleagues (2011), examined the association between PA performed in green spaces and weight status. They concluded that there is a positive association between the two factors examined related to feelings of connection with nature and visual recognition of characteristic elements such as the color green. As discussed, the results of this research are in line with previous studies that confirmed evidence of a significant association between active lifestyle, self-esteem and school performance (Ellemborg, & St-Louis-Deschênes, 2010; Hillman, Buck, Themanson, Pontifex, & Castelli, 2009; Pesce, Crova, Cereatti, Casella, & Bellucci, 2009).

Physical activity would appear to have several positive effects on school performance that occur through different physiological, emotional, cognitive and learning processes (Fredericks, Kokot, & Krog, 2006; Kamijo et al., 2011; Tomporowski, 2003). For this reason, schools should provide their students with more opportunities for physical activity. Although this research provides support regarding the positive relationship between physical activity, self-esteem, weight loss and academic achievement, some limitations of this study deserve consideration. The first limitation is that the female students were recruited from only one school, so the results

cannot be extended to pupils from other schools or with different backgrounds. Furthermore, the small sample size (N=100), generated by the difficulties in involving a large number of overweight female students, is another limitation. A final limitation concerns the failure to assess the long-term effects of physical activity on cognitive functions. Furthermore, it does not explore a wide age range and the data were collected from a single time window.

It is therefore recommended that subsequent research should analyze similar factors on a larger and more heterogeneous sample. However, the results achieved may provide significant pointers for future studies. Therefore, the strengths of this research lie in the fact that this effective strategy improves the physical fitness and school performance as well as the psychosocial factors of overweight girls.

Conclusions

The results obtained from the present work allow us to conclude with greater certainty that physical activity, especially aerobic exercise, induces significant effects that mediate improvements in cognitive performance that can provide multiple pathways for optimizing the learning strategies of school-age children. Furthermore, providing children with the opportunity to be regularly active during the school day can improve school performance and, at the same time, promote harmonious psycho-physical development.

Therefore, by virtue of the recognized positive relationship between physical activity, self-esteem, BMI and scholastic success, Physical Education can and should be an advantageous opportunity to promote an active lifestyle among school-age children. The school is the educational setting where the child spends most of his or her time, so the school environment should provide the opportunity to ensure recommended levels of physical activity through more vigorous actions to extend the time devoted to exercise.

Funding

No sources of funding were used to assist in the preparation of this manuscript.

Conflicts of interest statement

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Authors' contribution

Author 1 designed the study, conducted the research, carried out the statistical analysis, interpreted the data, wrote and revised the manuscript. Author 2 supervised the intervention program, collected data, was involved in the interpretation of data and revised the manuscript. Author 3 was involved in data collection and helped supervise the intervention program. All authors contributed intellectually to the manuscript, and all authors have read the manuscript and approved the submission.

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