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Association of physical activity, muscular strength, and obesity indicators with self-concept in Chilean children

Asociación de indicadores de actividad física, fuerza muscular y obesidad con el autoconcepto en niños chilenos

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Abstract

Objectives: the present study examined the association of physical activity, muscular strength, and obesity indicators with self-concept in Chilean children.

Methods: this cross-sectional study included 1078 Chilean children (mean age: 9.1 years [standard deviation: 1.1]; 598 boys). Physical activity was evaluated using the Physical Activity Questionnaire for Older Children. Upper and lower limb strength was evaluated using a digital dynamometer and standing long jump performance, respectively. The general strength index was calculated based on z-score values. Obesity indicators used were height, weight, body mass index, and body fat. The self-concept test was used to determine the academic, social, emotional, family, physical self-concept dimensions and total self-concept of children.

Results: the mean total self-concept was 3.3 (standard deviation: 0.5). Physical activity was associated with academic (β: 0.32; p = 0.03), social (β: 0.24; p = 0.04), family (β: 0.13; p = 0.01), physical (β: 0.46; p = 0.01) self-concept dimensions and total self-concept (β: 0.22; p = 0.01), regardless of sex and age. Upper limb strength and general strength index were negatively associated with academic self-concept dimensions (β: -0.02; p = 0.01 and β: -0.13; p = 0.02) and total self-concept (β: -0.04; p = 0.01). Body weight and body mass index were negatively associated with academic (β: -0.01; p = 0.01 and β: -0.01; p = 0.02) and physical self-concept dimensions (β: -0.03; p = 0.03).

Conclusions: these findings suggest that physical activity is positively related with self-concept. Thus, physical activity and self-percept must be considered as an essential social cognitive perspective to provide suitable mental health in children.

Keywords:

Physical activity. Physical fitness. Obesity. Self-concept. Schoolchildren.

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Resumen

Objetivos: el presente estudio examinó la asociación de indicadores de actividad física, fuerza muscular y obesidad con el autoconcepto en niños chilenos.

Métodos: este estudio transversal incluyó a 1078 niños chilenos (edad media: 9,1 años [desviación estándar: 1,1]; 598 niños). La actividad física se evaluó mediante el *Physical Activity Questionnaire for Older Children*. La fuerza de los miembros superiores e inferiores se evaluó utilizando un dinamómetro digital y el rendimiento en salto de longitud de pie. El índice de fuerza general se calculó en base a los valores de z-score. Los indicadores de obesidad utilizados fueron altura, peso, índice de masa corporal y grasa corporal. Se utilizó el test de autoconcepto para determinar las dimensiones académicas, social, emocional, familiar, físico y autoconcepto total.

Resultados: la muestra total presento un autoconcepto promedio de 3,3 (desviación estándar: 0,5). La actividad física se asocio con autoconcepto académico (β: 0,32; p = 0,03), social (β: 0,24; p = 0,04), familiar (β: 0,13; p = 0,01), físico (β: 0,46; p = 0,01) y total (β: 0,22; p = 0,01). La fuerza muscular de miembros superiores y el índice general de fuerza se asociaran negativamente con al autoconcepto académico (β: -0,02; p = 0,01 y β: -0,13; p = 0,02) y total (β: -0,04; p = 0,01). Mientras que el peso corporal e índice de masa corporal se asociaron negativamente con autoconcepto académico (β: -0,01; p = 0,01 y β: -0,01; p = 0,02) y físico (β: -0,03; p = 0,03).

Conclusiones: estos hallazgos sugieren que la actividad física se relaciona positivamente con el autoconcepto. Así, la actividad física y la autopercepción deben ser consideradas como una perspectiva cognitiva social imprescindible para proporcionar una adecuada salud mental en los niños.

Palabras clave:

Actividad física. Aptitud física. Obesidad. Autoconcepto. Escolares.

INTRODUCTION

Self-concept is a psychological construct that refers to the mental perception that an individual has of himself or herself. This mental perception begins to develop early and is critical for the future physical and mental balance (1). Self-concept during early ages is based on the relationship with others. It considers a multidimensional perspective including academic, emotional, social, family and physical dimensions (2). The academic dimension is the result of experiences, fails and successes in the school context; the emotional dimension relates to the feeling of wellbeing and personal satisfaction; the social dimension refers to the meaning a child's behavior has for others (family, friends, teachers); and the physical dimension includes the perception of the own appearance and physical skills (2). All of these dimensions form a global self-concept, which is considered an emotional resource for mental and physical health (3). Moreover, each dimension of self-concept can be related to different aspects of wellbeing in childhood. A positive academic self-concept would be associated with academic performance and motivation to learn in primary school children (4), and the emotional self-concept would be associated with higher feelings of satisfaction with life and better psychological wellbeing (5). The social self-concept has been positively related to psychosocial wellbeing and satisfactory relationships with peers, and negatively with bullying victimization (6). The family self-concept is negatively related to disruptive behaviors and victimization (7).

The physical self-concept is one of the most studied dimensions in relation to health indicators such as nutritional status, body composition, physical activity and fitness. Such health indicators are considered predictors of physical and mental health in childhood and in adulthood (8,9), so studying its relationship with self-concept is interesting for developing health promotion strategies at young ages.

Cross-sectional studies have shown associations of physical self-concept with obesity indicators. Raustorp et al. reported a negative correlation between physical self-concept and body mass index in Swedish schoolchildren (11-12 years), and this association was stronger in girls than in boys (10). Similar results have also been shown in Spanish children (10-12 years) (11). In addition, moderate relationships between physical self-concept and physical activity and fitness have been observed in Estonian schoolchildren (11-14 years). This study further showed that specific components of self-concept predict physical activity and fitness (12). This positive correlation between physical self-concept and fitness has been observed even in the absence of a correlation between fitness and global self-concept (11). There is also evidence for positive effects on physical activity and strength interventions on children's physical self-concept. Lubans et al., for example, showed that that girls increased their physical self-concept (specifically body attractiveness) after an 8-week strength training. There was also a significant but marginal effect on the body. However, among the boys who participated in the intervention, physical self-concept remained stable (13). In addition, 80 % of Chilean children do not meet the minimum recommendations for physical activity, and their eating habits are far from the healthy ideal (14). Chilean children increased their prevalence of overweight and obesity by 3.9 % from 2009 through 2018 (15). The results of the 2018 Nutritional Map of Chile showed that more than 50 % of children were overweight and obese (15). This suggests that improving physical activity and decrease the rate of obesity has the potential to influence psychological health in children positively.

A meta-analysis studied the effect of physical activity interventions on self-outcomes, including self-concept. Included studies consisted of supervised physical activity interventions in children and adolescents in different settings. The results showed that randomized controlled interventions that considered physical activity alone (not in conjunction with other interventions) are effective in improving self-concept (16). A systematic review on the mechanisms of the effect of physical activity on mental health reported similar results (17). Both increase the physical activity level and muscular strength, are important for healthy future levels, and consequently decrease overweight and obesity in childhood. Nonetheless, few studies have associated health indicators with self-concept in Chilean children (18). To enhance the understanding of the association between physical activity, physical fitness, and self-concept the present study examined the association of physical activity, muscular strength, and obesity indicators with self-concept in Chilean children.

METHODS

STUDY DESIGN AND SAMPLE

This cross-sectional study is part of the "Development, scaling and validation of an integrated system for school interventions on diet, physical activity, and community environment in the Metropolitan Region of Chile". Details have been previously published (18).

The target population of the study included all students enrolled in primary schools from the southern area of Santiago, which provides a total sample size of 6,308 students. The study population consists of second to fourth-grade students (mean age of 9 years) from seven schools in the the Metropolitan Region of Chile. Data collection occurred from October to December 2019. Stratification, proportionality, and randomization techniques were employed to establish a representative sample (sample error, 0.04; IC = 95.5 %). Random stratified sampling with proportional affixation was used to ensure a homogeneous representation of the sample. The strata considered were grade (second, third and fourth grades from primary school), and sex (men and women). The final sample was 1,078 participants (598 boys).

The research team was present during the application of the instruments to ensure their correct implementation. Students completed the questionnaire anonymously, ensuring confidentiality during regular class time. Physical condition tests were administered during their regular physical education classes. Assessments were applied by health professionals who were previously trained in applying the tests and supervised by the expert investigators during all the dimensions.

This project was approved by the Ethics Committee of the Universidad de Santiago de Chile (number 187-2019). In all aspects, this research has been conducted according to the Declaration of Helsinki. Written consent has been obtained before participation from the guardians of students and the school community, who were informed of the study's nature before obtaining informed consent.

PHYSICAL ACTIVITY

Physical activity was evaluated using the Physical Activity Questionnaire for Older Children (19-21), in its validated Spanish version (21). The Physical Activity Questionnaire for Older Children is appropriate for school-aged children (grades 4-8; approximately, ages 8-14) who are currently in the school system and have recess as a regular part of their school week (22). Measures of physical activity have been validated previously and showed acceptable levels of test-retest reliability for both males ($r = 0.75$) and females ($r = 0.82$) (19).

Questions related to the amount of physical activity carried out in the last 7 days through 10 questions about its type and frequency. From the answers, a score that ranged between 1 and 5 was obtained, with a higher score indicating a greater practice of physical activity. The overall Physical Activity Questionnaire for Older Children score is a composite value that calculates the mean of nine item scores.

MUSCULAR STRENGTH

A Jamar® PC-5030 hydraulic dynamometer was used to determine maximum voluntary grip force contraction with precision range of 5-100 kg to 100 g, through two alternated attempts per hand with participants maintaining a standardized position with arms parallel to the body without touching it. The average of the best attempt for each hand was used for further analyses. Children were instructed to stop squeezing if they felt pain or discomfort during measurement. A standing long jump was used as a measure of lower limb strength. Participants performed two trials, with the better attempt being used for further analyses. The participants were verbally encouraged by the examiner to do their best during the tests. A general strength index was calculated as the mean of the z-scores (Z = [value-mean] / standard deviation) for upper and lower limb strength, for example (23).

OBESITY INDICATORS

The data were collected by professionals during the school visit according to standardized procedures of the National Health and Nutrition Examination Survey (24). The children were weighed with a Seca 813 scale (Seca®, Hamburg, Germany), which has a precision of 100 g, in light clothing and barefoot. Height was measured with the participants in the Frankfurt position using a Seca 213 (Seca®, Hamburg, Germany) stadiometer with a precision of 1 mm. Body mass index (kg/m^2) was calculated and subsequently converted to z-scores based on the World Health Organization growth reference charts (25).

Body fat was estimated via skinfold measurements using a Lange® caliper with a precision of 0.2 mm, and a constant pressure of 10 g/mm^2. Specifically, the equation proposed by Slaughter was used, which estimates total body fat based on triceps and subscapular skinfold thickness (26).

SELF-CONCEPT ASSESSMENT

To determine the level of self-concept of the participants, the Five-Factor Self Concept Questionnaire was used (27). The Five-Factor Self-Concept Questionnaire (27) is based on the Shavelson et al. (28) model and is one of the self-concept questionnaires most utilized for Spanish-speaking samples (29,30). The Five-Factor Self Concept Questionnaire was developed, validated, and normed in Spain on a large sample of nearly 6,500 participants ranging in age from 10 to 62 years, providing national norms for sex and age (28). Furthermore, Five-Factor Self Concept Questionnaire has been shown to be a valid and reliable measure of self-concept and has been used

previously in health research (17,31,32). Specifically, the AF-5 was developed to evaluate a person's self-concept, including academic (e.g., "I do my homework well"), social (e.g., "I am a friendly person"), emotional (e.g., reversed item, "Many things make me nervous"), family (e.g., "I feel that my parents love me"), and physical dimensions (e.g., "I like the way I look"). The scale consists of 30 items, six for each dimension. The items are statements that the participant must rate using a continuous response on a 99-point scale (visualized as a thermometer), ranging from 1 (complete disagreement) to 99 (complete agreement).

All participants completed the questionnaire on one occasion. Participants were asked to complete the questionnaire independently and honestly, based upon their feelings at that precise moment. Questionnaires were completed inside the school environment in the presence of the researchers.

STATISTICAL ANALYSIS

Descriptive statistics included mean and standard deviation as summary measures. The normality of continuous variables was verified using the Kolmogorov-Smirnov test. Sex differences were assessed using Student's t-test for independent samples. The correlation between physical activity, muscular strength, obesity indicators, and self-concept were performed with Pearson's correlation coefficients (r). The correlation was classified as weak (< 0.40), moderate (between ≥ 0.40 and < 0.70), or high (≥ 0.70) (33).

Multilevel linear regression models were used to determine physical activity, muscular strength, obesity indicators that best predicted self-concept. Our models were run individually for each variable adjusted for sex and age and allowed for clustering at the school level. The adjusted β and respective confidence interval (95 % CI) were obtained from multilevel linear regression models investigating the β of four different outcomes: academic, social, emotional, family, physical, and total self-concept. The statistical analyses presented in this study were conducted using the Statistical Package for the Social Sciences V26 software (SPSS Inc., IBM Corp., Armonk, New York, NY, USA)(34) and a p-value < 0.05 was adopted as significance level.

RESULTS

The children's characteristics are presented in table I. Of the 1,078 Chilean children (mean age: 9.1 years) in the sample 598 (55.5 %) were boys. Mean physical activity level, muscle strength (upper and lower limb strength, and general strength index), body weight, and body mass index were significantly higher in boys compared to girls. Girls had significantly higher body fat percentage values. Girls also displayed higher academic, physical, and total self-concept dimensions than boys. There were no significant differences between boys and girls for age, body height, and social, emotional, and family self-concept dimensions (Table I).

Table II presents the results of the correlation analysis describing associations between physical activity, muscular strength, and obesity indicators with self-concept dimensions. Correlation coefficients, generally, showed weak correlations with physical activity as the most prominent correlate with various dimensions of self-concept. Specifically, physical activity was positively associated with academic, social, family, and physical as well as total self-concept. On the other hand, muscle strength was negatively associated with academic and emotional self-concept dimensions as well as total self-concept. Obesity indicators were negatively associated with academic, social, emotional, physical self-concept dimensions, and total self-concept (with a greater correlation coefficient for body weight) (Table II).

Table III shows the results of the multilevel linear regression models for the effects of physical activity, muscular strength, and obesity indicators on self-concept dimensions in children. Physical activity was positively associated with academic, social, family, physical self-concept dimensions, and total self-concept regardless of sex and age. Upper limb strength and general strength index were negatively associated with academic self-concept dimensions and total self-concept, respectively. Furthermore, body weight and body mass index were negatively associated with academic and physical self-concept dimensions.

Table I. Descriptive analysis [mean (SD)] of physical activity, muscular strength, obesity indicators, and self-concept in Chilean children

Variables	Total (n = 1078)	Boys (n = 598)	Girls (n = 480)	p-value*
Age (years)	9.1 (1.1)	9.2 (1.2)	9.0 (1.1)	0.072
Physical activity	2.8 (0.6)	2.9 (0.6)	2.7 (0.5)	*0.041*
Upper limb strength (kg)	11.2 (4.0)	11.7 (4.0)	10.6 (3.9)	*< 0.001*
Lower limb strength (cm)	104.3 (20.5)	109.7 (21.1)	97.4 (17.5)	*< 0.001*
General strength index (z-score)	-0.04 (0.8)	0.19 (0.8)	-0.24 (0.7)	*< 0.001*
Body height (cm)	133.8 (9.1)	134.1 (9.0)	133.5 (9.3)	0.597

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Table I (Cont.). Descriptive analysis [mean (SD)] of physical activity, muscular strength, obesity indicators, and self-concept in Chilean children

Variables	Total (n = 1078)	Boys (n = 598)	Girls (n = 480)	p-value*
Body weight (kg)	35.4 (10.5)	35.7 (11.3)	35.1 (9.4)	*0.010*
Body mass index (kg/m^2)	19.5 (3.9)	19.5 (4.2)	19.4 (3.6)	*< 0.001*
Body fat (%)	27.2 (9.3)	25.3 (9.9)	29.5 (8.1)	*< 0.001*
Self-concept				
Academic	3.6 (0.9)	3.4 (0.9)	3.8 (0.9)	*0.049*
Social	3.4 (0.6)	3.4 (0.7)	3.5 (0.6)	0.069
Emotional	2.6 (0.9)	2.5 (0.9)	2.7 (0.8)	0.150
Family	3.5 (0.5)	3.4 (0.6)	3.5 (0.5)	0.134
Physical	3.4 (0.8)	3.4 (0.6)	3.5 (0.8)	*0.004*
Total	3.3 (0.5)	3.2 (0.5)	3.4 (0.5)	*0.042*

**Student's t-test for comparisons between boys and girls (p < 0.05).*

Table II. Correlation (r) between physical activity, muscular strength, obesity indicators, and self-concept in Chilean children

Variables	Academic	Social	Emotional	Family	Physical	Total
Physical activity	0.22 (p = 0.01)*	0.24 (p = 0.02)*	-0.01 (p = 0.06)	0.15 (p = 0.01)*	0.34 (p = 0.02)*	0.28 (p = 0.04)*
Upper limb strength (kg)	-0.11 (p = 0.02)*	-0.02 (p = 0.06)	-0.01 (p = 0.08)	-0.04 (p = 0.12)	0.01 (p = 0.09)	-0.05 (p = 0.06)
Lower limb strength (cm)	-0.09 (p = 0.02)*	-0.04 (p = 0.11)	-0.08 (p = 0.01)	-0.05 (p = 0.14)	0.05 (p = 0.17)	-0.06 (p = 0.02)*
General strength index (z-score)	-0.11 (p = 0.04)*	-0.03 (p = 0.13)	-0.06 (p = 0.17)	-0.06 (p = 0.11)	0.04 (p = 0.18)	-0.07 (p = 0.01)*
Body weight (kg)	-0.12 (p = 0.04)*	-0.07 (p = 0.02)*	0.02 (p = 0.09)	-0.05 (p = 0.11)	-0.14 (p = 0.01)*	-0.10 (p = 0.01)*
Body mass index (kg/m^2)	-0.06 (p = 0.02)*	-0.04 (p = 0.08)	-0.04 (p = 0.07)	-0.01 (p = 0.15)	-0.12 (p = 0.01)*	-0.06 (p = 0.03)*
Body fat (%)	-0.01 (p = 0.18)	-0.01 (p = 0.11)	-0.06 (p = 0.03)*	-0.02 (p = 0.12)	-0.07 (p = 0.04)*	-0.01 (p = 0.11)

**p < 0.05: Pearson's correlation (r).*

Table III. Multilevel linear analyses [β (95 % CI)] for physical activity, muscular strength, obesity indicators with self-concept in Chilean children

Variables	Academic	Social	Emotional	Family	Physical	Total
Physical activity	0.32 (0.23; 0.40) p = 0.01*	0.24 (0.18; 0.30) p = 0.02*	-0.02 (-0.10; 0.06) p = 0.06	0.13 (0.08; 0.18) p = 0.02*	0.46 (0.38; 0.53) p = 0.03*	0.22 (0.18; 0.27) p = 0.01*
Upper limb strength (kg)	-0.02 (-0.04; -0.01) p = 0.04*	-0.00 (-0.01; 0.00) p = 0.06	-0.00 (-0.01; 0.01) p = 0.09	-0.00 (-0.01; 0.00) p = 0.07	0.00 (-0.01; 0.01) p = 0.06	-0.01 (-0.01; 0.00) p = 0.11

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Table III (Cont.). Multilevel linear analyses [β (95 % CI)] for physical activity, muscular strength, obesity indicators with self-concept in Chilean children

Variables	Academic	Social	Emotional	Family	Physical	Total
Lower limb strength (cm)	-0.00 (-0.01; 0.01) p = 0.06	-0.01 (-0.00; 0.01) p = 0.08	-0.01 (-0.00; 0.01) p = 0.05	-0.01 (-0.01; 0.00) p = 0.09	0.01 (0.00; 0.01) p = 0.11	-0.00 (-0.00; 0.00) p = 0.08
General strength index (z-score)	-0.13 (-0.19; -0.06) p = 0.04*	-0.03 (-0.07; 0.02) p = 0.07	-0.06 (-0.13; 0.00) p = 0.12	-0.04 (-0.08; 0.00) p = 0.11	0.04 (-0.01; 0.10) p = 0.15	-0.04 (-0.08; -0.01) p = 0.04*
Body weight (kg)	-0.01 (-0.01; -0.02) p = 0.02*	0.01 (-0.01; -0.00) p = 0.09	0.01 (-0.01; 0.01) p = 0.11	0.01 (-0.01; 0.01) p = 0.14	0.01 (-0.01; 0.01) p = 0.17	0.01 (-0.01; 0.01) p = 0.09
Body mass index (kg/m^2)	-0.01 (-0.02; -0.01) p = 0.03*	0.01 (-0.01; -0.00) p = 0.08	0.01 (-0.01; -0.00) p = 0.12	0.01 (-0.01; -0.01) p = 0.14	-0.03 (-0.04; -0.01) p = 0.02*	0.01 (-0.01; 0.01) P = 0.16
Body fat (%)	0.00 (0.00; 0.00) p = 0.24	0.00 (0.00; 0.00) p = 0.26	0.00 (0.00; 0.00) p = 0.29	0.00 (0.00; 0.01) p = 0.22	0.00 (0.00; 0.001) p = 0.35	0.00 (0.00; 0.00) p = 0.29

*Multilevel general linear model controlling for sex, age, and type of school with school as a random effect, unstandardized beta coefficients are presented. *p < 0.05.*

DISCUSSION

The present study examined the association of physical activity, muscular strength, and obesity indicators with self-concept in Chilean children. We found that physical activity was positively associated with academic, social, family, physical self-concept dimensions and total self-concept, independently of sex and age. Upper limb strength and general strength index, on the other hand, were negatively associated with academic self-concept and total self-concept, respectively. Furthermore, body weight and body mass index were negatively associated with academic and physical self-concept dimensions.

A systematic review and meta-analysis suggested that children or adolescents with stronger beliefs about their physical features are more likely to engage in physical activity than those who report lower levels of self-concept (35). However, the authors propose that it is not clear if participation in physical activity leads to developments in self-concept or those with high levels of self-concept are concerned with physical activity (35). Particularly, the strength of the relationship between physical activity and self-concept (and dimensions) did not depend upon how the data were treated (i.e., whether self-concept was the dependent or independent variable). There is conflicting evidence in the literature regarding associations of this nature (35).

Although there is satisfactory evidence from previous studies to conclude that there is a bi-directional association between physical activity and self-concept, investigators working in this area are encouraged to conduct mediation analyses to assist in unravelling the nature of the association between self-concept and physical activity (16,35,36). Also, separate analyses that model the bidirectional nature of self-concept and its dimensions as both mediators and moderators of physical activity are necessary.

The observed associations between obesity indicators and self-concept in the present study are similar to those of other studies, with a higher body mass index being associated with a lower self-concept (37-39). García-Sánchez et al., (40), for example, found significant associations of body mass index and waist circumference with physical self-concept. However, the authors suggest that being in good physical shape counteracts low total self-concept associated with excess body weight, and overweight/obese children can reach similar levels as children of normal weight. Nevertheless, college girls with a higher body mass index also displayed a lower self-concept (41). Intervention studies using anthropometric measures and psychological tests comparable to the present study also found that people with a high body mass index obtain lower scores in self-concept, with stronger associations in the physical dimension than in other dimensions of self-concept (42-44).

It is necessary to mention that fitness or physical condition are currently assigned a protective value against cardio-metabolic diseases in obese subjects of different ages, which, added to this line of study of psychological factors in children and young people, is revealing a very interesting panorama regarding the role of physical fitness as a protective factor against overweight and obesity, controlling the associated psychosocial and pathophysiological alterations. Other authors point out a tendency to influence the elevated body mass index in all self-concept scores, this being more accentuated in the physical dimension than in the others (42,43).

This study has several strengths and limitations. The strengths of the present study include the study population, which consists of a representative group of the southern sector of Santiago, which allows for the generalization of the results. The limitations include the cross-sectional design and not being representative of all Chilean children. The work presented was restricted to children 9-11 years of age and, therefore, limits generalizability to other age groups, and we did not assess pubertal development. Questionnaires were used to determine physical activity and self-concept, which can lead to recall bias. Interventions with strategies that focus on the physical activity, muscular strength,

obesity indicators and self-concept should be planned and implemented, which may help understand which strategies should be implemented to promote self-concept dimension. This helps build evidence on the direct and indirect effects of physical activity, muscular strength, obesity indicators and self-concept at the population level.

The results of this study have demonstrated a significant association between physical activity, muscular strength, and obesity indicators with self-concept in children. Thus, physical activity and self-percept must be considered as an essential social cognitive perspective to provide suitable mental health in children. Accordingly, self-concept needs to be considered in the development of interventions targeting health behavior in children. A better understanding of various correlates contributing to health behaviors may also facilitate a more targeted approach towards health promotion in children. However, future studies with larger sample sizes and more heterogeneous populations are needed to clarify the association between lifestyle behaviors and self-concept in children and adolescents.

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