

Weight status, physical activity and self-concept in primary school children

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ABSTRACT

Objective: The self-concept, self-esteem and body image of schoolchildren is being compromised due to stigmatization and discrimination in many areas of their lives. Recent studies have shown different associations between those variables and fitness. The objective of this study was to analyse the relationship between weight status, physical activity and self-concept in 103 schoolchildren (63 girls) aged 8-12 years. **Design and method:** The design was cross-sectional relational. The sampling was non-probabilistic. The body mass index was calculated and the participants were categorized according to their weight status (normal weight vs. overweight-obesity) following international criteria. Physical activity (minor vs. major) was estimated with the short Krece-Plus test. The self-concept was evaluated with the Piers-Harris Self-concept Scale. Non-parametric statistics were used. **Results:** The results showed that those with normal weight had a better behavioural self-concept ($p = 0.048$). Those with greater physical activity scored higher in the intellectual ($p = 0.034$), physical ($p = 0.016$), social ($p = 0.031$) and global ($p = 0.008$) dimensions. The *fat but fit* paradox was also found in the self-concept; thus, those with normal weight/ greater physical activity presented a better intellectual self-concept ($p = 0.022$), physical ($p = 0.006$) and global ($p = 0.008$). **Conclusions:** These findings suggest that weight status and physical activity could be differentiating elements in the self-concept in childhood and preadolescence. Prospective studies are needed to analyse the effects in this relationship. **Keywords:** School; Well-being; Physical exercise; Body mass index; Fat but fit.

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INTRODUCTION

During the last decades, sedentary behaviours have been related to lack of physical activity, obesity and mental disorders among young people in their leisure and free time, resulting in the increase of excess weight, affecting even their mental well-being (Biddle & Asare, 2011, González & Ortega, 2013, Reigal-Garrido, Videra-García, Márquez-Casero, & Parra Flores, 2013).

This situation, which has contributed to unhealthy body weight status, especially in industrialized countries, has increased the prevalence of obesity to 8% in schoolchildren worldwide (Ng et al., 2014). This chronic illness, complex and multifactorial disease (Rubio et al., 2007; Gálvez et al., 2016) is due, among other reasons, to the convergence of different factors such as genetics, chronodisruption and an obesogenic environment (Lecube et al., 2017) which results in the term comorbidity, influencing the appearance of other diseases such as metabolic syndrome, hypertension, diabetes mellitus type 2, and various psychopathological symptoms, among which are mood disorders, depression, poor self-esteem and low self-concept (SC) (Jelalian, Sato, & Hart, 2011; Sanders, Han, Baker, & Cobley, 2015; Wallander et al., 2009); which are not easy to treat at an early age and can even last until adulthood (Singh, Mulder, Twisk, Van Mechelen, & Chinapaw, 2008).

In this context, in today's society a great concern has been generated since schoolchildren and young people usually face stigmatization and discrimination in many areas of their lives and, as a result, it has been assumed that their psychological well-being will be compromised (Bacchini et al., 2017; Navarro-Pardo, Meléndez, Sales, & Sancerni, 2012); it is necessary to strengthen especially their body image, self-esteem and SC (González-Toche et al., 2017; Moreno, Ángel, Castañeda, Castelblanco, López, & Medina, 2011; Vaquero-Cristóbal, Alacid, Muyor, & López-Miñarro, 2013). In this sense, Gálvez et al. (2015) emphasizes the importance of detecting factors that contribute to improving the mental health status of the youngest generation, highlighting among them the influence of body weight status on SC.

According to Piers & Herzberg (2002), SC is a psychological construct that measures the self-perception of a person in relation to different dimensions that he considers important for his life. In primary school children these dimensions or domains refer to the academic, social, emotional and physical (Cardenal & Fierro, 2003), which must be in balance so that the individual reaches the level of realization and personal satisfaction with himself, also necessary to have an autonomous and healthy lifestyle (Fraile & Catalina, 2013).

The evolution of SC is not innate or stable, but it is continuously being built throughout life (Piers & Herzberg, 2002), the first years determining the perception that the individual has of himself (Roa-García, 2013). His genesis is the product of the interactions that take place in the social contexts in which the individual develops (Sabeh, 2002). An individual's development can be supported by the stimulation of various factors such as the reorganization of eating habits, the adoption of active behaviour patterns, motivation and awareness of the school with the help of their immediate environment (Lecube et al., 2017).

Recent studies from different scientific fields emphasize the relevance of SC as one of the predictors of success in academic performance, social relationships or in the performance of physical activity (PA) (Moreno, Ángel, Castañeda, Castelblanco, López, & Medina, 2011; Rodríguez-García et al., 2014; Rosa-Guillamón, García-Cantó, Rodríguez-García, & Pérez-Soto, 2017a) being, in turn, one of the psychological constructs most analysed in relation to PA and sport (Guillén & Ramírez, 2011; Moreno, Cervelló, & Moreno, 2008; Rodríguez-García et al., 2015). Several studies show that SC predicts the intensity of PA (Fraile & Catalina, 2013; Garn et al., 2016; Kyle, Hernández-Mendo, Reigal-Garrido, & Morales-Sánchez, 2016;

Murgui, García, & García, 2016; Sánchez-Alcaraz & Gómez-Mármol, 2014). Other studies suggest the influence of SC of variables linked to healthy lifestyles such as body weight status and PA (Gálvez, Rodríguez, Rosa, García, Tárraga, & Tárraga, 2016; Mitchell, Moore, Bibeau, & Rudasill, 2012; Poulsen et al., 2011; Willows, Ridley, Raine, & Maximova, 2013).

Taking into account the frame of reference discussed above, this research set out several objectives. First, verifying the relationship between body weight status and SC. Second, analysing the relationship between PA and SC. Lastly, it was intended to examine a less documented topic. We tried to study the combined relationship between weight status (normal weight vs. overweight-obesity), PA (minor or major) and SC. All this was done to demonstrate the hypothesis that in spite of being overweight or obese you can have a good SC if you are physically active, based on the phenotype known as *fat but fit* applied to SC (Gálvez et al., 2016; García Sánchez, Burgueño-Menjíbar, López-Blanco, & Ortega, 2013).

The infant age stage was chosen because it is an important period in the life cycle of a person, in which there are multiple physical, social and psychological changes that can significantly affect the configuration of the SC and its dimensions (Mendo-Lázaro, Polo-del-Río, Iglesias-Gallego, Felipe-Castaño & León-del-Barco, 2017) hence, the multidimensional and hierarchical conception of the self-concept of Shavelson's model, Hubner & Stanton (1976), was used as a starting point.

MATERIAL AND METHOD

Participants

A total of 103 students (40 males and 63 females), between 8 and 12 years (mean \pm standard deviation = 9.94 ± 1.40 years) participated in this empirical, relational and cross-sectional study. Students have an average socioeconomic level and belonged to state school from the Region of Murcia (Spain). Sampling was non-probabilistic, chosen in a non-random manner and for convenience. The schoolchildren who presented some psychosocial pathology were excluded.

Measures

Assessment of body weight status

To measure the weight, the participant remained standing in the centre of an electronic scale (model 220, SECA, Hamburg, Germany) wearing light clothes (excluding long pants and coat), barefoot, distributing the weight on both feet, looking forward, arms along the body and without making any movement. Two measurements were made and the average of both was recorded. The size was measured through a telescopic height rod built into the scale. The participant was barefoot, standing upright, with heels together and arms along the body. The heels, the buttocks and the upper part of the back were in contact with the height rod. The head was oriented in a horizontal plane, the upper protuberance of the ear tragus and the lower edge of the eye's orbit (Frankfort plane). The participant breathed deeply and, holding their breath, the measurement was made at that moment taking as reference the highest point of the head, leaving the hair compressed. Two measurements were made and the average of both was recorded.

The body mass index (BMI) defined as the weight in kg divided by the height in meters squared was calculated. Based on the BMI, schoolchildren were categorized into two weight status groups (underweight / norm-weight and overweight / obese) following standard criteria adjusted to their age and sex (Cole, Bellizzi, Flegal, & Dietz, 2000).

Assessment of physical activity

The level of PA was measured with the Krece-Plus Short Test, belonging to the study enKid (Román-Viñas, Serra-Majem, Ribas-Barba, Pérez-Rodrigo, & Aranceta-Bartrina, 2003). This instrument allows estimating the PA of the students based on the daily average of hours that they watch television or play with video games (Item 1), and the hours of PA after school per week (Item 2). According to the test score, the students were categorized into two groups: minor PA ($X < P50$) and major PA ($X \geq P50$). The psychometric properties of this scale have been documented in research with schoolchildren of similar ages and sociocultural environments showing adequate internal consistency and high reliability and validity (Rosa et al., 2017). In this study, Cronbach's Alpha was 0.70.

A new variable was also created combining BMI and PA, categorizing school children into four groups: 1) normal weight / minor PA, 2) normal weight / major PA, 3) overweight-obesity / minor PA, and 4) overweight-obesity / major PA.

Assessment of self-concept

To measure the SC, the Piers-Harris Self-concept Scale (Piers & Herzberg, 2002) was used and administered to children from 7 to 12 years of age and adapted to Spanish by Cardenal & Fierro (2003). It is an instrument widely used in the educational field (Gálvez et al, 2015; Gálvez et al, 2016; Guillén & Ramírez, 2011; Rodríguez-García et al., 2014; Rodríguez-García et al., 2015), with a methodology of completion based on items of a dichotomous type (yes or no), which assess the degree of agreement or disagreement with what is stated in each item.

The instrument is composed of different dimensions or subscales: i) behavioural (18 items), which describes the degree to which the individual affirms or denies conduct of a problematic nature; ii) intellectual (17 items), which measures the child's self-assessment in relation to academic tasks, including a general perception towards the educational institution; iii) physical (12 items), which poses the behaviours related to their physical characteristics (appearance and physical attributes), and aspects such as leadership and the ability to express their opinions; iv) lack of anxiety (12 items), which describes an altered mood and includes different emotions related to worry, nervousness, sadness or fear; v) social or popularity (12 items), which assesses the way in which the individual values their relationship, popularity and acceptance among their peer group; vi) subjective happiness-life satisfaction (9 items), which describes a general feeling of being happy and being content to live; and, vii) global (80 items), which includes the individual perception related to physical attributes, habitual behaviour patterns, social relationships, academic performance, emotions-feelings and life satisfaction.

A better SC is related to higher scores in the six dimensions and in the global SC, except for the sub-scale of lack of anxiety, in which higher scores describe lower levels of anxiety.

The psychometric properties of this instrument have been documented in other studies that show adequate internal consistency and high reliability and validity (Gálvez et al., 2015; Gálvez et al., 2016; Rodríguez-García et al., 2014; Rodríguez-García et al., 2015).

In this work we have applied reliability tests of the items of the scale and a confirmatory factor analysis to verify the grouping of the items in the different sub-scales originally defined. All the items on the scale have consistency and reliability, since if any of them is eliminated, the variance explained and the global reliability in each sub-construct and in the global scale decreases significantly. The scale showed good reliability measured through the Cronbach's Alpha test ($\alpha = 0.892$). The reliability of the different sub-constructs was

as follows: behavioural ($\alpha = 0.921$), intellectual (0.935), physical ($\alpha = 0.845$), lack of anxiety ($\alpha = 0.901$), social or popularity ($\alpha = 0.856$) and happiness -satisfaction ($\alpha = 0.845$).

The confirmatory factor analysis with varimax rotation confirmed the six sub-scales in which the instrument is structured. Each of the sub-constructs of the scale and the global scale explain a variance that provides consistency to the scale applied. The percentages of the variance explained in the different sub-constructs were the following: behavioural (15.11%), intellectual (14.89%), physical (13.98%), lack of anxiety (13.06%), social or popularity (11.65%) and happiness-satisfaction with life (0.94%). The total variance explained was 78.66%.

Procedures

The schools were selected based on the acceptance of the teachers and parents to participate in the study. The authorization to carry out the study was received in writing. The informed consent was received from the parents. The field work was done by an explorer, who was a graduate in sports science. The questionnaires were administered by natural class groups. The researcher resolved any doubt in the completion. The average duration was 25 minutes. The design of the research was carried out taking into account the deontological norms recognized by the Helsinki Declaration (2013 revision). The study was conducted during the month of October of the academic year 2016/17. This study belongs to a wider investigation that is being developed in the Faculty of Education of the University of Murcia (Murcia, Spain).

Data analysis

For all the continuous variables, the statistics of the mean and the standard deviation were calculated; for those categorical, the numerical count and the percentage. The distribution of the sample was not normal when applying the Kolmogorov-Smirnov test, therefore it was decided to perform an analysis using the Mann-Whitney U test to study the relationship between weight status and SC, and between PA and SC. The Kruskal-Wallis H test was applied to analyse the combined association between weight status, PA and SC. The statistical analysis was carried out with the Statistical Package for Social Science® software (SPSS, 23.0v, Chicago, Illinois, USA), setting the statistical significance at a value $p < 0.05$.

RESULTS

The differences in the SC according to the weight status (normal weight vs. overweight-obesity) are presented in table 1. The Mann-Whitney U test detected statistically significant differences in behavioural SC ($p = 0.048$). A trend toward statistical significance was also observed in physical SC ($p = 0.088$).

Table 1. Relationship between weight status and self-concept

	Normal-weight (n = 65)	Overweight-Obesity (n = 38)	Z	p value
Behavioural (0-18)	15.8 ± 2.5	14.4 ± 3.0	-1.974	0.048*
Intellectual (0-17)	12.9 ± 2.7	12.7 ± 2.1	-0.776	0.438
Physical (0-12)	10.2 ± 2.0	9.6 ± 2.2	-1.704	0.088
Anxiety (0-12)	8.3 ± 2.5	8.1 ± 2.2	-0.759	0.448
Social (0-12)	10.8 ± 2.1	10.8 ± 1.7	-0.555	0.579
Life satisfaction (0-9)	8.0 ± 1.4	8.0 ± 1.2	-0.194	0.846
Global (0-80)	67.4 ± 10.1	65.3 ± 8.6	-1.639	0.101

The results are presented as mean ± standard deviation. Source: self-made design.

Table 2 shows the average values in the SC according to the level of PA (minor vs. major). When applying the Mann-Whitney U test, statistically significant differences were detected in the intellectual ($p = 0.034$), physical ($p = 0.016$), social ($p = 0.031$) and global ($p = 0.012$) dimensions, with higher average values in schoolchildren with a higher PA level.

Table 2. Relationship between physical activity and self-concept

	Minor AF (n = 55)	Major AF (n = 48)	Z	p value
Behavioural (0-18)	15.2 ± 3.0	15.8 ± 2.4	-1.061	0.289
Intellectual (0-17)	12.4 ± 2.5	13.4 ± 2.3	-2.117	0.034*
Physical (0-12)	9.5 ± 2.3	10.5 ± 1.6	-2.405	0.016*
Anxiety (0-12)	7.9 ± 2.5	8.7 ± 2.1	-1.775	0.076
Social (0-12)	10.4 ± 2.2	11.2 ± 1.4	-2.152	0.031*
Life satisfaction (0-9)	7.8 ± 1.4	8.2 ± 1.2	-1.591	0.112
Global (0-80)	64.4 ± 10.4	69.1 ± 7.9	-2.521	0.012*

The results are presented as mean ± standard deviation. PA = physical activity. Source: self-made.

By categorizing the sample based on the combined relationship between weight status and PA level, the Kruskal-Wallis H test found that the normopeso / major PA (group B) schoolchildren showed a better overall SC (see table 3). Specifically, statistically significant differences were observed in the intellectual SC ($p = 0.022$), physical ($p = 0.006$) and global ($p = 0.008$). In addition, Overweight-Obesity / major PA (group D) students generally had a better SC with respect to the normal weight / minor PA (group A) and overweight-obesity / minor PA (group C) groups.

Table 3. Combined relationship between weight status and physical activity with self-concept

	A (n = 34)	B (n = 31)	C (n = 22)	D (n = 16)	χ^2	p value
Behavioural (0-18)	15.6 ± 2.9	16.1 ± 1.9	14.5 ± 3.0	15.3 ± 3.0	6.135	0.105
Intellectual (0-17)	12.0 ± 2.7	13.8 ± 2.2	13.0 ± 1.9	12.4 ± 2.4	9.659	0.022*
Physical (0-12)	9.6 ± 2.1	10.9 ± 1.5	9.5 ± 2.6	9.7 ± 1.5	12.440	0.006*
Anxiety (0-12)	7.6 ± 2.8	9.1 ± 1.8	8.3 ± 1.9	7.9 ± 2.6	6.226	0.101
Social (0-12)	10.3 ± 2.4	11.3 ± 1.4	10.6 ± 1.8	11.0 ± 1.5	5.627	0.131
Life satisfaction (0-9)	7.8 ± 1.5	8.2 ± 1.2	8.0 ± 1.1	8.1 ± 1.3	3.051	0.384
Global (0-80)	64.1 ± 11.1	70.9 ± 7.5	65.0 ± 9.2	65.6 ± 7.9	11.948	0.008*

The results are presented as mean ± standard deviation. A = normal weight / minor PA; B = normal weight / major PA; C = overweight-obesity / minor PA; D = overweight-obesity / major AF. Source: self-made.

DISCUSSION

This paper tried to analyse the multidimensional SC of a sample of schoolchildren in pre-adolescent and childhood ages. This analysis was performed according to their weight status (normal weight vs. overweight-obesity), level of PA (minor vs. major), and combined relationship between weight status and PA. Regarding the first objective, the results indicate that behavioural SC ($p = 0.038$) was higher in normal-weight schoolchildren (see table 1). With respect to the second objective, those with higher PA had a greater intellectual SC ($p = 0.034$), physical ($p = 0.016$), social ($p = 0.031$) and global ($p = 0.012$) (see table 2). In relation to the third objective, those with normal weight / major PA had a greater intellectual SC ($p = 0.022$), physical ($p = 0.006$) and global SC ($p = 0.008$) (see table 3).

These findings are consistent with what is established in the scientific literature that demonstrates the consistent relationship between maintaining a normal body weight status, performing PA routinely and having a global SC (or in some of its dimensions) superior (Bacchini et al., 2017, Barnett et al., 2009, Gálvez et al., 2015, Garn et al., 2016, Mitchell et al. al., 2012; Wallander et al., 2009; Willows et al., 2013). In addition, their results are partially aligned with those studies that suggest a relationship of SC with variables directly linked to weight status and PA as the general physical condition (Rodríguez-García et al., 2014) and muscle strength (Rodríguez-García et al., 2015).

Although the differences were not high (15.8 ± 2.5 vs. 14.4 ± 3.0), those normal schoolchildren showed a greater behavioural SC, possibly because of the satisfaction of having a body image according to the parameters that the current society values and promotes, it can influence the adoption of socially adjusted behaviour patterns (Willows et al., 2013; Vaquero-Cristóbal et al., 2013). Fernández-Zabala & Goñi-Palacios (2008) point out that from preadolescence, social acceptance acquires a greater protagonism, so a balanced construction of the SC depends to a large extent, of the social nuclei that surround the person being fundamental dimensions, body image for girls and physical abilities for children (Moreno et al., 2008). Trujano et al. (2010) indicates that for 55% of girls aged 7 to 12 having a body image is a key aspect in their lives, rising to 80% in adolescence.

By categorizing the participants according to their level of PA, the results showed differences in a greater number of dimensions of the SC. Thus, those with greater PA were perceived better on an intellectual, physical and social level, manifesting themselves accordingly in a superior overall SC. Other studies with similar methodological designs found differences in the physical and emotional dimensions in favour of physically active schoolchildren, adolescents and university students compared to their non-active peers (Moreno et al., 2008; Reigal-Garrido & Videra-García, A., 2011).

These findings suggest that although at these ages there may be other factors that are related to SC such as age, gender (Soriano-Llorca, Navas-Martínez & Holgado-Tello, 2011) or physical fitness (Sánchez-Alcaraz & Gómez- Marmol, 2014; Fraile & Catalina, 2013), it has been demonstrated that the habitual and vigorous performance of PA is one of the factors with a more powerful correlation to multidimensional SC and, especially, at a physical level (Reigal-Garrido & Videra-García, 2011; Kyle, Hernández-Mendo, Reigal-Garrido, & Morales-Sánchez, 2016).

Reigal-Garrido et al. (2013) conclude in their study that SC and PA could maintain a relationship of mutual reciprocity; also, they reflect that possibly those more active Children are subject to a constant improvement of their SC, interpreting that those people who are physically active are influenced by their intention to continue being given the continuous positive effects that they experience. Probably, the feeling of ability to acquire a healthy habit increases the likelihood of persisting, as the individual observes that he is more skilled and effective in undertaking a task.

In relation to school sports practice, the pedagogical organization of the same task-oriented, self-improvement and teamwork could contribute to the proper development of the SC against a model based on the result and individual development; favouring in turn the balanced and integral formation of the personality, the biological, cognitive, socio-affective development, as well as a greater knowledge of oneself (Goñi & Zulaika, 2000). Also stimulating brain and cognitive functioning, processes closely related to memory, attention, motivation and alertness (Ratey & Hagerman, 2010), which results in better grades in certain subjects such as mathematics, languages and in the average grade for all subjects (Cladellas, Clariana, Badia, & Gotzens, 2015, González & Ortega, 2013).

However, some studies (Guillén & Ramírez, 2011, García-Sánchez et al., 2013, Zurita-Ortega et al., 2016) argue that in stages prior to adolescence, family and social relationships are prioritized over relationships made by sport practice, this association is reversed as the age increases, making it clear that the PA, especially that performance in teams, favours the set of positive experiences, successes and better evaluations that the child has throughout childhood (Roa García, 2013).

It has been observed that the *fat but fit* paradox (Duncan, 2010; McAuley and Blair, 2011) applied to SC is fulfilled in this study. In this way, the normopeso / major PA group showed a better overall SC. Also, when comparing the normal weight and overweight-obesity groups with lower and higher PA, those with major PA have more positive average values in the SC dimensions, so that subjects with lower PA were associated with poorer SC registers, which agrees with that found in global SC by Gálvez et al. (2016) and, above all, in the physical dimension in coherence with that observed in schoolchildren and adolescents by García-Sánchez et al., (2013) and Mitchell et al. (2011). This demonstrates the relevance of PA as a mediating variable in the relationship between weight status and SC.

This could be taken into account in the design of multidisciplinary strategies for the prevention of psychosocial disorders at critical ages such as childhood and adolescence, given the progressive increase of psychological disorders in children and adolescents which has generated great social alarm, especially, within the sector of health professionals (Navarro-Pardo et al., 2012).

This paper presents a series of limitations (size and selection of the sample, use of self-report instruments, non-differentiation by gender) that must be assessed to interpret the results adequately. The results of this cross-sectional study should be interpreted as associations rather than causal influences. However, they are a contribution to take into account when designing motivational strategies to encourage the adoption of active lifestyle habits in such a relevant stage as childhood. In addition, PA was quantified through a questionnaire, there have been other more objective means, such as accelerometry or even the level of physical fitness (Rodríguez-García et al., 2014; Rosa-Guillamón et al., 2017), which can be a determining factor for assessing the possible benefits on SC, given that the impact generated may depend on the effects it causes on the body itself, providing more consistent data to determine in which PA intensities there is a greater association with the SC (Murgui, García & García, 2016).

CONCLUSION

The results of this study show the following findings: 1) school children with normal weight have a better behavioural SC; 2) the students with higher PA present a better intellectual, physical, social and global SC; and, 3) schoolchildren with normal weight and greater PA present a better intellectual, physical and global SC. These findings suggest that weight status and PA could be differentiating elements in the SC of school children aged 8 to 12 years. Prospective studies are needed based on interventions focused on the performance of PA, on the treatment of other psychological variables (such as self-esteem, body image or psychosocial adjustment behaviours, and others), and on education in patterns of eating behaviour, among others, that analyse the influence on the multidimensional SC of the evolution from an overweight status to a normal weight status.

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