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Physical fitness and self-concept in students of different ages in Extremadura (Spain)

Condición física y autoconcepto en estudiantes de diferentes edades en Extremadura (España)

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Abstract

Self-concept can be defined as the set of beliefs a person has about himself/herself, encompassing his/her personality and multiple dimensions. These dimensions study the perception of social and family relationships, emotional management, academic performance, and motor skills, establishing an important concept in the development of children and adolescents. On the other hand, physical fitness is a very important health parameter that encompasses both physical and psychological health. Therefore, this study aimed to examine the correlations between these two variables according to educational stage and sex. Kolmogorov-Smirnov was used to determine the normality of the data, Spearman's Rho test was applied for the correlational analysis of the dimensions of both tools (Self-concept scale AF-5 and Visual Analogical Scale of Physical Fitness Perception for Adolescents (VAS PFA, and a prediction model was also performed with the most relevant variables in students from 10 to 18 years old. The results showed high correlations between the physical dimensions and physical fitness, encompassing general, strength, and endurance as the educational stages progressed (<0.001). The overall development of school-aged children is of great interest because a positive self-concept can be influenced by physical well-being and optimal skills. In addition, children who have a positive self-concept are likely to be motivated to engage in sports and physical activities, which improves their physical health. Therefore, the health and education community could promote this through interventions in and out of the classroom for the best possible mental health.

Keywords: physical fitness; physical education; physical activity; self-concept; self steem; school

Resumen

El autoconcepto puede definirse como el conjunto de creencias que una persona tiene sobre sí misma, abarcando su personalidad y múltiples dimensiones. Estas dimensiones estudian la per-cepción de las relaciones sociales y familiares, la gestión emocional, el rendimiento académico y las habilidades motoras, estableciendo un concepto importante en el desarrollo de niños y adolescentes. Por otro lado, la condición física es un parámetro de salud muy importante que engloba tanto la salud física como la psicológica. Por lo tanto, este estudio pretendía examinar las correlaciones entre estas dos variables según la etapa educativa y el sexo. Se utilizó Kolmogorov-Smirnov para determinar la normalidad de los datos, se aplicó el test Rho de Spearman para el análisis correlacional de las dimensiones de ambas herramientas (Escala de Autoconcepto AF-5 y Escala Visual Analógica de Percepción de la Condición Física para Adolescentes (VAS PFA, y también se realizó un modelo de predicción con las variables más relevantes en estudiantes de 10 a 18 años. Los resultados mostraron correlaciones elevadas entre las dimensiones físicas y la aptitud física general, de fuerza y de resistencia a medida que avanzaban las etapas educativas (<0,001). El desarrollo general de los niños en edad escolar es de gran interés porque un autoconcepto positivo puede verse influido por el bienestar físico y unas aptitudes óptimas. Además, es probable que los niños que tienen un autoconcepto positivo estén motivados para practicar deportes y actividades físicas, lo que repercute en su salud física. Por lo tanto, la comunidad

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sanitaria y educativa podría promover esto mediante intervenciones dentro y fuera del aula para conseguir la mejor salud mental posible.

Palabras clave: condición física; educación física; actividad física; autoconcepto; autoestima; colegio.

1. Introduction

Self-concept is a construct that can be defined as the set of beliefs that an individual has about him/herself at a particular time, with positive or negative beliefs about him/her based on previous experiences that build his/her personality and influence his/her social and emotional development, affected by the sociocultural context and constructed over time (Bustos et al., 2015; Herrera et al., 2020; Montoya Londoño et al., 2019; Soriano Llorca et al., 2011). This term has been widely studied, although it has recently attracted increased interest in psychological research as an indicator of mental health (Conde et al., 2019). These investigations have revealed that this construct has a multidimensional character, identifying five subdivisions related to the belief that the individual has about himself and establishes his personality (Montoya Londoño et al., 2019), establishing an organized, multidimensional, hierarchical, and evaluative model (F. García & Musitu, 2009) each of which refers to a different area of personality: academic work, social, emotional, family, and physical (J. F. García et al., 2011).

Self-concept has become a construct of great interest as it plays an important role in the health and integral development of children and adolescents. By definition, self-concept encompasses the development of personality, establishing identity, and understanding one's own feelings (Brown et al., 2009). Poor self-concept management could generate a decrease in self-esteem and self-confidence, undermining their potential (Y. Chen et al., 2022); and is also related to an increase in the probability of suffering from depressive and anxiety disorders, accompanied by social isolation (Busch et al., 2021). In the study of self-concept and its behavior related to physical activity, studies reveal that individuals with a lower self-concept tend to participate in fewer activities that require physical activity (Kang et al., 2020), which in the long run may have consequences on their physical and mental health since it is related to worse

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lifestyles (Delgado-Floody et al., 2022). Additionally, in the study by dimensions, physical self-concept showed relationships with different areas, such as better motor development, improved mental health (Grao-Cruces et al., 2017; Navarro-Patón et al., 2016; Videra-García & Reigal-Garrido, 2013), better academic performance, especially in mathematics and logical language (Hayat et al., 2020), prosocial and less disruptive behaviors (Fox, 1997; Navarro-Patón et al., 2016) and an increase in social and family relationships and self-esteem (Goñi Grandmontagne & Zulaika Isasti, 2000). Therefore, the correct development of self-concept influences the adoption of healthy habits, increasing their importance in childhood and adolescence, as these are critical moments in the formation of these habits and their maintenance in adulthood (Telama, Risto Yang et al., 2014).

On the other hand, physical fitness (PF) is an important marker of health at all stages of life. It encompasses cardiorespiratory capacity, Muscular strength, speed agility, and flexibility and is a fundamental element in the development of a healthy and quality life, with the necessary ability to enjoy leisure time and overcome everyday obstacles (Ortega et al., 2008). Moreover, especially in children and adolescents, it is a particularly important marker of mortality, as it is useful for detecting diseases related to physical inactivity at an early age (Twisk et al., 2002). High levels of PF are associated with better mental health, quality of life, bone health, and endocrine regulation, among others (Reiner et al., 2013), also revealing a dose-response relationship, indicating that the higher the PF, the better the general health and the lower the probability of suffering diseases (Warburton et al., 2006). On the other hand, the development of PF is fundamental to the motor development of children and adolescents, increasing in importance as age progresses into adulthood (J. Chen et al., 2023).

Studies conducted in this field reveal that PF and self-concept are interrelated, indicating that those who are more physically fit express a better self-concept (Babic et al., 2014). The same study also revealed two powerful mediators in this relationship: sex and age, where younger adolescent boys showed a stronger correlation. Other dimensions related to these two concepts were identified, such as perceived physical appearance, which is included in the physical dimension of self-concept. Published studies on this concept reveal that PF, through its dimensions, correlates directly with

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physical appearance (Haugen et al., 2013), being lower in girls and decreasing throughout adolescence (Chrismas et al., 2019).

After reading various works published on this subject, the important role of PF on health and self-concept in the integral development of adolescents stands out on the one hand. Furthermore, the authors found positive correlations between both constructs, highlighting the importance of this interrelation for the correct social, cognitive, and healthy development of this group, although no studies have been found in which both concepts were studied according to the educational stage of the students. However, most of these studies were developed through interviews, leaving aside other more accessible tools, such as subjective scales. For this reason, the aim of this study was to explore the possible correlations between self-concept and its dimensions and PF, studying them in the different domains of PF according to sex and educational stage with validated tools that allow us to know the relationships between self-concept and PF at different maturity ages.

2. Materials and Methods

2.1 Participants

The sample consisted of 932 students at different educational stages. To determine the number of participants, a non-probabilistic sampling method based on convenience sampling was used (Salkind, 2013). The sex distribution of the participants was balanced, with 51.7% male and 48.3% female. In terms of educational stage, the students belonged to the third cycle of primary, secondary education and baccalaureate. In Spain, the educational system is divided into different parts: Primary Education (PrE) has three cycles of two years each (first cycle: 6-8 years; second cycle: 8-10 years; third cycle: 10-12 years); Compulsory Secondary Education (ESO) has four compulsory courses divided into two cycles of two years (first cycle: 12-14 years; second cycle: 14-16 years), and the Baccalaureate, which consists of two voluntary courses. To determine the location of the center, those located in towns with more than 20,000 inhabitants were categorized as urban centers, and those located in towns with less than 20,000 inhabitants as rural centers, following the criteria established by the Diputación Provincial de Cáceres (https://www.dip-caceres.es/). Of the total, 23.4% were rural

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schools, and 76.6% were urban schools. In addition, 61.2% of the participants were residents of the Cáceres province and 38.8% of the Badajoz province.

To participate in the study, two inclusion criteria were established: (1) being a pre-adolescent and adolescent Physical Education student in a public or private secondary school in Extremadura and (2) having an informed consent signed by the parent or guardian authorizing the student's participation in the research. The characteristics of the sample are listed in Table 1.

Table 1. Characterization of the sample (n=932)

Variable	Categories	N	%
Sex	Boys	482	51.7
	Girls	450	48.3
School stage	Third Cycle of PrE	140	15
	First Cycle ESO	251	26.9
	Second Cycle ESO	269	28.9
	Baccalaureate	272	29.2
School Location	Rural	218	23.4
	Urban	714	76.6
Province	Cáceres	570	61.2
	Badajoz	362	38.8
Variable		M	SD
Age		14.58	2.08

N: number; %: percentage; SD: standard deviation; M: Mean.

2.2. Procedure

To collect information on the schools and institutes that taught physical education in primary and secondary education (10 to 18 years of age), access was gained to the Department of Education and Employment of the Regional Government of Extremadura. The Physical Education teachers were contacted and informed of the objective of the study, the procedure, the instruments applied, and a copy of the informed consent form was given to them. If they agreed to participate in the study, an appointment was made for the researcher to visit the center. Data collection was carried out between November 2022 and January 2023.

Once the researcher went to the center, he first collected the duly signed informed consent forms from the students and then gave the students a tablet with the two instruments applied. To eliminate any bias, the researcher read each item aloud to ensure that all students correctly understood each item of the questionnaire; when

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everyone finished, the responses were collected to ensure their anonymity for subsequent statistical analysis, and took approximately twenty minutes to complete all the items.

This study was structured in accordance with the principles of the Declaration of Helsinki. This study was conducted in accordance with relevant ethical regulations and approved by the Institutional Ethics Committee (Registration No. 71/2022).

2.3. Instruments

Self-concept scale AF-5 (J. F. García et al., 2011): This instrument is composed of 30 items divided into five dimensions: academic work, social, emotional, family, and physical. The scoring system of this scale is based on a Likert scale ranging from 1 to 5, with 1 = "totally disagree" and 5 "totally agree." The psychometric properties revealed by the authors were over 0.71 in the five dimensions, and 0.78 taking self-concept as a single construct. These values reveal that the items measure self-concept. The distribution of items is presented in Supplementary Material 1.

Visual Analogical Scale of Physical Fitness Perception for Adolescents (VAS PFA) (Mendoza-Muñoz et al., 2021), which subjectively measures self-perception of PF specifically in adolescents, is composed of five items (general fitness, cardiorespiratory fitness, muscular Muscular strength, speed-agility, and flexibility). The scoring system is visual, with a Likert scale from 1 to 10, where 1 is "very poor" and 10 is "very excellent." The authors obtained high reliability indices, with a Cronbach's alpha α= 0.860, and fit values performed by means of a Confirmatory Factor Analysis (CFA) (Rojo Ramos et al., 2023) with the following results: χ^2=0.433; *df* =24; $p < 0.001$; CFI = 0.999 RMSEA = 0.016; SRMR = 0.036. Regarding the CFI, values above 0.90 are considered suitable indicators of good fit (Hu & Bentler, 1999). In this study, we obtained a value of 0.79.

Sociodemografic Questionnaire: Eight questions were related to the sex, grade, school location, province, age, and teaching cycle of the participants.

2.4 Statistical analysis

To determine the normality of the data, the Kolmogorov-Smirnov test was applied, and when this assumption was not met, nonparametric tests were

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applied.Subsequently, Spearman's Rho test was applied for the correlational analysis of the dimensions of the AF-5 and the dimensions of the VAS PF A in sex and grade, following the data of Mondragón-Barrera (2004), from 0.11 to 0.50 (moderate correlation), from 0.51 to 0.75 (considerable correlation), from 0.76 to 0.90 (very high correlation) and from 0.91 to 1.00 (perfect correlation).To determine the prediction model, linear regression of the relationships between self-concept and the different variables (sex, age, and VAS PF A variables) was performed. To determine the prediction model, linear regression of the relationships between self-concept and different variables (sex, age, and VAS PF A variables) was performed.Also, Cronbach's alpha and McDonald's omega coefficients were used to analyze the reliability of each instrument. The values established to determine the level of validity and reliability are those established by Nunnally and Bernstein <0.70 (low), 0.71 to 0.90 (satisfactory) and >0.91 (excellent) (Nunnally & Bernstein, 1994). Version 23 of the Statistical Package for Social Sciences (SPSS) was used to perform these analyses and process data.

3. Results

In the first correlation analysis, presented in Table 2, the self-concept dimensions were related to PF according to sex and educational stage, finding significant correlations in practically all categories, except in the emotional dimension and the third cycle of primary school. As the only construct, self-concept and perception of PF express a direct, significant, and medium-range relationship. The physical dimension obtains correlations of greater magnitude in all categories, especially in the female sex and Baccalaureate. On the other hand, the emotional dimension presents correlations with an inverted character, revealing that those who have a lower emotional self-concept perceive a higher PF.

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Table 2. Correlation between the dimensions of AF-5 and VAS PF A.

Dimensions	VAS PF A *ρ (p)*	VAS PF A *ρ (p)*					
		Boys	Girls	Third Cycle of PrE	First Cycle ESO	Second Cycle ESO	Baccalaureate
Academic	0.27 (<0.001)	0.29 (<0.001)	0.34 (<0.001)	0.38 (<0.001)	0.31 (<0.001)	0.23 (<0.001)	0.20 (<0.001)
Social	0.37 (<0.001)	0.30 (<0.001)	0.41 (<0.001)	0.43 (<0.001)	0.37 (<0.001)	0.38 (<0.001)	0.34 (<0.001)
Emotional	-0.24 (<0.001)	-0.16 (0.001)	-0.21 (<0.001)	-0.16 (0.050)	-0.29 (<0.001)	-0.16 (0.007)	-0.30 (<0.001)
Familiar	0.25 (<0.001)	0.24 (<0.001)	0.25 (<0.001)	0.30 (<0.001)	0.23 (<0.001)	0.18 (0.002)	0.25 (<0.001)
Physical	0.64 (<0.001)	0.59 (<0.001)	0.64 (<0.001)	0.48 (<0.001)	0.66 (<0.001)	0.63 (<0.001)	0.70 (<0.001)
AF-5	0.48 (<0.001)	0.46 (<0.001)	0.53 (<0.001)	0.52 (<0.001)	0.46 (<0.001)	0.51 (<0.001)	0.44 (<0.001)

The correlation is significant at the *p < 0.05.

In the analysis of the correlation between the dimensions of self-concept and global PF, results similar to previous ones were found. As the only construct, correlation was positive and averaged. In the study by sex, social and family dimensions showed the greatest variability, although the correlation was significant. On the other hand, the physical dimension of self-concept presents the strongest correlations, especially in women and in the baccalaureate stage. On the other hand, the emotional dimension reveals inverse and significant correlations, except in the third cycle of primary school. However, in the academic dimension, the correlation loses its strength and significance as the educational stage progresses.

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Table 3. Correlation between the dimensions of AF-5 and general fitness status.

Dimensions	General fitness status *ρ (p)*	General fitness status *ρ (p)*					
		Boys	Girls	Third Cycle of PrE	First Cycle ESO	Second Cycle ESO	Baccalaureate
Academic	0.20 (<0.001)	0.26 (<0.001)	0.25 (<0.001)	0.35 (<0.001)	0.25 (<0.001)	0.18 (0.003)	0.09 (0.138)
Social	0.35 (<0.001)	0.27 (<0.001)	0.38 (<0.001)	0.41 (<0.001)	0.30 (<0.001)	0.37 (<0.001)	0.36 (<0.001)
Emotional	-0.23 (<0.001)	-0.12 (0.006)	-0.20 (<0.001)	-0.13 (0.050)	-0.20 (0.001)	-0.25 (<0.001)	-0.28 (<0.001)
Familiar	0.20 (<0.001)	0.12 (0.006)	0.27 (<0.001)	0.30 (<0.001)	0.16 (<0.001)	0.19 (0.002)	0.20 (0.001)
Physical	0.63 (<0.001)	0.62 (<0.001)	0.67 (<0.001)	0.57 (<0.001)	0.65 (<0.001)	0.66 (<0.001)	0.73 (<0.001)
AF-5	0.46 (<0.001)	0.45 (<0.001)	0.50 (<0.001)	0.52 (<0.001)	0.44 (<0.001)	0.45 (<0.001)	0.41 (<0.001)

The correlation is significant at the * $p < 0.05$.

As for resilience, they also presented direct correlations of a medium nature in all subdivisions, as represented in Table 4. The social dimension reveals great variability among educational stages, being weaker in the oldest students. The emotional factor did not obtain significance in the third cycle of primary school, and in the rest, this significance varied, revealing correlations with little stability and an inverse character. The family dimension revealed mean associations similar to the academic ones, although more stable and significant in all dimensions. Finally, the physical dimension again showed the highest correlations, ranging from moderate to considerable, with Baccalaureate students once again obtaining the highest correlation.

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Tabla 4. Correlation between the dimensions of AF-5 and Cardiorespiratory fitness.

Dimensions	Cardiorespiratory fitness *ρ (p)*	Cardiorespiratory fitness *ρ (p)*					
		Boys	Girls	Third Cycle of PrE	First Cycle ESO	Second Cycle ESO	Baccalaureate
Academic	0.21 (<0.001)	0.21 (<0.001)	0.30 (<0.001)	0.24 (0.002)	0.24 (<0.001)	0.21 (<0.001)	0.17 (0.004)
Social	0.33 (<0.001)	0.27 (<0.001)	0.36 (<0.001)	0.43 (<0.001)	0.32 (<0.001)	0.32 (<0.001)	0.29 (<0.001)
Emotional	-0.21 (<0.001)	-0.11 (0.010)	-0.17 (<0.001)	-0.09 (0.268)	-0.30 (<0.001)	-0.12 (0.048)	-0.22 (<0.001)
Familiar	0.26 (<0.001)	0.22 (<0.001)	0.29 (<0.001)	0.28 (<0.001)	0.21 (0.001)	0.23 (<0.001)	0.23 (<0.001)
Physical	0.56 (<0.001)	0.49 (<0.001)	0.57 (<0.001)	0.45 (<0.001)	0.58 (<0.001)	0.50 (<0.001)	0.62 (<0.001)
AF-5	0.42 (<0.001)	0.39 (<0.001)	0.49 (<0.001)	0.47 (<0.001)	0.37 (<0.001)	0.45 (<0.001)	0.40 (<0.001)

The correlation is significant at the * $p < 0.05$.

The strength dimension reveals direct and significant correlations with general self-concept, with little variability between educational stages, although it is higher in females. By dimension, the academic dimension loses magnitude and significance in the correlations as the educational stage advances, showing non-significant associations in the second cycle of secondary education and baccalaureate. In both the family and social dimensions, correlations appeared with great variability in academic years, although all were significant, with the exception of the third cycle of primary education in the family dimension. Regarding the emotional dimension, the correlations found were significant in inverse and moderate in terms of sex and educational stage. Finally, the physical dimension expressed the highest direct correlation, with the exception of the third cycle of primary education.

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Table 5. Correlation between the dimensions of AF-5 and muscular strength.

Dimensions	Muscular strength *ρ (p)*	Muscular strength *ρ (p)*					
		Boys	Girls	Third Cycle of PrE	First Cycle ESO	Second Cycle ESO	Baccalaureate
Academic	0.17 (<0.001)	0.17 (<0.001)	0.28 (<0.001)	0.32 (<0.001)	0.20 (<0.001)	0.12 (0.050)	0.08 (0.161)
Social	0.32 (<0.001)	0.29 (<0.001)	0.30 (<0.001)	0.40 (<0.001)	0.27 (<0.001)	0.35 (<0.001)	0.30 (<0.001)
Emotional	-0.32 (<0.001)	-0.25 (<0.001)	-0.22 (<0.001)	-0.35 (<0.001)	-0.30 (<0.001)	-0.27 (<0.001)	-0.33 (<0.001)
Familiar	0.24 (<0.001)	0.22 (<0.001)	0.26 (<0.001)	0.16 (0.052)	0.21 (0.001)	0.17 (0.004)	0.26 (<0.001)
Physical	0.50 (<0.001)	0.45 (<0.001)	0.45 (<0.001)	0.26 (0.001)	0.49 (<0.001)	0.50 (<0.001)	0.58 (<0.001)
AF-5	0.34 (<0.001)	0.32 (<0.001)	0.41 (<0.001)	0.30 (<0.001)	0.31 (<0.001)	0.34 (<0.001)	0.33 (<0.001)

The correlation is significant at the * $p < 0.05$.

In the analysis of the PF expressed through speed–agility, developed in Table 6, the results show a positive, moderate, and direct correlation, significant in all analyses. In the study of the dimensions, the academic dimension is variable, losing significance in the second cycle of secondary education and baccalaureate; similarly, in the family dimension, where in the second cycle of secondary education, there are no significant associations. On the other hand, in the physical dimension, the correlations are considerable, except in the third cycle of junior high school, where the correlation is moderate.

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Tabla 6. Correlation between the dimensions of AF-5 and speed-agility.

Dimensions	Speed-Agility *ρ (p)*	Speed-Agility *ρ (p)*					
		Boys	Girls	Third Cycle of PrE	First Cycle ESO	Second Cycle ESO	Baccalaureate
Academic	0.15 (<0.001)	0.19 (<0.001)	0.23 (<0.001)	0.24 (0.004)	0.16 (0.011)	0.08 (0.170)	0.11 (0.052)
Social	0.30 (<0.001)	0.20 (<0.001)	0.34 (<0.001)	0.25 (0.003)	0.30 (<0.001)	0.32 (<0.001)	0.30 (<0.001)
Emotional	-0.22 (<0.001)	-0.11 (0.001)	-0.13 (0.004)	-0.10 (0.215)	-0.23 (<0.001)	-0.11 (0.063)	-0.33 (<0.001)
Familiar	0.17 (<0.001)	0.15 (0.001)	0.17 (<0.001)	0.17 (0.039)	0.16 (0.011)	0.05 (0.387)	0.23 (<0.001)
Physical	0.53 (<0.001)	0.47 (<0.010)	0.48 (<0.001)	0.37 (<0.001)	0.61 (<0.001)	0.51 (<0.001)	0.55 (<0.001)
AF-5	0.35 (<0.001)	0.32 (<0.001)	0.40 (<0.001)	0.38 (<0.001)	0.34 (<0.001)	0.35 (<0.001)	0.31 (<0.001)

The correlation is significant at the *p < 0.05.

Table 7 presents the last expressions of PF and flexibility, and the results show little stability. Self-concept as the only construct revealed a moderate and significant correlation in terms of sex and all educational stages except upper secondary school. The social dimension, in the same way as the physical dimension, reveals significant correlations in all divisions except for upper secondary school and baccalaureate. The academic dimension correlated significantly with all stages, except in the second cycle of secondary school. The emotional dimension does not reveal any significant correlation.

Table 7. Correlation between the dimensions of AF-5 and flexibility.

Dimensions	Flexibility ρ (p)	Flexibility ρ (p)					
		Boys	Girls	Third Cycle of PrE	First Cycle ESO	Second Cycle ESO	Baccalaureate
Academic	0.20 (<0.001)	0.17 (<0.001)	0.18 (<0.001)	0.25 (0.003)	0.27 (<0.001)	0.10 (0.080)	0.22 (<0.001)
Social	0.11 (0.001)	0.11 (0.01)	0.16 (0.001)	0.17 (0.003)	0.18 (0.004)	0.04 (0.474)	0.08 (0.179)
Emotional	0.01 (0.642)	-0.02 (0.559)	-0.08 (0.079)	0.01 (0.888)	-0.06 (0.295)	0.07 (0.231)	0.015 (0.810)
Familiar	0.04 (0.200)	0.10 (0.020)	0.01 (0.993)	0.10 (0.215)	0.09 (0.122)	0.038 (0.539)	-0.04 (0.509)
Physical	0.16 (<0.001)	0.20 (<0.001)	0.24 (<0.001)	0.25 (0.002)	0.23 (<0.001)	0.083 (0.175)	0.11 (0.058)
AF-5	0.19 (<0.001)	0.20 (<0.001)	0.17 (<0.001)	0.30 (<0.001)	0.26 (<0.001)	0.036 (0.12)	0.13 (0.029)

The correlation is significant at the * p < 0.05.

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A linear regression analysis (Table 8) was performed to broaden the understanding of the behavior of these variables on self-concept, taking the latter as the dependent variable. The results of this model reveal that it explains 28% of the variance through the general fitness status, resistance, strength, sex, and age, with statistical significance in the t and p coefficients.

Table 8. Self-concept prediction model.

Model 1 (R^2) = 0.28				
Variable	β	SE	t	p
General fitness status	0.057	0.008	7.367	<0.001
Cardiorespiratory fitness	0.039	0.007	5.927	<0.001
Muscular Strength	0.022	0.007	3.114	0.002
Sex	0.127	0.023	5.410	<0.001
Age	-0.021	0.005	-3.841	<0.001
Constant	3.067	0.097	31.588	<0.001

Finally, the reliability and validity of the instruments were evaluated using Cronbach's alpha and McDonald's Omega, revealing satisfactory values for both instruments (Table 9).

Table 9. McDonald's Omega and Cronbach's Alpha coefficients.

Dimensions	Omega de McDonald's	Alfa de Cronbach
Academic	0.887	0.881
Social	0.779	0.761
Emotional	0.779	0.777
Familiar	0.878	0.878
Physical	0.763	0.759
AF-5	0.778	0.798
VAS-PFA	0.790	0.774

4. Discussion

The motivation for the creation of this work arose from the study of the possible co-relationships between physical self-concept and self-perceived PF, taking them as unique constructs and dimensions. These relationships were analyzed according to sex and educational level. Subsequently, to further understand the behavior of these

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variables, a prediction model was developed based on sex, age, and the most relevant manifestations of PF.

In general, the results of this study show that self-concept, as a single dimension, correlates positively with self-perceived PF in all its expressions, both in both sexes and in all educational stages. However, the strength of the correlation varies greatly, with strength and endurance correlating with the greatest magnitude and flexibility with the least magnitude. The scientific community has extensively studied both constructs, stating that the development of a self-concept is fundamental for the correct development of PF (Schmidt et al., 2015) and vice versa, where those who perform more physical activity and therefore have greater PF express a higher self-concept, especially in its physical dimension (Marsh et al., 2007). Related to the results obtained, a study developed in 2022 identified the same expressions of PF as determinants of a high self-concept (Bou-Sospedra et al., 2021; Kumar et al., 2023), especially in the physical dimension. The authors also highlight the importance of PF on the development of self-concept, especially in adolescents, because of the bodily changes that arise at this stage, which can affect self-esteem and, therefore, the mental health of young people (J. de D. Benitez-Sillero et al., 2023; Liu et al., 2015). However, in relation to what was previously commented, positive and significant associations were found in the self-concept and PF dimensions, especially strong in physical expression. It is highly correlated in general PF and PF as a single construct, as well as in endurance and strength, varying to a great extent according to educational stage. In this context, the magnitude of the correlation increases as academic years progress, and high school students express a higher self-concept, highlighting a great difference in students in the third cycle of primary school. In this sense, scientific research developed in this area obtains similar results, claiming that with the development of anatomical structures, older students have better motor development and a higher sense of competence than their younger peers (Onetti-Onetti et al., 2019). Moreover, coupled with the lack of motor coordination and control that appears with pupil growth, this phenomenon is largely explained (Jekauc et al., 2017). However, the behavior of the rest of the dimensions is notably variable, especially the social and family dimensions, both in global PF and in endurance, strength, and speed during educational periods. The

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literature does not provide much information on the behavior of these two dimensions and their relationship with PF, although it does provide information on how social and family dimensions change during this educational stage. Studies explain that during this period, students tend to form social groups and decrease their relationship with their nuclear family (Preckel et al., 2013); however, the results obtained in this study do not directly reflect this reality, since both dimensions decrease their correlation as the age of the students increases, indicating that PF does not directly condition these dimensions. In relation to this, the correlation that appears in the third cycle of primary school in the social factor stands out, well above the rest of the correlations of the educational stages of all dimensions, suggesting that in this age range, a high PF (in general, general PF, strength, and endurance) increases the social relations and integration of the students. In this sense, the scientific literature has not found results to support this assertion; however, in relation to physical activity, they find that it is a predictor and powerful moderator of perceived social support, where the more physical activity performed, the greater the social support and, therefore, the greater the self-concept (Springer et al., 2006; Zhang et al., 2022). The emotional dimension, related to how one perceives oneself in situations that may generate stress, reveals inverse associations with all factors of PF. The results of other previously published articles are contrary: they revealed direct associations in their study sample, suggesting that high PF helps better quality emotional management (F. G. García & Gómez, 2011; Olmedilla et al., 2016). Age has been found to be a powerful mediator between PF and self-concept, revealing that younger adolescents have stronger associations than schoolchildren, possibly because the perception of motor skills in children does not correspond to the real ones of that particular stage (Babic et al., 2014; Henning et al., 2022), agreeing with the findings of this work related to the physical dimension of self-concept.

In the study of correlation by sex, the research revealed a multitude of inconclusive results. In relation to PF, these studies reveal that sex can be a moderator of the physical dimension of self-concept, since the correlations found are positive and direct (Putri et al., 2019; Sáez et al., 2020), with differences leaning towards the male sex (Babic et al., 2014; Carraro et al., 2010). However, in this study, higher correlations were identified in girls, particularly in the physical dimension of all expressions of PF.

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Finally, the proposed prediction model predicts 28% of self-concept behavior, with sex, age, and fitness dimensions related to strength and endurance being predominantly relevant. The development of PF and especially of strength and endurance, taking into account the sex and age of the students, is really important at an early age to promote the self-concept of the students and to be able to develop all its dimensions, achieving social integration, academic performance, emotional management and correct self-esteem and motor competence that increase health and the promotion of healthy habits, reducing the incidence of other problems such as mental disorders and bullying situations (Arcila-Arango et al., 2022; J. D. Benitez-Sillero et al., 2022; Jekauc et al., 2017).

4.1 Limitations and future lines

This study had several limitations that should be considered in future research. First, it is important to note that all participants were exclusively drawn from an autonomous community in Extremadura, Spain. While this allowed for a focused examination within this specific cultural context, it also raised concerns regarding the broader generalizability of the findings to populations with distinct cultural backgrounds. However, the design of this study did not consider the physical activities performed by students during out-of-school hours. Among the strengths of this work is the novelty in the study of self-concept and its correlation with PF on educational stages and sex, reporting strong correlations especially on physical self-concept.

4.2 Practical applications

The importance of the results of this study lies in the correlation found in all the dimensions of self-concept, especially in the physical dimension and in the general PF and the sub-expressions of strength and endurance, in relation to the sex and educational stages of the students. The increase in PF, especially in these two expressions, could improve general physical self-concept and specifically physical self-concept in all school stages, although even more so in the high school period. In the lower stages, it is also important to work on them since these dimensions develop social integration with greater interaction, better self-esteem, and better emotional management. In other studies, physical self-concept has been identified as a predictor and protective agent of

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the role of bully/victim bullying. Therefore, physical fitness work is of high importance for physical education teachers and institutions responsible for health promotion and healthy habits.

5. Conclusions

In conclusion, significant correlations were identified between general self-concept and physical fitness in all educational stages and both sexes; and in their subanalyses, high magnitude correlations were reported in general fitness, muscular strength and endurance as the educational stage progresses, especially in the physical dimension. Regarding sex, the correlations were significant and slightly higher in girls in all dimensions. In the remaining dimensions, the magnitude of the correlations varied according to the stage and expression of physical fitness. This is of interest for school-age child development because a good state of physical health and developed physical skills can contribute to a positive self-concept. Children who feel strong, agile and healthy tend to have greater self-confidence and a better perception of their body. And in turn, a positive self-concept can motivate children to participate in physical activities and sports, which contributes to improved physical fitness. Children who feel capable and confident tend to be more willing to participate in activities that challenge their physical abilities and to maintain an active lifestyle. It is therefore very important to encourage this through school physical education, extracurricular sports activities, emotional support and promotion of a healthy body image for optimal mental health.

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