





# Impact of socioeconomic level on the physical condition of schools: A motor gap

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## ABSTRACT

The objective of this study was to analyse the physical condition of students in the third cycle of Primary Education from various educational centres in the Province of Alicante, in relation to their socioeconomic level. The study sample was made up of a total of 240 students from the third cycle of Primary Education, specifically 136 boys and 104 girls, from various schools located in three different geographical environments in the province of Alicante (urban, rural, coastal). A correlational and descriptive study was carried out. To measure the socioeconomic level of the students, families completed the Social Class Questionnaire; Regarding the anthropometric and motor condition of the students, body composition, musculoskeletal capacity, aerobic capacity and motor capacity were evaluated, for which the ALPHA-Fitness battery was used. In addition, to measure the students' adherence to the Mediterranean diet and extracurricular sports activity, the students filled out the KIDMED and PAQ-C questionnaires (Physical Activity Questionnaire for Children) respectively. The results showed that the students in the study with a higher socioeconomic level have a better physical condition in terms of body composition, musculoskeletal capacity, aerobic capacity and motor capacity. Therefore, it is necessary to implement programs and activities that encourage the practice of physical activity and the acquisition of healthy habits, especially in the most disadvantaged areas.

**Keywords:** Physical activity, Healthy habits, Primary education, Geographical environment.

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## INTRODUCTION

The practice of physical activity in childhood and adolescent stages is of great importance for the development of the person, which is why its promotion and implementation in people's lives acquires capital importance. (Cortés et al., 2021). The benefits provided by the practice of physical activity are manifested in various areas of health, such as psychological, social, cognitive (Janssen & LeBlanc 2010, Tremblay et al., 2010), as well as at a physiological level, through improved circulation and cerebral oxygenation, increased muscle levels and better tolerance to stress (Frischenschlager & Gosch, 2012).

However, following Patiño-Palma & Apolinar-Joven, (2021), the factors that determine the higher or lower level of physical activity of people are numerous, and can be grouped into two large categories based on the nature of the factor (endogenous factors and exogenous factors).

One of the most relevant exogenous factors that significantly influence the physical condition of boys and girls, and therefore their health (Font-Ribera et al., 2014) is the socioeconomic level (NSC), understood as *"the group of people with similar occupations, level of education and economic characteristics"* (Santrock, 2004). This factor is decisive in the accentuation of the motor gap that occurs in childhood stages (Van Hecke et al., 2016), associating a low NSC with unhealthy habits and lifestyles (de Frenne et al., 1997).

According to Sheldrick et al., (2022), the practice of physical activity as well as the acquisition of healthy habits is conditioned throughout childhood by numerous factors (home size, access to sports equipment, studies, time and family support,...). This statement is supported by numerous studies that affirm that boys and girls belonging to families with a low socioeconomic level have a higher body mass index, a lower quality of life, less healthy nutrition, greater exposure to screens and less physical activity (Shrewsbury & Wardle 2008, Poulain et al., 2019), leading to the acquisition of sedentary habits as well as unhealthy nutritional intake (Mayorga, 2022).

Currently, the rates of sedentary lifestyle and obesity, in subjects between 5 and 19 years old, have multiplied by 10 (Fondo de las Naciones Unidas para la Infancia, 2019). In Spain, this rate of overweight and obesity, in the established age range, rises to 33%, being the second country in Europe with the highest prevalence of childhood overweight and obesity and, therefore, suffering, in this population extract, a greater risk of suffering from cardiovascular and glycaemic diseases derived from the acquisition of unhealthy lifestyle habits, which are usually associated with social groups with a lower socioeconomic level (Carmona-Rosado & Zapata-Moya, 2022).

In the pandemic caused by COVID-19, this inequality of opportunities between families of different NSC became more evident, in reference to sports practice and exposure to the screen (Ostermeier et al., 2021) these habits being prolonged after confinement (Tuñón, 2022).

Likewise, this disparity in the practice of physical activity is in turn reflected by various factors such as the typology of the centres, the geographical environment and gender. Regarding the typology of the centre, Pérez Camacho et al, (2021) They affirm that the practice of physical activity is more frequent in private centres compared to public centres. In reference to the geographical environment, students belonging to rural environments show better physical condition (Torres et al., 2014), as well as greater practice of sports activities (De la Cruz & Ortega, 2010) compared to students from urban areas. Nevertheless, Boraita et al. (2022), affirm that the practice of extracurricular physical activity is greater in urban environments compared to rural environments, due to the lack of access to sports facilities. And in relation to gender, studies such as

that of Barbeira et al. (2017) identify the prevalence of lower participation in extracurricular activities and physical-sports activities during recreation time by the female gender.

Taking into account the above, the objective established in this research is to analyse the physical and eating habits and physical condition of third cycle primary school students, taking into account their socioeconomic level, in schools in the province of Alicante.

## METHOD

### *Participants*

The study sample had an intentional or convenience nature (Otzen y Manterola, 2017). The total number of participants amounted to 287 of whom completed the entire research protocol and, therefore, the final sample constituted 240 subjects from the 5th year of Primary Education from various schools in the province of Alicante with different socioeconomic level and geographical location: rural (13%), coastal (34%) and urban (54%). Of the total sample (240 subjects), 136 were boys (57%) and 104 girls (43%), all of them aged between 10 and 12 years.

### *Instruments*

The following instruments have been used to collect data in accordance with the objectives of this research.

The ALPHA-Fitness battery has been used (Ruíz et al., 2011), which evaluates body composition, musculoskeletal capacity and motor capacity, to measure the anthropometric and motor condition of the students. This battery, designed to evaluate health-related physical condition in children and adolescents, is composed of the following tests: 1. Sexual maturation. 2. Weight and height (BMI). 3. Waist circumference. 4. Skin folds (triceps and sub-scapularis). 5. Hand grip strength, long jump with feet together, and 4x10 m speed-agility test. And 6. 20 m round trip test.

To measure the NSC of the students, the Social Class Questionnaire (CCS) has been used (Cueto et al., 2013). This consists of 9 items in which the participant must quantify the number of elements that exist in their home, except in the case of books, for which 4 categories were offered: less than 100 books, between 100 and 500, between 500 and 1000 and more than 1000, assigning them values from 0 to 3, respectively. Thus, the final score of the test is given by the sum of the number of elements quantified in each item, to which the value from 0 to 3 must be added, corresponding to the category of books that the participant has at home.

Once the elements have been added, the final result obtained corresponds to an established social class based on the following scale (Table 1). In this way, the social class was assigned to the participant, categorising them in the study.

Table 1. Scoring scale and correspondence with the socioeconomic level of social class (Cueto et al., 2013)

Score	Socioeconomic level
<10	Low
10-12	Middle-low
12.01-16	Middle-low
16.01-20	Middle-high
>20	High

The Physical Activity Questionnaire for older Children (PAQ-C) questionnaire has been used, (Kowalski, 2004), adapted and translated into Spanish, to assess the physical practice of students between 8 and 14 years old. It is carried out in a self-administered manner and is designed to measure moderate and vigorous physical activity carried out in the last seven days, considering the hours of physical education, extracurricular activities and leisure time, both during the week and on the weekend. The questionnaire is made up of ten items, of which eight are used to calculate the level of physical activity, one to specify the type of physical activity carried out and a last item that aims to verify whether the subject surveyed has had any personal impediment to not doing your regular physical activity in the last week. Each of the items has a score from one to five that indicates the type of activity carried out in each time slot (1 = Very low, 2 = Low, 3 = Regular, 4 = Intense and 5 = Very intense). The overall result of the test was obtained by taking the arithmetic mean of the first eight items.

Finally, to categorise adherence to the Mediterranean diet, the KIDMED questionnaire was used (Serra-Majem et al., 2004). This questionnaire consists of 16 dichotomous YES-NO direct response questions. Questions with a negative connotation are assigned a value of -1 and those with a positive connotation are assigned a value of +1. After carrying out the corresponding summation, it is considered that: a total test score of 0-3 reflects adherence to the poor Mediterranean diet; from 4-7, you need to improve your diet; and a result equal to or greater than 8, reflects good adherence to the principles of the Mediterranean diet.

### **Procedure**

To collect data, firstly, various educational centres in the Province of Alicante were contacted by telephone. Once approval was obtained from the management team to carry out the project, the informed consent was sent to the families, in which the purpose of the project was communicated and consent was requested for the participation of their sons and daughters. Data processing was carried out in accordance with the ethical criteria of the Helsinki Treaty (Manzini, 2000). Once the authorizations of the students were collected, meetings were held with the teachers of the different schools to specify the sessions in which each test would be carried out, since some were done during Physical Education time, with the specialist, and others in the time slot of other subjects, with the tutors. 3 sessions per group-class were dedicated to carrying out all the tests. Note that the protocols followed and materials used for data collection have been those recommended by Ruiz et al (2011) for the ALPHA-Fitness battery. Regarding the questionnaires, the one corresponding to the NSC categorization was distributed to the families, along with the informed consent for participation in the research, which facilitated data collection. In reference to the PAQ-C Physical Activity Questionnaire, as well as the KIDMED questionnaire, it was carried out both during school hours and during recess hours, in both cases with the presence and help of the corresponding course tutor.

### **Data analysis**

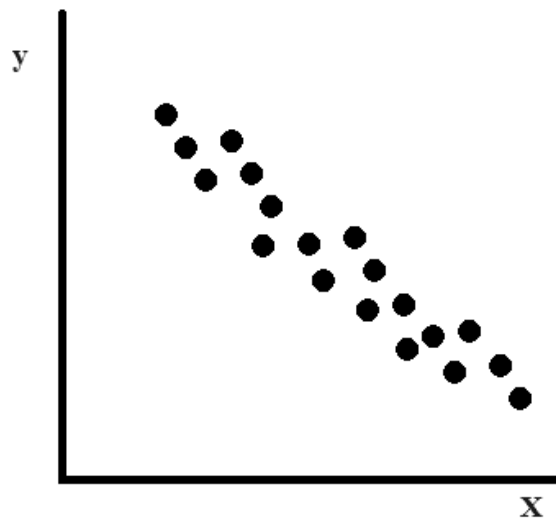
The statistical analyses of the data that have been carried out have been, first of all, the Kolmogorov-Smirnov normality test, obtaining a result of .005, so the sample has a normal distribution. Subsequently, the variables were analysed through the Pearson correlation coefficient. This coefficient presents the probability of two variables appearing together, in such a way that if one appears the other does too covariance (Roy-García, et al., 2019) To calculate this coefficient, the following formula has been used:

$$rs = \frac{n\sum XY - (\sum x)(\sum Y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum Y^2 - (\sum Y)^2]}}$$

Where the covariance is calculated in the numerator, and the square root of the product of the squares of both variables is established in the denominator.

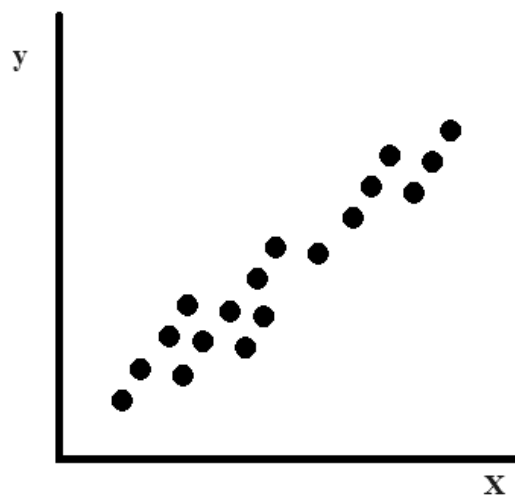
The result of this coefficient is between +1 and -1, with the value 0 indicating that there is no correlation, that is, the behaviour of one variable has no relationship with the behaviour of the other. On the contrary, a result of -1 or +1 exactly implies a perfect correlation, that is, by knowing the value of one variable, the value of the second variable could be known. Regarding the sign that the coefficient presents, negative (-) or positive (+), it determines the relationship in which the correlation between the variables occurs, in such a way that, in the event that the result is negative (-) indicates that the greater the value of one variable on the X axis, the lower the value of the other variable on the Y axis (negative correlation, Figure 1). On the contrary, in the event that the result of the coefficient turns out to be positive (+), it is interpreted that the greater the value of one variable on the X axis, the greater the value of the second variable on the Y axis (Correlation positive, Figure 2)

To carry out these analysis tests, SPSS version 22 software was used.



*Note. Source: self-made.*

Figure 1. Graphic representation of a negative correlation.



*Note. Source: self-made.*

Figure 2. Graphic representation of a positive correlation.

## RESULTS

The results obtained in relation to the different batteries of tests carried out in the study are presented below. Based on the ALPHA-Fitness battery (Ruíz et al., 2011), the results obtained after carrying out the analysis of the Pearson correlation coefficient between the variables Socioeconomic level (NSE) and Handgrip strength (right grip and left grip) show a non-significant result ( $p > .724$  and  $p > .467$  respectively) between them, so they do not maintain a relationship with each other (Table 2).

Table 2. SES correlation and hand grip strength.

		Correlations		
		NSE	Right Press	Left Press
NSE	Correlation of Pearson	--		
	N	240		
Right Press	Correlation of Pearson	0.023	--	
	Next (bilateral)	0.724		
Left Press	N	240	240	
	Correlation of Pearson	-0.047	0.12	--
Left Press	Next (bilateral)	0.467	0.064	
	N	240	240	240

In relation to the Standing Jump test, the results obtained, after the correlational analysis between the variables studied, present significant results ( $p < .001$ ), so both variables are related to each other. The result of the coefficient  $r$  is positive ( $r = 0.212$ ) so it can be stated that the higher the NSE, the greater the jump length of feet together (Table 3).

Table 3. NSE correlation and jumping feet together.

		Correlations	
		NSE	Jump length
NSE	Correlation of Pearson	--	
	N	240	
Jump length	Correlation of Pearson	.212**	--
	Next (bilateral)	<.001	
	N	240	240

Note. \*\*. The correlation is significant at the .01 level (two-sided).

Table 4. NSC correlation and 4x10 speed and agility.

		Correlations	
		NSE	Test_4x10
NSE	Correlation of Pearson	--	
	N	240	
Test_4x10	Correlation of Pearson	-.384**	--
	Next (bilateral)	<.001	
	N	240	240

Note. \*\*. The correlation is significant at the .01 level (two-sided).

In reference to the 4x10 Speed and Agility test, the results obtained present significant differences when relating it to the Socioeconomic Level ( $p < .001$ ), showing a relationship between them. The correlation index

obtained after the analysis is negative ( $r = -0.384$ ), that is, the higher the socioeconomic level, the less time is spent executing the test (Table 4).

Table 5 presents the results obtained in the analysis of the Pearson correlation coefficient between the variables, Socioeconomic Level and the 20m Round Trip Test, presenting a significant result, so both variables are related. Considering the result obtained from the correlation coefficient, it is positive ( $r = 0.184$ ), so the higher the socioeconomic level, the greater the weight achieved in the test.

Table 5. Correlation NSE and round trip 20m.

		Correlations	
		NSE	Test_20m
NSE	Correlation of Pearson	--	
	N	240	
Test_20m	Correlation of Pearson	.184**	--
	Next (bilateral)	0.004	
	N	240	240

Note. \*\*. The correlation is significant at the .01 level (two-sided).

Based on the Pearson correlation analysis between the variables Socioeconomic Level and BMI, the results obtained present a negative  $r$  coefficient ( $r = -0.287$ ) that is significant ( $p < .001$ ). Therefore, there is a relationship between the variables studied and the correlation that appears is inverse, that is, the higher the socioeconomic level, the lower the BMI (Table 6).

Table 6. SES and BMI correlation.

		Correlations	
		NSE	IMC
NSE	Correlation of Pearson	--	
	N	240	
IMC	Correlation of Pearson	-.287**	--
	Next (bilateral)	<.001	
	N	240	240

Note. \*\*. The correlation is significant at the .01 level (two-sided).

Table 7 presents the results obtained corresponding to the analysis of the Pearson correlation coefficient between the variables Socioeconomic Level and Waist Perimeter. The correlation index is negative ( $r = -0.271$ ) and significant ( $p < .001$ ), so an inverse correlation is established between variables with a confidence index of 99%, where the higher the socioeconomic level, the lower the waist circumference.

Table 7. NSC correlation and waist perimeter.

		Correlations	
		NSE	Waist Perimeter
NSE	Correlation of Pearson	--	
	N	240	
Waist Perimeter	Correlation of Pearson	-.271**	--
	Next (bilateral)	<.001	
	N	240	240

Note. \*\*. The correlation is significant at the .01 level (two-sided).

In reference to the analysis of the correlation coefficient between the Socioeconomic Level variables and the score obtained in the Physical Activity Questionnaire for older Children (PAQ-C), (Kowalski, 2004) (Table 8), the results obtained present a high significance ( $p < .001$ ) and a positive correlation index ( $r = 0.285$ ). These results imply that the higher the socioeconomic level, the higher the score on the PAQ-C questionnaire.

Table 8. NSC and PAQ-C correlation.

		Correlations	
		NSE	PAQ
NSE	Correlation of Pearson	--	
	N	240	
PAQ-C	Correlation of Pearson	.285**	--
	Next (bilateral)	<.001	
	N	240	240

Note. \*\*. The correlation is significant at the .01 level (two-sided).

Finally, the results corresponding to the analysis of the Pearson correlation index between the variables Socioeconomic level and score obtained in the KIDMED questionnaire are presented. In Table 9 you can see a positive Pearson correlation index ( $r = 0.248$ ) and significant ( $p < .001$ ), that is, they show that the higher the socioeconomic level, the higher the score is obtained in the KIDMED questionnaire.

Table 9. NSC and KIDMED correlation.

		Correlations	
		NSE	KIDMED
NSE	Correlation of Pearson	--	
	N	240	
KIDMED	Correlation of Pearson	.248**	--
	Next (bilateral)	<.001	
	N	240	240

Note. \*\*. The correlation is significant at the .01 level (two-sided).

## DISCUSSION

The practice of physical activity in childhood contributes to the development and maturation processes, improving the motor skills of boys and girls as well as the cognitive, social and emotional skills; in addition to preventing the appearance of various diseases. Since the habits acquired during this stage have an impact on adult life, not doing physical exercise on a regular basis can pose a health risk, in the short and long term. The results obtained in this study are supported by previous research, stating that having a higher NSC means both better physical condition and healthier lifestyle habits (Shrewsbury & Wardle 2008; Font-Ribera et al., 2014; Van Hecke et al., 2016; Patiño-Palma & Apolinar-Joven, 2021; Sheldrick et al., 2022).

In relation to aerobic capacity, significant differences have been found in the scores of the 20m Round Trip Test: the average duration of students with a medium-high NSC is 6.3 stages (>980m), while the average of students with a low NSC is 2.87 stages (<460m). High levels of aerobic capacity are associated with healthier current and future cardiovascular health, so students with lower NSC are more likely to suffer from cardiovascular disease.



Regarding motor ability, there are large differences between the scores of the different socioeconomic level groups, with the groups with a higher SES having obtained better scores. Because there are no health percentiles referring to the age of the sample used in this study, the data have been compared based on a similar study carried out in Chile by Matiz (2016). This establishes that the average values in carrying out this test range between 13.25 and 16.65 seconds for girls and between 12.35 and 15.65 seconds for boys (10-12 years old). In the case of children with a higher NSC, they are close to the limit of the minimum time established in the range (12.53 seconds), while children with a lower NSC are close to the upper limit of the range (14.54 seconds). As for girls, those belonging to a higher social class have obtained scores higher than our reference range (12.84); On the contrary, girls with a lower NSC have obtained execution time scores higher than the established range, which suggests that they have lower coordination, agility and movement speed.

Regarding the Body Mass Index, students belonging to families with a lower socioeconomic level have a higher BMI: following the table of health percentiles of the World Health Organization (2007), as cited in Atalah (2012), Normal BMI values are considered those that are between 15.3–19.1, for boys, and 15.3–19.8 for girls. In this study, the means of the results obtained show that both boys and girls with a low or medium-low NSC are overweight, which is associated with a worse cardiovascular profile, as well as a larger waist circumference, being This is a risk factor for the development of cardiovascular diseases. On the contrary, students with a higher NSC are within the normal ranges established by the WHO.

On the other hand, to analyse the results obtained from the waist circumference of the students, these have been compared with the percentile table by Hermanussen (2010) which establishes that the appropriate measurement for children aged 10-11 years is between 63.3-67.4cm; and 62.8-66.7cm for girls. The means in this case show that both the male group and the female group belonging to a medium-high NSC are within the established range (65.87cm). In contrast, children with a low, medium-low and medium NSC obtain much higher measurements (77.44cm, 70.57cm and 70.85cm respectively). Girls, on the other hand, those belonging to a high NSC, obtain measurements below the range (59.75cm); those belonging to a medium and medium-high social stratum coincide with the established percentile; and finally, those who have a low and medium-low NSC, obtain measurements higher than the established range (71.73cm and 72 cm respectively).

In terms of musculoskeletal capacity, students with higher NSC also obtained better scores in the jumping feet together test, with them having a lower risk of bone density and mineralization, cardiovascular diseases and back pain. Regarding handgrip strength, no significant correlations have been found between the different socioeconomic level groups.

Regarding the physical activity habits of Primary Education students, students belonging to a medium-high or high socioeconomic level, in addition to obtaining higher scores (Poulain et al., 2019), they go to the regulated extracurricular sports activities offered by their centres, which have the relevant facilities to carry them out, or to private sports clubs (Tuñón, 2022). On the contrary, students belonging to lower socioeconomic levels tend to do unregulated physical activity in the street, except for those boys and girls who go to clubs, located in the neighbourhood, for soccer, judo or dance academies.

Regarding the eating habits of the sample studied, it was found that boys and girls, with a higher socioeconomic level, have greater adherence to the Mediterranean diet, which means a healthier diet. For their part, students with a lower NSC eat a greater amount of fast food and industrial pastries, which is why it is necessary to improve their eating pattern (Carmona-Rosado & Zapata-Moya, 2022; Mayorga, 2022).

## CONCLUSIONS

The objective established in this research is to analyse the physical and eating habits and physical condition of third cycle primary school students, taking into account their socioeconomic level, in schools in the province of Alicante.

The objective established in the present study has been to analyse the physical and eating habits and physical condition of third cycle primary school students, taking into account their socioeconomic level, in schools in the province of Alicante.

In conclusion and in response to this objective, it can be stated that girls and boys in the province of Alicante belonging to higher socioeconomic levels have greater adherence to the Mediterranean diet, as well as better physical condition and greater adherence to it in their lives. the practice of healthy habits, with respect to those students who belong to lower strata in terms of socioeconomic level.

Based on the results obtained in this study, it can be determined that being born into a family with a low NSC significantly increases the probability of having a worse physical condition in relation to health, of acquiring lifestyle habits linked to a sedentary lifestyle. , the consumption of unhealthy foods and the lack of physical activity, this fact being more notable in the female gender. Therefore, an intervention plan that promotes physical activity is necessary, especially in environments with more disadvantaged socioeconomic levels.

In this regard, the United Nations General Assembly proposed the 17 Sustainable Development Goals (SDGs), among which is Ensuring healthy lives and promoting well-being for all at all ages (SDG.3). This goal is considered the basis for achieving the other 16 SDGs, just as physical activity represents the means to achieve them. (Tabarquino-Muñoz, 2023).

Following this line, educational centres should be promoters of free physical activity after the school day and offer activities led by professionals, hold sports days and healthy eating and cooking workshops for both students and families.

### **Limitations**

Among the limitations found in the present study, we highlight the sample size; the lack of time, which has prevented students who missed any of the sessions in which the data was collected from repeating the tests; and the bias of the use of questionnaires self-completed by students.

### **Future lines of research**

For future research, it is proposed to expand the sample size and carry out a longitudinal study of the physical condition of Primary Education students.

## AUTHOR CONTRIBUTIONS

All authors have contributed equally to all sections of this article.

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## DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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