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Motor self-efficacy, Physical Education and Spanish adolescence

Autoeficacia motriz, Educación Física y adolescencia española

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Resumen. La adolescencia es un periodo importante en el desarrollo humano, y la educación física puede desempeñar un papel vital en la promoción de hábitos saludables que mejoren el bienestar general. Un factor que contribuye al éxito de los programas de Educación Física es la autoeficacia motriz. Es decir, la autoconfianza en la propia capacidad para realizar tareas físicas puede influir en el compromiso y el rendimiento de los adolescentes en Educación Física, mejorando así su salud general, ya que puede afectar a su nivel de actividad física y, posteriormente, repercutir en sus resultados en materia de salud. Objetivo: Analizar la autoeficacia motriz en Educación Física, en función del sexo y el entorno educativo en adolescentes españoles. Metodología: A 1155 estudiantes (52.2% chicas and 48.8% chicos) se les realizó la escala de Autoeficacia motriz (E-AEM). Para su análisis, se utilizó el test U de Mann-Whitney. Resultados: Se encontraron diferencias significativas por sexo en todos los ítems de E-AEM, obteniendo los chicos mejor puntuación en autoeficacia motriz que las chicas. En cuanto al entorno, se encontró diferencia significativa en un ítem de E-AEM, siendo los adolescentes del entorno rural más autoeficaces en la superación de las pruebas de las clases de Educación Física que los adolescentes de entorno urbano. Conclusiones: Estos hallazgos resaltan la importancia de tener en cuenta las diferencias contextuales y de género a la hora de diseñar intervenciones para mejorar la Educación Física y la autoeficacia motriz en adolescentes con el fin de conseguir un estilo de vida saludable.
Palabras clave: Autoeficacia motriz, Adolescente, Actividad Física, Educación Física, Secundaria.

Abstract. Adolescence is an important period in human development, and physical education can play a vital role in promoting healthy habits that improve overall well-being. One factor contributing to the success of physical education programmes is motor self-efficacy. That is, self-confidence in one's own ability to perform physical tasks can influence adolescents' engagement and performance in PE, thus improving their overall health, as it can affect their level of physical activity and subsequently impact on their health outcomes. Aim: To analyse motor self-efficacy in Physical Education as a function of sex and educational environment in Spanish adolescents. Methodology: 1155 students (52.2% girls and 48.8% boys) were administered the Motor Self-Efficacy Scale (E-AEM). The Mann-Whitney U test was used for the analysis. Results: Significant sex differences were found in all E-AEM items, with boys scoring higher in motor self-efficacy than girls. In terms of environment, a significant difference was found in one E-AEM item, with adolescents from rural environments being more self-efficient in passing tests in Physical Education classes than adolescents from urban environments. Conclusions: These findings highlight the importance of taking contextual and gender differences into account when designing interventions to improve Physical Education and motor self-efficacy in adolescents in order to achieve a healthy lifestyle.
Keywords: Motor self-efficacy, Adolescent, Physical Activity, Physical Education, Secondary School.

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Introduction

Motor self-efficacy (MSE), understood as the belief in one's own ability to perform specific motor and physical tasks (Bandura, 1977), plays a crucial role in the integral development of adolescents. This stage of life, characterised by rapid physical, emotional and social changes, constitutes a vital period for the consolidation of skills and healthy habits that can last into adulthood (Morales et al., 2024). Physical education (PE), as an educational discipline, has the responsibility to foster not only physical competence, but also WEA, thus promoting an active and healthy lifestyle (Babic et al., 2014).

During adolescence, MSE can be influenced by a variety of factors, including gender and the educational environment in which they develop, whether urban or rural. Several studies have addressed these differences, shedding light on how these variables may impact adolescents' perception of MSE (Hernández et al., 2008; Buendía et al., 2015; Perea et al, 2016) and, ultimately, their participation in physical activity (PA) (Velázquez et al., 2015; Vega, 2022).

Numerous studies have indicated that there are significant differences in MSE between adolescents of different sexes (Domenico et al., 2019; Puello et al., 2020; Codella et al., 2020; Vega, 2022; Aguilar et al., 2023). Research suggests that boys tend to report higher levels of MSE compared to girls (Hernández et al., 2011; Hernández et al., 2012; Carissimi et al., 2017; Domenico et al., 2019). These discrepancies could be attributed to societal and cultural norms that have historically associated physical prowess with masculinity. But society is changing and stereotypes are breaking down.

Another factor to take into account is that educational environment in which adolescents develop may also influence MSE. There are not many studies on the subject but in general, adolescents in urban settings tend to have greater opportunities to participate in a variety of PA (Hernández et al., 2010), thanks to a more developed infrastructure and greater availability of sport resources. On the other hand, adolescents in rural areas may face limitations in terms of access to sport facilities and structured PE programmes (Álvarez, 2020), which may negatively affect their MSE. However, some studies have pointed out that young people in rural areas may benefit from increased contact with nature

and outdoor activities (Mateos, 2018), which may partially compensate for the lack of formal resources. These outdoor activities often require a di-verse set of motor skills (González, 2023), which may contribute to the development of a robust MSE. However, most studies do not clarify whether there is an influence, as the differences do not appear to be significant (Salazar et al., 2020).

In conclusion, MSE in adolescence is a complex and multifaceted construct, influenced by various factors that affect it to different extents and which varies according to the latest research, so there is no clear consensus in the scientific community. Therefore, the aim of this study is to determine the factors that influence MSE according to sex and educational environment in Spanish adolescents in the area of PE. PE, as a vehicle for promoting health and well-being, should consider these differences when designing and implementing its programmes. Fostering an inclusive environment adapted to the individual needs of students can not only improve their MSE, but also lay the foundations for a lifelong active and healthy lifestyle.

Materials and methods

Participants

In order to select the sample size, a non-probabilistic sample was used, this being a convenience sample (Salkind, 1999). In terms of gender, the sample (n=1155) is made up of 52.2% females and 48.8% males, which is considered to be balanced with respect to this item. The item related to the environment or location in which the school was located indicates that 68.1% of the students belong to urban contexts and 31.9% to rural contexts. The criterion selected to discriminate the context of the centre was to consider rural environments to be those localities with less than 20,000 inhabitants and urban environments to be those with more than 20,000, adhering to the guidelines and criteria established by the competent body of the Cáceres Provincial Council. The mean age of the participants was 14.71 years (SD=1.58).

Procedure

The contact details of those schools in which Baccalaureate (estimated ages between 16 and 18 years) and Compulsory Secondary Education (CSE) with ages between 12 and 16 years, are taught were selected from the directory provided by the Regional Ministry of Education and Employment of Extremadura, which lists the public schools in the region.

The selected schools were contacted by means of an informative e-mail about the purpose of the study and instruments, addressed to Physical Education teachers and, after accepting the collaboration, they were sent the informed consent form that they had to have on the agreed day for the data collection. Appointments were established and scheduled by e-mail so that a member of the research team could attend the school to ensure that all participants had informed parental consent and to provide the questionnaires to those pupils who were able to participate.

Data collection days consisted of attending the school, ensuring that parental informed consent was provided and providing the questionnaires via tablet devices to facilitate viewing and storing all responses in a single database, using a document created with Google Forms. Similarly, the researcher ensured that students understood the questions asked in the questionnaire. The average response time was about 10 minutes.

Instruments

The instruments used for the study were:

Sociodemographic questions. Through the Google Forms application, five questions were asked (Sex, Course, Province, Location of the centre and age of the participant) to obtain the sociodemographic data.

Motor self-efficacy scale. The instrument validated in Spanish to be applied at school age (Hernández-Álvarez et al., 2011) was used to measure the degree of motor self-efficacy. The instrument uses a Likert-type scale with values ranging from 1 "totally disagree" to 4 "totally agree" to respond to 10 items that pose possible situations that are experienced during physical-sports practice. In order to obtain the result of this scale, it is necessary to add up the 10 items, being able to find minimum scores of 10 points that would indicate a low level of motor self-efficacy and being able to obtain a maximum score of 40 points. The authors reflect a reliability value for the instrument based on the Crombach's alpha coefficient of 0.82.

The research procedure was carried out through the directory of public schools developed by the Consejería de Educación de la Junta de Extremadura, contacting the schools where the students studied at the CSE stage.

An e-mail was sent to the physical education teachers informing them about the research: objectives, methodology and informed consent for the parents of the students. Before the possibility of participating, they were advised to respond to their acceptance by e-mail. One of the members of the evaluation team would go to the school and administer the questionnaires to the physical education students who had signed the parental consent form.

On the planned day, the evaluator gave the students an electronic device (Tablet), which they connected to the internet, to answer the questionnaires via a link to a digital platform (Google Forms). First, they read aloud all the tests and asked questions about them. Then, through the e-questionnaire, they marked their answers, whose data were recorded on the platform, thus saving paper and time. The test lasted around 10 minutes. These data were collected anonymously in 2022.

Statistical Analysis

The data collected were analysed using the Statistical Package for Social Sciences (SPSS) application version 23.0 for Mac IOS. To analyse whether the data complied with the assumption of normality in their distribution, the Kolmogorov Smirnov test was applied, indicating that this

assumption was not met. Thus, non-parametric tests were used. Descriptive data are presented as standard deviation (SD) and mean (M).

Differences between questionnaire items according to gender and school setting were analysed using the Mann-Whitney U test (Table 2). This test was also used to analyse differences in the overall median according to the school setting and sex of the participants (Table 2). The Bonferroni correction was applied to the multiple comparisons made in the analyses of each of the items of the instrument according to sex and location of the centre, so that a significance value of $p<0.005$ was established. For the rest of the analyses, a significance value of $p<0.05$ was established.

To explore the relationship between the Age item and the median score of the questionnaire, Spearman's Rho test was used (Table 3).

Adhering to Nunally and Bernstein (1994), Crombacht's alpha coefficient was used to analyse the reliability of the instrument, taking into account that values considered acceptable vary between 0.60 and 0.70, while values between 0.70 and 0.90 can be considered satisfactory.

Results

Table 1 shows the score obtained in each of the items of the E-AEM instrument according to sex and school location. The Mann-Whitney U test was used to analyse whether there were statistically significant differences. Significant differences by sex were found for all items of the questionnaire, with males obtaining the highest scores.

In terms of location, significant differences were obtained in item 8 "I can do most of the activities in PE class if I make the necessary effort" in which students from schools located in rural areas obtained higher scores.

Table 1.
Descriptive analysis and differences by sex and school location of the questionnaire items.

Item	Sex				School Location		
	Total	Boy	Girl		Rural	Urban	
	M (SD)	M (SD)	M (SD)	p	M (SD)	M (SD)	p
1. During a sports game I can get into trouble, even if someone opposes me.	2.97 (0.85)	3.13 (0.81)	2.82 (0.85)	<0.001	2.98 (0.85)	2.97 (0.85)	0.764
2. In Physical Education classes I can solve difficult tasks if I try hard enough.	3.36 (0.79)	3.54 (.70)	3.19 (0.84)	<0.001	3.44 (0.76)	3.32 (0.80)	0.012
3. In physical activity it is easy for me to persist in what I have set out to do until I reach my goals.	3.19 (0.85)	3.35 (0.80)	3.04 (0.87)	<0.001	3.25 (0.87)	3.17 (0.84)	0.051
4. I am confident that I can deal effectively with unexpected situations in physical activity.	3.07 (0.90)	3.27 (0.80)	2.87 (0.94)	<0.001	3.09 (0.89)	3.06 (0.90)	0.581
5. Thanks to my qualities and resources I am able to overcome unexpected situations in physical activity.	3.07 (0.87)	3.30 (0.80)	2.85 (0.87)	<0.001	3.06 (0.83)	3.08 (0.88)	0.564
6. When I find myself in difficulties during a game or match I can remain calm because I have the necessary skills to handle difficult situations.	2.88 (0.91)	3.11 (0.84)	2.66 (0.91)	<0.001	2.86 (0.89)	2.88 (0.91)	0.749
7. No matter what happens during a sports game, I am usually able to handle the situation.	2.98 (0.85)	3.14 (0.78)	2.83 (0.88)	<0.001	3.01 (0.81)	2.96 (0.86)	0.481
8. I can do most of the activities in PE class if I make the necessary effort.	3.47 (0.74)	3.64 (0.64)	3.31 (0.79)	<0.001	3.59 (0.67)	3.42 (0.76)	<0.001
9. If I find myself in a difficult situation during a sports game, I can usually think of what I should do.	3.00 (0.85)	3.14 (0.79)	2.87 (0.88)	<0.001	3.02 (0.83)	2.99 (0.86)	0.676
10. When confronted with a problem in the game or in PE class, I can usually think of several alternatives of how to solve it.	2.99 (0.88)	3.15 (0.83)	2.84 (0.91)	<0.001	2.93 (0.83)	3.02 (0.90)	0.054

Note: M = mean value; SD = standard deviation. Note: P is significant at <0.005; Each dimension score is based on a Likert scale (1-4).

Table 2 shows the mean score obtained through the Likert-type scale (1-4) obtained in the E-AEM and the mean of the total sum obtained according to the items gender and school environment.

Higher scores were found for males than for females, with statistically significant differences ($p<0.001$). As for the score obtained with respect to the school environment, it was found that students trained in schools in rural environments obtained a higher score than students in schools in urban environments without finding statistically significant differences ($p=0.318$).

Table 3 shows the data on the correlations between the E-AEM instrument and the age of the participants, obtained using Spearman's test.

Table 2.
Descriptive analysis of each dimension of the questionnaire

	Sex				School Environment		
	M (SD)	Boy	Girl	p	Rural	Urban	p
E-AEM	3.10 (0.63)	3.27 (0.56)	2.93 (0.64)	<0.001	3.12 (0.62)	3.08 (0.63)	0.318
	MeΣ (IQR)	Boy	Girl		Rural	Urban	
E-AEM	31.00 (6.31)	32.78 (5.66)	29.31 (6.44)		31.25 (6.21)	30.89 (6.37)	

Note: M = mean value; SD = standard deviation. Note: P is significant at <0.005; Each dimension score is based on a Likert scale (1-4).

Table 3.
Correlations between the dimensions and the age variable.

Dimensiones	Edad ρ (p)
E-AEM	0.05 (0.089)

Note: Correlation is significant at ** p<0.001; * p<0.05. Each dimension score is based on a Likert scale (1-4).

With regard to the reliability finding of the questionnaire was excellent according to Nunnally& Bernstein (1994), (α=0.90).

Finally, Crombach's alpha was analysed in each of the dimensions, with very satisfactory findings in all of them, according to the criteria established by Estévez, Martínez & Musitu (2006) or Cava et al., (2008). Our findings support those of García & Musitu (1999), whose reliability was α=0.810.

Discussion

The aim of this study was to analyse MSE as a function of gender and educational background in Spanish adolescents.

In terms of gender, significant differences were found in all the items of the questionnaire used, with higher scores in boys or, in other words, Spanish adolescent boys have better MSE than Spanish adolescent girls. Coinciding with several authors such as Hernández et al., (2011), Hernández et al., (2012), Carissimi et al., (2017), Domenico et al., (2019) and Puello et al., (2020) who in their research showed that the MSE of boys is higher than that of girls. These differences may be related to social and cultural expectations that traditionally associate physical competence with the male gender or can be attributed to other factors, such as differences in practice opportunities or gender socialisation. A study by Martínez-López et al. (2014) found that boys report higher self-efficacy in specific motor skills and in playing sports, which is in line with other international studies. In addition, PE programmes and sport activities are often more oriented to-wards skills and sports in which males traditionally excel, which may reinforce this MSE gap. Our results are consistent with this trend. This reinforces the notion that gender differences in motor self-efficacy are consistent and may be influenced by socio-cultural and educational factors that promote greater participation of boys in physical activities from an early age. However, it is crucial to consider the context and specific educational initiatives. There are studies where no significant gender differences have been found (Li et al., 2018; Muñoz & García, 2019; Cisternas et al., 2023). And some recent studies have shown that interventions designed to foster equal participation in PA can reduce these disparities, promoting an inclusive and supportive environment for adolescent girls (Codella et al., 2020).

In terms of location, significant differences were only obtained in item 8 'I can do most of the activities in physical education class if I make the necessary effort'. Our findings indicate that adolescents from rural settings have better MSE than their urban peers. This is in line with literature suggesting that access to outdoor spaces and participation in informal PA in rural settings may contribute to higher MSE. In their research, Navarro-Patón et al. (2019) found that rural adolescents tend to participate more in outdoor PA, which could increase their MSE. Also another reason can be more PA practice in rural areas, because in another recent study, (Úbeda-Palomares & Hernández-Álvarez, 2020), where an intervention was conducted by increasing PA, students who received extra PE lessons had better perceived motor self-efficacy over time than students who received extra PE lessons. In this line, other authors found that motor games could improve motor self-efficacy and some components of physical fitness in schoolchildren. (Cisternas et al., 2023). However, there are also studies in which no significant differences were found (Salazar et al., 2020). Therefore, it is important to consider other factors such as social support, opportunities for organised sport practice and lifestyle differences that may influence these outcomes.

Practical implications

Schools and physical education programmes play a crucial role in the development of MSE. Implementing programmes that foster the development of motor skills and provide successful experiences can increase students' self-efficacy. Silverman and Mercier (2015) suggest that activities designed to be inclusive and tailored to different skill levels can help all students experience success and thereby increase their MSE. Longitudinal studies suggest that continuous support and positive feedback from educators can help students to maintain and develop their MSE (Neira et al., 2022). In addition, the incorporation of diversified PA adapted to different ability levels can contribute significantly to this goal (Bravo-Bravo et al., 2023; Concha-Cisternas et al., 2023; Romero et al., 2024).

From a public health perspective, it is essential to promote policies that support the development of MSE in adolescents. This includes the creation of environments that facilitate safe and accessible PA, such as parks and recreational areas, as well as community-based sports and PA programmes.

Conclusions

MSE is a complex construct influenced by several factors, including gender and environment. It can be concluded that boys have higher MSE than girls and that adolescents in rural settings tend to have higher MSE compared to their urban counterparts. These findings highlight the importance of considering contextual and gender differences when designing interventions to improve PA and MSE in adolescents.

Author Contributions

All authors have read and agreed to the published version of the manuscript

Institutional Review Board Statement

The study was conducted according to the guidelines of the Declaration of Helsinki.

Informed Consent Statement

Informed consent was obtained from all participants' progenitors involved in the study.

Conflicts of Interest

The authors declare no conflict of interest.

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