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Original

Do perceived motor competence and physical literacy mediate the association between actual motor competence and physical activity engagement?

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ABSTRACT

Perceived motor competence (PMC) and physical literacy (PPL), in conjunction with actual motor competence (AMC) are relevant factors for engaging early adolescents in active lifestyles. The main purpose of this study is to analyze the mediating role of PMC and PPL in the association between AMC and physical activity (PA) participation. In this study, 222 students (112 girls; 50.5%) aged 12 to 14 years-old participated voluntarily. By using structural equation modeling, the relationship between AMC and PA and the mediating influence of PMC and PPL on this relationship was analyzed. Model one, considering PMC (CFI = .97, RMSEA = .08, SRMR = .04) and model two with PPL (CFI = .99, RMSEA = .05, SRMR = .03) fitted satisfactorily. Therefore, it is not only important to promote AMC, but also to develop psychosocial and emotional factors such as PMC and PPL to promote PA participation among adolescents.

¿La percepción de competencia y alfabetización motriz median la relación entre la competencia motriz y la práctica de actividad física?

Palabras clave:
Actividad física
adolescencia
educación física
desarrollo motor
autopercepción

RESUMEN

La percepción de competencia (PCM) y alfabetización motriz (PAM), junto con la competencia motriz real (CMR) son factores relevantes en el mantenimiento de estilos de vida activos en adolescentes. El objetivo principal de este estudio ha sido analizar el rol mediador de la PCM y PAM en la relación entre la CMR y la actividad física (AF). En este estudio han participado voluntariamente 222 estudiantes (112 chicas; 50.5%) de 12 a 14 años. Mediante la realización de modelos de ecuaciones estructurales, se ha analizado la relación entre la CMR y la AF y la influencia mediadora de la PCM y la PAM en dicha relación. El primer modelo considerando la PCM (CFI = .97, RMSEA = .08, SRMR = .04) y el segundo modelo con la PAM (CFI = .99, RMSEA = .05, SRMR = .03) muestran un ajuste satisfactorio. Por ello, no sólo es importante fomentar la CMR, sino que se han de desarrollar factores psicosociales y emocionales como la PCM y la PAM para promover la práctica de AF entre adolescentes.

Introduction

Physical activity (PA) is a fundamental behaviour for healthy development during childhood and adolescence, between ages 3 and 18 (Barnett et al., 2016). Despite this, 80% of adolescents do not meet the minimum PA recommendations (World Health Organization, 2021) and this means that physical inactivity is cur-

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rently a public health problem (Miller et al., 2019) closely related to the development of chronic diseases such as cancer or diabetes (Lee et al., 2012). In this line, previous research (Barnett et al., 2022; De Meester et al., 2020) shows that participation in PA is impacted by several factors among which motor competence (MC) or physical literacy (PL) stands out.

MC (Coppens et al., 2021; Estevan & Barnett, 2018) can be actual or perceived and in both cases is associated with lifetime PA practice (Barnett et al., 2022; Robinson et al., 2015). Actual motor competence (AMC) refers to the degree of mastery and abilities in multiple motor skills and underlying mechanisms, such as coordination and balance, resulting in quality movement (De Meester et al., 2020). The conceptual model of motor development (Stodden et al., 2008) postulates the role of MC within health-related child development. This model proposes the existence of a direct relationship between AMC and PA, as well as an indirect relationship mediated by perceived motor competence (PMC), which refers to each person's appreciation of their own motor skills or abilities (Estevan & Barnett, 2018).

Regarding the explanatory power of AMC on PA in adolescents (Barnett et al., 2022), recent studies show a positive association, with AMC being a predictor of both PA volume (McIntyre et al., 2018) and intensity (Gu et al., 2018). This relationship seems to acquire greater predictive value when the mediating role of PMC is considered (Barnett et al., 2022). Those who show high PMC levels tend to persist in the motor challenges; thus, PMC is positively associated with AMC (De Meester et al., 2020). In this sense, this relationship between PMC and AMC seems to be moderated by the gender and age of children and young people. With reference to gender, boys tend to show higher levels of both PMC and AMC than girls. In terms of age, during childhood, children tend to overestimate themselves, whereas in adolescence, as they get older, their assessment of their own motor skills adjusts more to reality with implications for PA practice (Barnett et al., 2022). Thus, those adolescents who show high levels of AMC and PMC tend to perform more PA (Coppens et al., 2021; Menescardi, De Meester et al., 2022). However, evidence on the mediating role of PMC in the relationship between AMC and PA found so far has been indeterminate (Barnett et al., 2022) which, in addition to the lack of studies, may mean that there are other psychosocial factors that influence PA participation that are not included in the conceptual model of motor development such as PL (Barnett et al., 2016, 2023; Shen et al., 2018).

PL refers to the ability to understand the importance of PA practice across the lifespan. This capacity is achieved through holistic learning that results in the motivation, knowledge and physical competence needed to perform PA (Barnett et al., 2023; Whitehead, 2019). Because of its pedagogical potential, PL has acquired a key significance in Physical Education and sport being considered a central aspect to develop quality experiences in children and young people (Cairney & Clark, 2016), as it is a holistic concept that gathers some relevant aspects (such as physical, psychological, social and cognitive) of the person (Barnett et al., 2019, 2022; Cairney, Dudley et al., 2019) and which have been related to PA practice (Estevan et al., 2021; Menescardi, De Meester et al., 2022; Menescardi & Estevan, 2021; Monteiro et al., 2021; Nezondet et al., 2023; Shen et al., 2018).

Previous studies show adolescents with higher levels of AMC are more autonomously motivated towards PA practice (Estevan et al., 2021; Menescardi et al., 2023). Similarly, the social context can influence young people's motivation and enjoyment, as well as the adoption and maintenance of an active lifestyle (Barnett et al., 2016; Monteiro et al., 2021; Shen et al., 2018). In addition, an adequate understanding and comprehension of importance of maintaining active lifestyles promotes cognitive awareness that is associated with increased PA practice (Edwards et al., 2017). Thus, physically literate individuals would tend to show higher PA practice levels to a greater extent because they would have higher levels of autonomous motivation, social support, PMC, or AMC (Cairney, Clark et al., 2019). Therefore, the measurement of PL can be useful to holistically understand the different domains that impact PA practice increasing the possibilities of being physically active (Barnett et al., 2023).

Just as PMC is a measure associated with AMC, perception of PL (PPL) can provide a comprehensive view of students' perspectives on their own PA levels, that helps teachers, coaches, and families to understand the state of adolescents and which aspects they need further development (Barnett et al., 2022). Furthermore, in the same way that PMC mediates the relationship between AMC and PA, it can be hypothesized that the PPL also mediates this relationship and provides nuances that may help to explain which aspects influence PA practice in young people. So far, few instruments have been used to measure students' PPL (e.g., Perceived Physical Literacy Inventory [PPLI], Li et al., 2020; Ma et al., 2020; Sum et al., 2016). Recently, a pictographic scale measuring PPL in adolescents, the Physical Literacy in Children Questionnaire (PL-C Quest), has been developed (Barnett et al., 2020). The PL-C Quest is aligned to the concept and structure of PL and has shown evidence of validity in children and early adolescents (Barnett et al., 2020). Unlike the PPLI scale and thanks to the use of pictograms, which have the ability to maximise students' ability to understand the constructs without highly developed written literacy skills, the PL-C Quest assesses how individuals perceive themselves in regarding their PL (Barnett et al., 2020).

To date, there is no study that examined the mediating role of PMC in the relationship between AMC and PA in the conceptual model of motor development by Stodden et al. (2008), nor the mediating role of PPL in the aforementioned relationship in adolescents. Thus, this study is the first to analyse how this perception influences PA levels, e.g., whether PPL plays a mediating role in the relationship between AMC and PA in early adolescence. Thus, the aim of this study was twofold: to analyse the mediating role of PMC (objective 1) and PPL (objective 2) in the relationship between AMC and PA in Spanish adolescents. In accordance with the proposals of Stodden et al. (2008) and Barnett et al. (2022), it is hypothesised that PMC and PPL mediate the relationship between AMC and PA.

Method

Study design and participants

In this cross-sectional study, we initially contacted the principals of four secondary schools in Valencia, Spain, who agreed to participate in the proposal. After explaining purpose and methods of the study, a sample was recruited by convenience from 11 classes in these schools. All subjects participated in the measurement tests voluntary and provided responsible adult's signed informed consent (consent ratio 80.7%). The inclusion criteria in the analyses were: (1) not having suffered an injury in the previous month, (2)

not having any type of disability limiting the autonomous performance of the tests and (3) not having been ill during the last week. Data from 222 students (112 girls, 50.5%) aged 12 to 14 (M = 12.31, SD = 0.57) were analysed. Of these, 24.1% of them practiced some kind of PA or sport that involves object control skills (e.g., basketball, soccer, handball, etc.), 44.6% locomotion skills (e.g., athletics, running, parkour, etc.) and 33.7% some rhythmic, aquatic or martial art activity (e.g., dance, swimming, martial arts, etc.). The remaining 25.7% indicated that they do not do any type of extracurricular directed PA. All data were treated confidentially, the study was approved by the Ethics Committee of the University of Valencia (Code 1564606) and the entire procedure was carried out in accordance with the Declaration of Helsinki.

Instruments

Actual Motor Competence

To measure the AMC of the participants, the Canadian Assessment of Motor Skills and Agility (CAMSA) circuit was used, created to assess AMC in students aged 8 to 14 years (Longmuir et al., 2017) in its version validated in the Spanish context (Menescardi, Villarrasa-Sapiña et al., 2022). The CAMSA consists of seven motor tasks: jumping with two feet (2 points), lateral displacement (3 points), reception (1 point), throwing (2 points), skipping (2 points), jumping with one foot (2 points) and shooting (2 points). The different aspects that make up each skill are scored on a scale from 0 = incorrectly executed to 1 = correctly executed and can result in a maximum score of 14 points (process-based criteria), while the CAMSA time score varies from 1 to 14, with the transformation being inversely proportional to the time taken to complete the circuit (product-based criteria). Time starts when the participant starts jumping with both feet and stops when he/she kicks the ball (Longmuir et al., 2017). The sum of the process and product criteria provides a CAMSA score ranging from 1 to 28 (Longmuir et al., 2017; Menescardi, Villarrasa-Sapiña et al., 2022). Prior to the assessment, all participants were instructed with two demonstrations of the CAMSA. In the first one, the circuit was shown slowly; during this first demonstration, it was explained verbally and in detail how each skill should be performed. For the second demonstration, the circuit was performed at high speed and with good quality execution. Each participant performed four trials, two repetitions for familiarisation and two for evaluation (Li et al., 2020). All videos were coded by two different observers. Inter-rater reliability as measured by the intraclass correlation coefficient (ICC) was excellent (> .81) for skill (ICC = .91) and time (ICC = .94) scores based on an independent subsample of 20 videotaped performances.

Using tests that include both product- and process-oriented measures can provide a comprehensive assessment of AMC (Robinson et al., 2015); Therefore, this test is one of the most authentic environments to evaluate AMC (Tyler et al., 2018) since it provides valid and reliable measures of fundamental motor skills (Kaioglou et al., 2020), being widely used in different countries such as Canada (Longmuir et al., 2017), China (Cao et al., 2020; Li et al., 2020), Denmark (Elsborg et al., 2021), Greece (Dania et al., 2020; Kaioglou et al., 2020) and Spain (Mendoza-Muñoz et al., 2021; Menescardi, Villarrasa-Sapiña et al., 2022).

Perceived Motor Competence

To measure the PMC of the students, the Spanish version of the pictorial scale of Perceived Motor Skills Competence (PMSC; Estevan et al., 2019; Johnson et al., 2016) was used. The PMSC is composed of thirteen pictographic motor tasks (running, galloping, hoping, jumping, sliding, throwing upperarm, catching the ball, kicking, hitting, bouncing a ball, throwing underarm and hitting with a racket). The student's perception of each skill is rated from 1 = lowest perception to 4 = highest perception. The overall PMSC score ranges from 13 to 52, with higher values representing higher PMC. The results of the confirmatory factor analysis (CFA) with all items loaded on a latent factor showed satisfactory fit indices, $\chi^2(57) = 96.509$; the root mean square error of approximation (RMSEA) = .05; the comparative fit index (CFI) = .94; and the standardized root mean squared residual (SRMR) = .05 (see supplementary material Figure S1). It showed good reliability (α and ω = .82).

Perceived Physical Literacy

To measure PPL, the pictographic PL-C Quest (Barnett et al., 2020) was used. This scale is composed of 30 items that cover four domains that are physical, psychological, social and cognitive domain. Throughout this scale, first of all, students are asked to indicate their level in the item represented; secondly, they are asked to report their degree of agreement with the image they have chosen (i.e., if they choose the lowest performance, they are asked ¨how do you think your performance is, is it not very good or sort of good?¨, or if you choose the best performance, you are asked, ¨how do you think your performance is, pretty good or really good?¨); The result of the scale is 4 points (1 = not very good, 2 = sort of good, 3 = pretty good and 4 = really good). The validity of the scale has been evaluated through concurrent validity and factor structure. Firstly, to evaluate concurrent validity, the Pearson correlation was calculated between the two scales that measure PPL (PL-C Quest and PPLI). The structural validity and reliability of these scales are shown in the supplementary material (Figures S2 and S3). The measured with the PL-C Quest scale correlates with the PPLI scale scores (Sum et al., 2016). The reliability of the PL-C Quest has been good for the one-factor scale (α = .84, ω = .83). In addition, the test-retest reliability of the PL-C Quest has been calculated to evaluate consistency 10-12 days later. The test-retest analysis has revealed a great relationship (total: r = .84).

Physical Activity

The level of PA practice was measured with the PA questionnaire for adolescents (PAQ-A, Kowalski et al., 2004) adapted to Spanish (Martínez-Gómez et al., 2009). The PAQ-A is a self-administered questionnaire that assesses individuals' participation in different types of physical activities in the last seven days, such as their level of PA during PE classes, lunch, recess, after school, in the evening and on weekends over 8 items, which are scored between 1 = low and 5 = high. The factor structure of the PAQ-A reveals a good scale fit, $\chi^2(20) = 18.089$; RMSEA = .01; CFI = .99; SRMR = .03, Figure S4). The scale has exhibited good internal consistency for the sample under study (α = .79, ω = .80).

Procedure

The administration of the questionnaires was performed during school hours in the regular classroom prior to the AMC mea-

Table 1
Descriptive statistics (mean and standard deviation), bivariate and partial correlations

	M (*SD*)	1	2	3	4	5	6
1. Age	12.31 (0.57)	–	–	–	–	–	–
2. Gender	–	-.053	–	–	–	–	–
3. PA	2.68 (0.71)	-.037	−0.114	–	.446**	.388**	.285**
4. PPL	2.99 (0.42)	-.063	-.174*	.458**	–	.614**	.179**
5. PMC	2.85 (0.51)	-.050	-.248**	.406**	.631**	–	.268**
6. AMC	19.98 (3.78)	-.177**	-.155*	.304**	.214**	.325**	–

Note. Gender = 1 male; 2 women. PA = Physical Activity, PPL = Perceived Physical Literacy, PMC = Perceived Motor Competence, AMC = Actual Motor Competence, *M* = Mean, *SD* = Standard Deviation. Bivariate Pearson correlations are presented on the lower left side, while partial correlations controlled for age and gender are presented on the upper right side of the diagonal.

* $p < .05$.

** $p < .01$.

surement which was performed in the playground or school gym during Physical Education classes. Prior to each participant's MC assessment, three 2 -h training sessions were conducted with two research assistants (RA) to determine agreement in coding MC in each skill and time score. A total of 20 videos (from ten students) were coded to assess intra-observer reliability. Reliability was measured with the ICC using a consistency method that revealed excellent values (> .74; see Table 1; Fleiss, 1981), for skill scores (α = .91 and .86) and time scores (α = .98 and .99), compared with an expert rater with MC experience. After confirming inter-rater reliability, the total sample was coded. Each participant's performance was videotaped with a 25 Hz Lumix TZ7 camera (Panasonic, Japan©) for subsequent coding.

Data analyses

To achieve the objective of analysing the mediating effect of two variables (PMC and PPL) between the relationship X (predictor, AMC) and Y (outcome, PA), the recommendations of different authors (Geiser, 2013; Jose, 2013; Kelloway, 2015) were followed. Descriptive and correlation analyses were initially conducted for inspection of all study variables in the full sample using SPSS v.26 (SPSS Inc. 2011). To examine whether the main study variables differed according to the age and gender of each participant, bivariate Pearson correlations were performed. As age and gender were related to PPL, partial correlations were performed controlling for these variables (Table 1).

Subsequently, a structural equation modelling (SEM) approach was used to test hypotheses using Mplus v.8 (Multhén & Multhén, 2017). In line with previous work (Baron and Kenny, 1986; Geiser, 2013; Jose, 2013; Kelloway, 2015), we first analysed the direct relationships between AMC and PA (Model 0 showing *path c*) and afterwards analysed the same model including each of the mediating variables (Models 1 and 2 showing the AMC-PA relationship with mediator/s: *path c'*). Following the recommendation of these authors, mediation was considered to occur when several aspects are fulfilled: a) *path c'* is less than *path c* (partial mediation), with full mediation occurring when *path c'* becomes non-significant, and b) indirect effects (mediator effects) are shown to be significant. Indirect effects were tested through the indirect model procedure in Mplus. To reduce the number of parameters to be estimated, item parcellation (i.e. including two or more items together) was used (Heitzler et al., 2010) with the scales PMC, PPL and PA. Fit indices (such as CFI, SRMR and RMSEA) of the models were also used to check goodness-of-fit (Hu & Bentler, 1999). To indicate good model fit, cut-off values were set at CFI > .90, RMSEA/SRMR < .08 (Hu & Bentler, 1999).

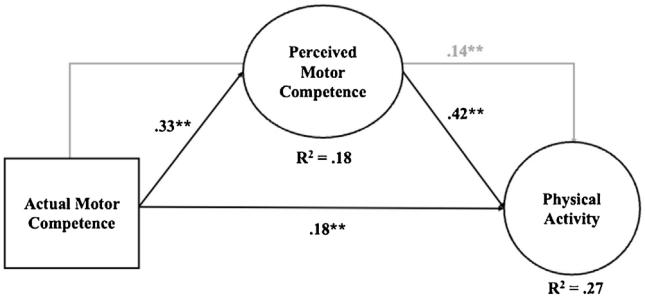

Figure 1. Structural equation model of the relationship between actual motor competence, perceived motor competence and physical activity (objective 1). The standardized coefficients (β) are reported in the figure. Gender and age are included as covariates. As only significant relationships are shown, age has been removed from the model as it is not related to the other variables. Black lines indicate direct relationships, while grey lines indicate indirect relationships. The factor loadings are: PAR_PMC1 = .83, PAR_PMC2 = .78, PAR_ PMC3 = .68; PAR_PA1 = .81, PAR_PA2 = .86. **p* < .05. ***p* < .01.

Results

Means, standard deviations and correlations between study variables are presented in Table 1, which also shows the results of Pearson's bivariate correlations and the association of participants' age with AMC. Gender was also related to PPL, PMC and AMC. In addition, being a girl is associated with lower PPL, PMC and in fact lower levels of AMC than boys.

Model 0, controlled for age and gender, has shown an optimal fit, $\chi^2(2) = .178$, CFI = 1.00, RMSEA = .00, SRMR = .00 and a direct relationship between AMC and PA (β = .31, $p < .001$, $R^2 = .11$). Figure 1 represents the results of the SEM of model 1 (AMC-PMC-PA), controlled for age and gender, which has shown an acceptable fit, $\chi^2(11) = 25.909$, CFI = .97, RMSEA = .08, SRMR = .04. AMC is positively related to PMC, which in turn is also positively related to PA. Furthermore, an indirect relationship of AMC through PMC with PA has been found (β = .14, IC 95%: .066 – .233; $p = .001$).

Regarding the second objective, Figure 2 shows the results of the analysis of model 2 (AMC-PPL-PA), controlled by age and gender, which has shown a good fit to the data $\chi^2(13) = 20.034$, CFI = .99, RMSEA = .05, SRMR = .03. AMC has been positively related to PPL, which in turn is positively related to PA. Furthermore, an indirect

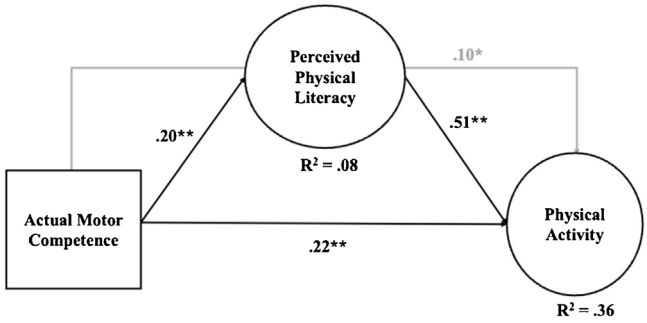

Figure 2. Structural equation model of the relationship between actual motor competence, perceived physical literacy and physical activity (objective 2). The standardized coefficients (β) are reported in the figure. Gender and age are included as covariates. Black lines indicate direct relationships, while grey lines indicate indirect relationships. The factor loadings are: PAR_PPL1 = .79, PAR_ PPL2 = .86, PAR_ PPL3 = .81, PAR_PA1 = .82, PAR_PA2 = .85. $^{*}p < .05$. $^{**}p < .01$.

relationship has been found from AMC through PPL to PA (β = .10, IC 95%: .029 – .190; p = .013).

Discussion

The purposes of the present study were twofold: (1) to analyse the mediating role of PMC in the AMC-PA relationship, and (2) to analyse the mediating role of PPL in the AMC-PA relationship. Regarding the first objective, examining the preliminary results of this study, AMC, PMC and PA are positively related to each other, coinciding with several studies that also report this relationship in European youth aged 8-13 years (Coppens et al., 2021; Menescardi, De Meester et al., 2022). Likewise, respect to the second objective, relationships have been found between PPL and PA, which is consistent with recent studies that have addressed this issue in Danish and Chinese students aged 12-21 (Ma et al., 2020; Melby et al., 2023). These findings help to support theoretical approaches that indicate that physically literate individuals show higher levels of PA practice (Nezondet et al., 2023; Öztürk et al., 2023). However, more in-depth analyses of these relationships are needed in order to better understand what factors play a mediating role in them.

Thus, when addressing the first objective of this research, in line with what is theorised in the conceptual model of motor development (Stodden et al., 2008), the results of the primary analyses of the first mediation model AMC-PMC-PA show a direct positive relationship between these variables (such as AMC-PA, AMC-PMC and PMC-PA), as well as an indirect relationship between AMC and PA through PMC, showing a partial mediation of PMC in the AMC-PA relationship. The relationship found between AMC and PA is in line with several cross-sectional studies proposing this association (Coppens et al., 2021; Webster et al., 2019), which indicates that AMC plays an important role in promoting regular PA practice (Lopes & Rodrigues, 2021). Following the conceptual model by Stodden et al. (2008), this relationship occurs through interaction with other mediating variables, such as PMC. Thus, analysing the results of this study, we found a relationship between AMC and PMC, which coincides with previous studies that confirm this positive association in schoolchildren of similar ages to the participants in this study (Carcamo-Oyarzun et al., 2020; De Meester et al., 2020; Jaakkola et al., 2019). These results support the idea that as schoolchildren get older, their PMC is less overestimated than in younger children and more in line with reality (Estevan & Barnett, 2018). Thus, in late childhood or early adolescence, schoolchildren can already make more accurate judgements about their performance, as they have had greater motor experiences that have allowed them not only to put their skills into practice, but also to compare themselves with their peers (Weiss & Amorose, 2005). In this way, the development of PMC during childhood acquires great relevance, since the confidence that schoolchildren have about their motor skills makes them more determined in the performance of PA where they are put to the test, increasing their motor experience baggage (Stodden et al., 2008).

Regarding the association between PMC and PA, the results of this study are in line with the studies analysed in the systematic review by Babic et al. (2014), who highlight that PMC shows a strong relationship with PA. These results suggest that schoolchildren with high PMC are more physically active, which may be due to these schoolchildren are more motivated (Menescardi, De Meester et al., 2022) and have a high expectation of success in motor demands, which stimulates greater effort when participating in games and sports, compared to schoolchildren with low PMC (Babic et al., 2014).

Regarding the indirect relationship between AMC and PA through PMC, in line with studies in schoolchildren of similar age ranges (Burns & Fu, 2018; Fu & Burns, 2018; Gu et al., 2017), the partial mediation that PMC exerts between AMC and PA is confirmed. Thus, the fact that higher AMC is directly associated with PA practice may be attributable to the fact that schoolchildren with higher PMC tend to be more self-confident and persistent in motor challenges (Stodden et al., 2008), which may lead to greater dedication and increased time spent doing PA (Estevan & Barnett, 2018). These findings provide new evidence regarding the recent review by Barnett et al. (2022), which shows that the mediating role of PMC is still undetermined, due to the lack of studies that delve deeper into this topic. However, it should be noted that the relationship between these factors found in this study is weak, which may indicate that there are other reasons related to perception that may influence the AMC-PA relationship.

To further explore the AMC-PA relationship, the second objective of the present study attempts to determine the possible mediating role of PPL in the above relationship. When analysing the second model presented in this study (AMC-PPL-PA, Figure 2), in line with Cairney, Dudley et al. (2019) and Cairney, Clark et al. (2019), a direct relationship between these variables (such as AMC-PPL, AMC-PA, PPL-PA), and an indirect one between AMC and PA through PPL, has been observed. With respect to the first model (Figure 1), the increase of the R^2 value in the second model (Figure 2) shows that the inclusion of PPL explains a higher percentage of variance than AMC alone. This may be because PPL captures more aspects (e.g., social, knowledge) than PMC; therefore, PPL is a factor to be taken into account when studying the PA practice levels of students. These results provide emerging evidence of the mediating role that PPL plays between AMC and PA, giving a broader view where those young people who are motor competent, if they are motivated, have self-confidence, feel physically competent, and value the importance of PA, tend to be more active.

The findings of this study have allowed us to determine that PPL plays a mediating role between AMC and PA, and have helped to better understand how other factors influence PL. This confirms the role of gender in these relationships, with boys having higher AMC and PPL values than girls. There is robust evidence that boys have higher levels of AMC (Barnett et al., 2016; Quintriqueo-Torres et al., 2022), while evidence of higher levels of PPL in young people is emerging (e.g., Öztürk et al., 2023). The prevalence of a greater sport offer for boys to the detriment of girls (With-Nielsen & Pfister, 2011), coupled with gender stereotyped activities, where boys participate in ball handling activities and girls practice activities linked to body control (Crane et al., 2015), promote the development of different skills in each gender and different self-perceptions of social creation that condition their practice of PA and PPL.

The present study offers relevant and novel information. These results help to deepen the still undetermined knowledge about the mediating role of PMC in the AMC-PA association, an issue

that needs to be addressed thoroughly (Barnett et al., 2022). Furthermore, the inclusion of models that include PPL as a mediator between AMC and PA is recent, so the results provide the first evidence for understanding this interaction and how PPL is involved in promoting habitual PA practice.

Although this is the first study to analyse the mediating role of PPL in the relationship between MC and PA, given the holistic nature of PL, future studies should analyse the mediating role of each of the PPL domains in the AMC-PA relationship in order to understand in more detail how these specific domains contribute to the relationship. Alongside these lines, despite the mentioned strengths, there are some limitations present in this study that are pertinent to mention for future research. One of them refers to the study design, which, being cross-sectional, only provides us with limited information from a specific moment in time, without the possibility of finding causal relationships. In addition, PA levels have been measured with a self-report scale, which could differ from reality. Therefore, it is necessary to carry out longitudinal or experimental studies in which PA is measured with more objective instruments (e.g., accelerometer) to corroborate the findings of the models analysed in this study.

Finally, the results of the present study highlight the importance of both PMC and PPL in mediating the interaction between AMC and PA. It is necessary to take this mediating role into account in interventions aimed at developing MC and promoting the recurrent practice of PA. In this way, favourable conditions can be generated to develop competence, confidence, and motivation at school age, stimulating PL to promote a lifelong commitment to PA.

Practical implications

The findings of this study underline the need to consider didactic proposals that address the different domains of PA in PE classes and in school programmes to promote PA. With this objective, the application of pedagogical models in PE that address motor, emotional, social and cognitive aspects can be effective (Fernandez-Rio & Iglesias, 2022). As a suggestion, proposals based on comprehensive teaching or non-linear pedagogy can be made to promote the diversity of motor tasks, offering young people a greater motor wealth and richness (Chow, 2013). At the same time, in order to stimulate affective aspects and social interaction, the use of the cooperative learning model as well as the SAAFE principles (Supportive, Active, Autonomous, Fair and Enjoyable) are suggested; both approaches can help PE teachers to create learning environments in which all students can experience success, fostering positive perceptions of their own abilities regardless of their level of competence (Lander et al. 2019; Lubans et al., 2017). Regarding the cognitive domain, it is recommended to apply models that stimulate students' search for creative solutions to various challenges and that produce greater cognitive involvement in the activities to be carried out (Barba-Martín et al., 2020).

Conclusions

The present study supports the idea of promoting PL in adolescents to encourage their health and well-being, as well as the need to advance in the discovery of the role of PMC and PPL as mediators in the relationship between MC and PA. The findings of this study are consistent with the hypothesis that PA is conditioned by both physical and other psychosocial or cognitive factors. For this reason, strategies should be created to develop all the domains that make up PL to help promote participation in PA and healthy lifestyles both inside and outside schools.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.psicoe.2024.03.001.

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