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A structural equation model of the mediating and moderating role of gender in the relationship between parental educational styles and emotional intelligence in physical education

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Abstract

Background Parental educational styles condition the development of emotional intelligence in the educational context. The aim of this study is to develop a structural equation model (SEM) to assess the causal relationship between parenting styles and emotional intelligence according to gender in primary school students.

Method This cross-sectional, exploratory and non-experimental study was conducted among 647 primary school students in Spain. A structural equation model was developed using maximum likelihood estimation, with goodness-of-fit tests (IFI, CFI, NFI, TLI; RMSEA). A multigroup analysis was also conducted to compare differences based on gender.

Results The SEM presented acceptable fit indices (IFI=0.900; CFI=0.888; NFI=0.925; TLI=0.901; RMSEA=0.073). A negative causal relationship of paternal criticism–rejection was found on emotional recognition ($\beta = -0.154$; $p < 0.05$), while the maternal affection–communication style showed positive effects on emotional recognition ($\beta = 0.084$; $p < 0.05$), emotional control ($\beta = 0.184$; $p < 0.05$), and empathy ($\beta = 0.164$; $p < 0.05$). The multigroup analysis presented a moderating effect of gender, with stronger maternal causal relationship on girl's emotional recognition ($\beta = 0.186$; $p < 0.05$) and on boys' emotional control ($\beta = 0.266$; $p < 0.05$) and empathy ($\beta = 0.193$; $p < 0.05$).

Conclusions It is highlighted that parental practices based on affection play a relevant role in the development of emotional skills in childhood. Finally, the need to include a gender perspective in future actions aimed at both families and educational centres is highlighted.

Keywords Emotional recognition, Emotional control, Emotional empathy, Affection-Communication, Criticism-Rejection

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Introduction

The family constitutes the primary socializing context in which emotional, cognitive and behavioral patterns are developed during childhood. Children acquire belief systems, coping strategies and affective schemas that shape their psychological adjustment and social functioning thorough life [1, 2]. Emotional development depends largely on the quality of early interpersonal relationships, where parents play a decisive role as the first models of emotional expression and regulation [3]. Parental educational styles therefore represent a determining factor in the development of emotional intelligence [4]. It is defined as the ability to perceive, understand, regulate and express emotions adaptively in oneself and in others [4].

The ability model of emotional intelligence proposed by Mayer et al. [5] provides the conceptual foundation for this study. It posits that Emotional Intelligence consists of four related skills [5]: Perceiving, facilitating, understanding and managing emotions [5]. These abilities emerge and strengthen within emotionally supportive environments where parents model appropriate affective behaviours. Empirical studies confirm that parental emotional responsiveness and open communication predict children's capacity for empathy, emotional recognition and self-regulation [5, 6]. Conversely, emotionally distant or critical parenting undermines children's confidence in their emotional experience and may contribute to difficulties in emotional awareness, behavioural inhibition and social withdrawal [7, 8].

The theoretical basis for understanding parenting behaviour has been widely established in Baumrind's model of parenting styles [9, 10]. It proposed four main styles based on the intersection of two dimensions: warmth-affection and control-demand [9, 10]. Authoritative parenting, characterised by warmth and consistent discipline has been linked to children's emotional maturity, self-regulation and psychological well-being [11, 12]. In contrast, authoritarian styles based on criticism, punishment and emotional distance tend to produce emotional inhibition, low self-esteem and elevated anxiety [13]. Permissive or neglectful styles have been associated with impulsivity, poor emotional control and social difficulties [14].

The mechanism explaining these effects can be understood through Attachment Theory [15]. Secure attachment, developed through consistent and affectionate parental behaviour, provides children with a stable emotional base from which they can explore the world and regulate affective responses [15]. Insecure attachment often results from inconsistent or rejecting parenting and it has been linked to deficits in empathy and emotional distress [16, 17]. Regarding Social Learning Theory [18], it emphasizes that children learn emotional expressions

and regulation strategies by observing and imitating parental behaviours. Parents who model emotional openness, calm problem-solving and empathic communication foster these same abilities in their children [19].

Recent studies have conceptualized parenting styles as a complex socio-emotional systems that influences child outcomes through modelling, attachment and emotional reinforcement mechanism [20, 21]. Affective and communicative parenting predicts higher levels of emotional competence, prosocial behaviour and psychological well-being [21–23]. In contrast, parental rejection or overcontrol are risk factors for emotional dysregulation [24, 25].

Beyond family factors, gender has emerged as a significant determinant of emotional intelligence during childhood. From a developmental perspective, girls demonstrate higher emotional recognition, empathy and interpersonal sensitivity [26]. Conversely, boys tend to display higher scores in emotional control, resilience and management of frustration [26]. Parenting style can moderate the development of gender specific emotional skills. Affective and communicative parenting promotes empathy and recognition in both genders, but it may enhance emotional awareness in girls, while consistent and supportive paternal involvement strengthens regulation and control in boys [27, 28].

In recent years emotional intelligence has also become a core educational competency, especially within Physical Education. In this subject, students experience intense emotional exchanges through movement, cooperation and competition [29]. Physical Education provides a rich environment for emotional learning, as it confronts students with success, failure, collaboration and conflict in real time [30, 31]. Systematic reviews have shown that educational interventions that integrate emotional education in Physical Education significantly improve student's motivation, empathy and group cohesion [32].

Despite the solid theoretical and empirical links between parenting and emotional development, research connecting parenting styles to emotional intelligence in Physical Education remains scarce. Recent studies suggest that parental affection and communication promote greater enjoyment, engagement and emotional resilience during Physical Education lessons [33, 34]. In contrast, authoritarian or neglectful parenting predicts avoidance of physical activity, emotional frustration and lower motivation [33, 34]. These findings point the need for integrative models that explain how parental emotional patterns influence students' emotional functioning in educational context.

The present study aims (a) to fit and develop a structural equation model that analyses the impact of parenting styles on emotional intelligence and (b) to compare the causal relationship of parenting styles on

emotional intelligence as a function of the gender of the participants.

Materials and methods

Design and participants

The study has a cross-sectional, exploratory and non-experimental design. Convenience sampling was used to collect the data. The sample consisted of 647 primary school students. The ages of the young people ranged from 10 to 12 years (11.86 ± 0.89). In terms of gender distribution, 56.4% ($n = 365$) were male and 43.6% female ($n = 282$). The sample size was determined using the following Eqs [35, 36]:

$$n = \frac{Z^2 p (1-p)}{e^2 + \left(\frac{Z^2 p (1-p)}{N} \right)}.$$
 In this case, n

symbolises the sample size, N the total population size, Z the critical value corresponding to the desired confidence level, p the expected proportion of the characteristic of interest, and e the permissible margin of error [37]. With a confidence level of 95%, a margin of error of 5% and an expected proportion of 0.5 [38], the calculation resulted in an approximate sample size of 650 participants, considering the total size of the student population. To ensure the representativeness of the sample, a sampling error analysis was applied. In this case, with a confidence level of 95%, an error of 3.80% was obtained, indicating an adequate level of precision for the study objectives [39].

Instruments

Ad hoc questionnaire

This instrument has been developed to collect socio-demographic variables. Specifically, the variables of gender and age were collected.

Emotional intelligence questionnaire in physical education

The instrument used to assess emotional intelligence during physical education classes was developed by Arruza-Gabilondo et al. [40]. The original version demonstrated adequate construct validity with acceptable internal consistence (RMSR = 0.08; GFI = 0.93; AGFI = 0.92; PNFI = 0.81). For the present study the version of Cecchini-Estrada et al. [41] was used, as it is specifically designed for the educational context in Spain. This adaptation assesses Emotional recognition (items 5,7,8,9,12,14,18,20), Emotional control and regulation (items 1,3,10,15,16,17,21) and Emotional empathy (items 2,4,6,11,13,19,22). This version [41] presented an excellent construct validity ($X^2 = 756.67$; CFI = 0.96; IFI = 0.96; RMSEA = 0.040) as well as strong internal consistency for each dimension (Emotional recognition $\alpha = 0.900$; Emotional control and regulation $\alpha = 0.880$ and Emotional empathy $\alpha = 0.880$). In the present study, the instrument also demonstrated high reliability with Cronbach's Alpha and McDonald's Omega values as follows:

Emotional recognition ($\alpha = 0.882$; $\omega = 0.903$) Emotional control and regulation ($\alpha = 0.907$; $\omega = 0.953$) and Emotional empathy ($\alpha = 0.883$; $\omega = 0.881$).

Affect scale

The instrument used to assess perceived parental educational styles was the version developed by Fuentes et al. [42], originally validated in Spain. This questionnaire evaluates the parental educational styles perceived by teenagers through two main dimensions: Affection-Communication (items 2,4,6,8,9,11,14,18,19,20) and Criticism-Rejection (items 3,5,7,10,12,15,17). Items 1,13 and 16 are negatively worded and related to the latter scale. It was conducted with Spanish teenagers [42], provided solid evidence of construct validity and internal consistency [42]. Confirmatory analyses supported a stable two-factor structure with satisfactory model fit indices ($X^2 = 145.32$; CFI = 0.94; IFI = 0.93; RMSEA = 0.045). The internal consistency coefficients were satisfactory, ranging from $\alpha = 0.82$ to $\alpha = 0.88$ for the Affection-Communication dimension and from $\alpha = 0.83$ to $\alpha = 0.89$ for the Criticism Rejection dimension [42]. In the present study Cronbach's Alpha and McDonald's Omega values were: Criticism-Rejection (father) ($\alpha = 0.897$; $\omega = 0.912$); Criticism-Rejection (mother) ($\alpha = 0.907$; $\omega = 0.929$); Affection-Communication (father) ($\alpha = 0.851$; $\omega = 0.893$) and Affection-Communication (mother) ($\alpha = 0.883$; $\omega = 0.888$).

Procedure

Firstly, the authors met to carry out a bibliographic search of instruments. This was conducted with the aim of identifying the different tools designed to collect data on the variables studied. Instruments with the best psychometric properties and highest internal consistency were selected.

Once the instruments had been selected, data relating to the total number of students enrolled in Andalusia was sought. This was done to find a representative sample of the population under study. It was established that the level of representativeness would be achieved with at least 600 participants. Once the number of participants to be reached had been established, an informative letter was sent to various educational centres in Granada explaining the aims and objectives of the research.

Eight educational centres in the province of Granada (Spain) were selected for convenience. Of these, five were private and three were semi-private. All schools were situated in urban or peri-urban areas with similar access to educational and recreational resources. The socioeconomic status of these families was determined based on information provided by schools' administration regarding average household income, parental occupation and educational attainment. Schools were classified

as medium-high socioeconomic level when most families met the following criteria: At least one parent held a university degree or equivalent vocational qualification, parental occupations corresponded to middle or high professional levels (teaching, healthcare, business administration) and the reported average household income exceeded the regional median income according to data from the National Institute of Statistics.

Once the relevant permissions had been obtained from the various educational centres, the headteachers sent an informative letter to the students' parents informing them of the purpose of the study. Subsequently, the research team informed the parents about the objectives of the study. These meetings were held in person at the schools themselves after school hours. During these meetings, the objectives of the study were explained, the research instruments were shown, and the procedure to be followed by the research team was explained. Parents were encouraged to ask questions to clarify any concerns about confidentiality, voluntary participation and the scientific use of the data. Following the meeting, parents were given a one-week reflection period to decide whether their children would participate in the study. Informed consent forms were distributed in electronic formats. Only students whose legal guardians provided signed informed consent were included in the study sample. Only 39 parents did not authorise their children to participate in the study.

Data collection took place during physical education classes. On the day of the collection, the physical education teacher and member of the research team were presented. The research team consisted of doctoral-level professionals specialized in physical education, physical activity and sport sciences. Participants completed the questionnaires in their usual physical education setting using paper and pencil forms. The research team explained how to fill out the instruments and remained available throughout to answer any questions and ensure full understanding.

The final sample included all students with signed parental consent who were present during data collection period. It took place between January and April 2025. The data were handled confidentially and stored anonymously, accessible only to the research team for scientific purposes. The study was approved by the Ethics Committee of the UCAM (reference: CE032409) and was conducted in accordance with the ethical principles established in the Declaration of Helsinki.

Data analysis

Data were analysed using IBM SPSS Statistics 25.0 (IBM Corp., Armonk, NY, USA) and IBM SPSS Amos 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics including means and standard deviation were calculated

for all study variables. Additionally, bivariate Pearson correlation analyses were conducted to examine the relationships between the study variables.

The assumption of normality was examined through skewness and kurtosis values, which were required to fall within the conventional thresholds of -1.5 to 1.5 for skewness and -3 to 3 for kurtosis [43, 44]. The internal consistency of the instruments was assessed using Cronbach's alpha (α) and McDonald's Omega (ω) coefficients, establishing reliability at a 95% confidence level.

To test the theoretical model and study hypotheses, a structural equation modelling (SEM) approach was applied using the maximum likelihood estimation method. Model fit was evaluated based on multiple indices, including Incremental Fit Index (IFI), Comparative Fit Index (CFI), Normalized Fit Index (NFI), Tucker Lewis Index (TLI) and Root Mean Square Error of Approximation (RMSEA). Acceptable model fit was defined by values of IFI, CFI, NFI and TLI ≥ 0.90 and RMSEA ≤ 0.08 [45, 46].

Figure 1 presents the theoretical model where the direction of the causal relationships of the variables can be observed. The model is made up of three endogenous variables (emotional recognition, emotional control and emotional empathy). The rest of the variables act as exogenous variables. They exert a unidirectional causal relationship on the endogenous variables.

For the endogenous variables, a causal explanation has been carried out. This was done based on the associations observed between the indicators and the degree of reliability of the measurement. All these variables are continuous and have been calculated through the mean value of the items of each dimension of the instrument. Arrows symbolise the direction of the causal relationship and are interpreted from the standardised regression weights. A significance level of 0.05 was established using Pearson's Chi-square test.

Results

Table 1 presents the goodness-of-fit indices for the general structural equation model and for the multigroup analysis according to participants' gender. The overall model showed adequate fit to the data, with values within the recommended thresholds (IFI=0.900; CFI=0.888; NFI=0.925; TLI=0.901; RMSEA=0.073). These indices indicate that the theoretical model provides an acceptable representation of the observed relationships among variables. Regarding the male and female group, the indices were IFI=0.905; CFI=0.900; NFI=0.902; TLI=0.900; RMSEA=0.069 and IFI=0.911; CFI=0.923; NFI=0.907; TLI=0.909; RMSEA=0.072 respectively.

Table 2 presents the values of skewness and kurtosis for each of the variables. In this case, a normal distribution is observed for all variables as the skewness values are

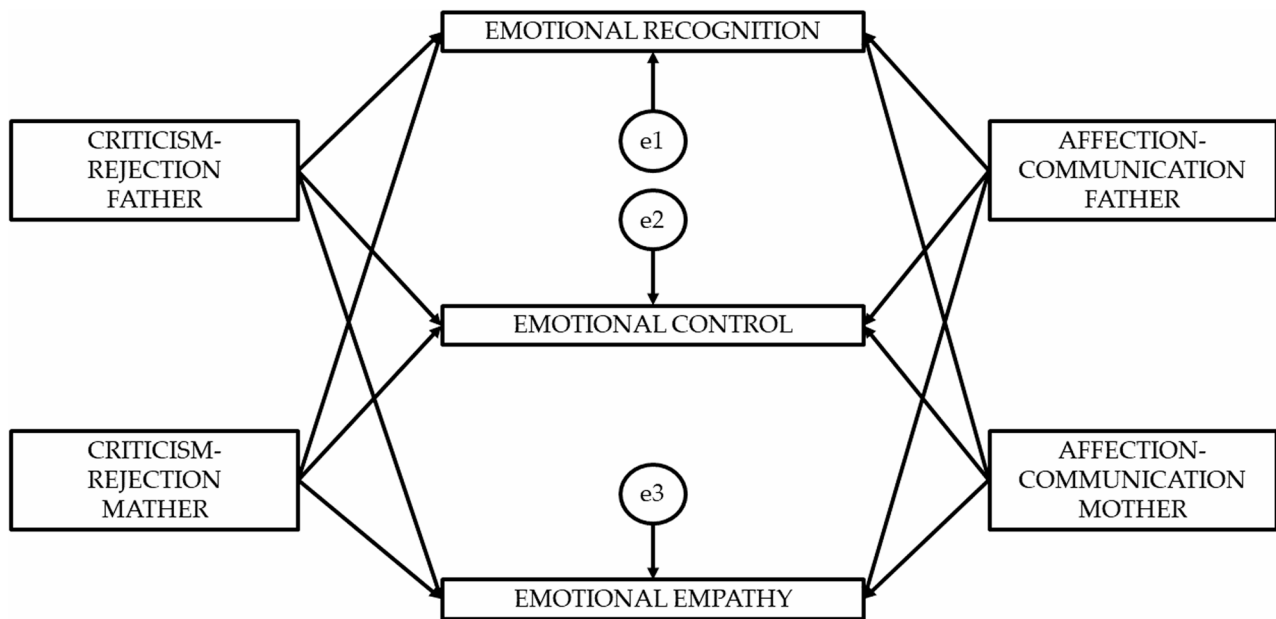


Fig. 1 Representation of the proposed theoretical model

Table 1 Adjustment indices for the proposed equation models

	General Model	Male model	Female model
Incremental Fit Index	0.900	0.905	0.911
Comparative Fit Index	0.888	0.900	0.923
Normalized Fit Index	0.925	0.902	0.907
Tucker Lewis Index	0.901	0.900	0.909
Root Mean Square Error of Approximation	0.073	0.069	0.072

Table 2 Skewness, kurtosis and descriptive analysis of the variables

	M ± SD	Skewness	Kurtosis
Emotional Recognition	0.75 ± 0.20	− 0.80	− 0.09
Emotional Control	0.66 ± 0.23	− 0.59	− 0.26
Emotional Empathy	0.67 ± 0.23	− 0.62	0.15
Affection-Communication Father	2.21 ± 0.70	− 0.32	0.053
Criticism-Rejection Father	0.66 ± 0.43	0.46	0.19
Affection-Communication Mother	2.26 ± 0.70	− 0.21	− 0.27
Criticism-Rejection Mother	0.65 ± 0.42	0.47	0.28

between − 1.5 and 1.5. In addition, the kurtosis values are between − 3 and 3 [19, 20].

Table 3 presents the bivariate correlations among the study variables. As expected, the three dimensions of emotional intelligence showed positive and statistically significant correlations with each other: Emotional recognition and Emotional Control ($r=0.440$; $p<0.05$), Emotional Recognition and Emotional Empathy ($r=0.429$; $p<0.05$) and Emotional Control and Emotional Empathy ($r=0.414$; $p<0.05$). Regarding parental educational styles, Affection-Communication Father correlated positively with Affection-Communication Mother ($r=0.458$; $p<0.05$) and moderately with both Criticism-Rejection Father ($r=0.789$; $p<0.05$) and Criticism-Rejection Mother ($r=0.418$; $p<0.05$). Likewise, Criticism-Rejection Father was strongly associated with Criticism-Rejection Mother ($r=0.842$; $p<0.05$). The affective parental dimensions also presented low but significant positive correlation with children's emotional intelligence. Affection-Communication Mother correlated with Emotional Recognition ($r=0.083$; $p<0.05$),

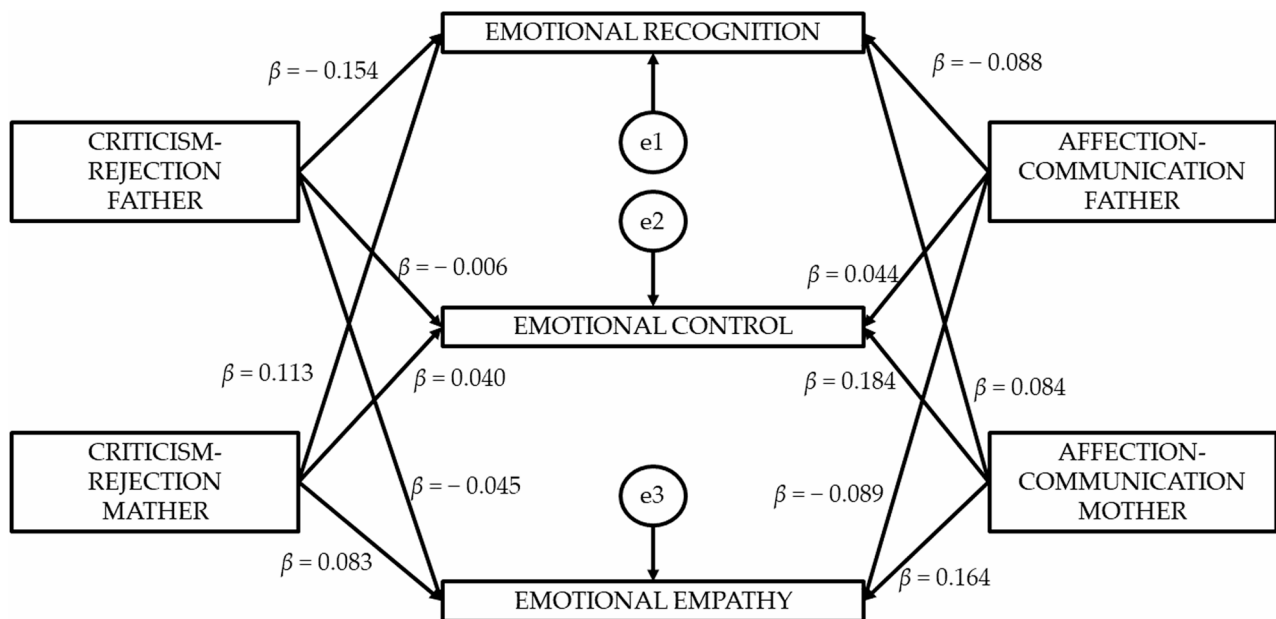
Table 3 Correlational analysis of the variables

	1	2	3	4	5	6	7
1. Emotional Recognition	1						
2. Emotional Control	0.440*	1					
3. Emotional Empathy	0.429*	0.414*	1				
4. Affection-Communication Father	− 0.13*	0.064	0.048	1			
5. Criticism-Rejection Father	0.044	0.083	0.085*	0.789*	1		
6. Affection-Communication Mother	0.083*	0.082	0.062	0.458*	0.401*	1	
7. Criticism-Rejection Mother	0.101*	0.127*	0.108*	0.418*	0.440*	0.842*	1

* $p<0.05$

Table 4 Analysis of causal relationships for the whole sample

	Regression Weights				Standardised Regression Weights β
	Estimation	Estimation Error	Critical Ratio	p	
Emotional Recognition $\leftarrow$ Criticism-Rejection Father	-0.073	0.020	-3.720	0.049	-0.154
Emotional Control $\leftarrow$ Criticism-Rejection Father	-0.003	0.023	-0.134	0.894	-0.006
Emotional Empathy $\leftarrow$ Criticism-Rejection Father	-0.024	0.022	-1.092	0.275	-0.045
Emotional Recognition $\leftarrow$ Criticism-Rejection Mother	0.055	0.020	2.744	0.006	0.113
Emotional Control $\leftarrow$ Criticism-Rejection Mother	0.023	0.023	0.972	0.331	0.040
Emotional Empathy $\leftarrow$ Criticism-Rejection Mother	0.046	0.023	1.999	0.076	0.083
Emotional Recognition $\leftarrow$ Affection-Communication Father	0.011	0.012	0.887	0.375	0.037
Emotional Control $\leftarrow$ Affection-Communication Father	-0.030	0.014	-2.127	0.033	-0.088
Emotional Empathy $\leftarrow$ Affection-Communication Father	-0.029	0.014	-2.158	0.031	-0.089
Emotional Recognition $\leftarrow$ Affection-Communication Mother	0.025	0.012	2.025	0.043	0.084
Emotional Control $\leftarrow$ Affection-Communication Mother	0.063	0.014	4.458	0.001	0.184
Emotional Empathy $\leftarrow$ Affection-Communication Mother	0.055	0.014	3.975	0.001	0.164

**Fig. 2** Theoretical representation of the model with standardized regression weights for the sample

Emotional Empathy ($r=0.082$; $p<0.05$) and Emotional Control ($r=0.062$; $p<0.05$). Criticism-Rejection Mother presented small but significant association with Emotional Recognition ($r=0.101$; $p<0.05$), Emotional Control ($r=0.127$; $p<0.05$) and Emotional Empathy ($r=0.108$; $p<0.05$).

Table 4 and Fig. 2 present the results obtained for the whole sample. A statistically significant negative causal effect relationship is observed for Parent Criticism-Rejection on emotional recognition ($\beta=-0.154$; $p<0.05$). A negative causal relationship of the father's affection-communication style on emotional control ($\beta=-0.088$; $p<0.05$) emotional empathy is also observed ($\beta=-0.089$; $p<0.05$). positive and significant causal relationship

of maternal affection-communication style on emotional recognition ($\beta=0.084$; $p<0.05$), emotional control ($\beta=0.184$; $p<0.05$) and emotional empathy is obtained ($\beta=0.164$; $p<0.05$).

Table 5 and Figs. 3 and 4 present the multigroup analysis of the variables according to the gender of the students. In this case, statistical differences are observed for the causal relationship of the mother's critical-rejection parenting pattern on Emotional Recognition ($p<0.05$). For both groups the effect is positive, however a higher causal relationship is observed for the female students ($\beta=0.186$). Statistical differences are also observed for the father's communication affect style on Emotional Control ($p<0.05$). A negative causal relationship is

Table 5 Multi-group analysis of causal relationships according to gender

		Regression Weights				Standardised Regression Weights
		Estimation	Estima- tion Error	Critical Ratio	p	β
Emotional Recognition ← Criticism-Rejection Father	Male	−0.028	0.31	−0.893	0.069	−0.053
Emotional Recognition ← Criticism-Rejection Father	Female	−0.106	0.024	−4.345		−0.244
Emotional Control ← Criticism-Rejection Father	Male	0.057	0.036	1.605	0.242	0.090
Emotional Control ← Criticism-Rejection Father	Female	−0.034	0.029	−1.169		−0.069
Emotional Empathy ← Criticism-Rejection Father	Male	0.005	0.035	0.146	0.167	0.008
Emotional Empathy ← Criticism-Rejection Father	Female	−0.039	0.027	−1.380		−0.081
Emotional Recognition ← Criticism-Rejection Mother	Male	0.008	0.032	0.267	0.039	0.016
Emotional Recognition ↓ Criticism-Rejection Mother	Female	0.084	0.025	3.323		0.186
Emotional Control ← Criticism-Rejection Mother	Male	0.08	0.036	0.233	0.874	0.013
Emotional Control ← Criticism-Rejection Mother	Female	0.013	0.030	0.425		0.025
Emotional Empathy ← Criticism-Rejection Mother	Male	0.050	0.035	1.427	0.245	0.083
Emotional Empathy ← Criticism-Rejection Mother	Female	0.034	0.029	1.172		0.068
Emotional Recognition ← Affection-Communication Father	Male	−0.001	0.017	−0.077	0.132	−0.005
Emotional Recognition ← Affection-Communication Father	Female	0.026	0.017	1.504		0.084
Emotional Control ← Affection-Communication Father	Male	−0.072	0.020	−3.688	0.012	−0.207
Emotional Control ← Affection-Communication Father	Female	0.015	0.020	0.745		0.044
Emotional Empathy ← Affection-Communication Father	Male	−0.035	0.019	−1.828	0.141	−0.106
Emotional Empathy ← Affection-Communication Father	Female	−0.028	0.020	−1.436		−0.084
Emotional Recognition ← Affection-Communication Mother	Male	0.018	0.018	1.021	0.089	0.061
Emotional Recognition ← Affection-Communication Mother	Female	0.035	0.016	2.127		0.119
Emotional Control ← Affection-Communication Mother	Male	0.097	0.020	4.749	0.043	0.266
Emotional Control ← Affection-Communication Mother	Female	0.036	0.019	1.886		0.111
Emotional Empathy ← Affection-Communication Mother	Male	0.066	0.020	3.317	0.074	0.193
Emotional Empathy ← Affection-Communication Mother	Female	0.049	0.019	2.580		0.151

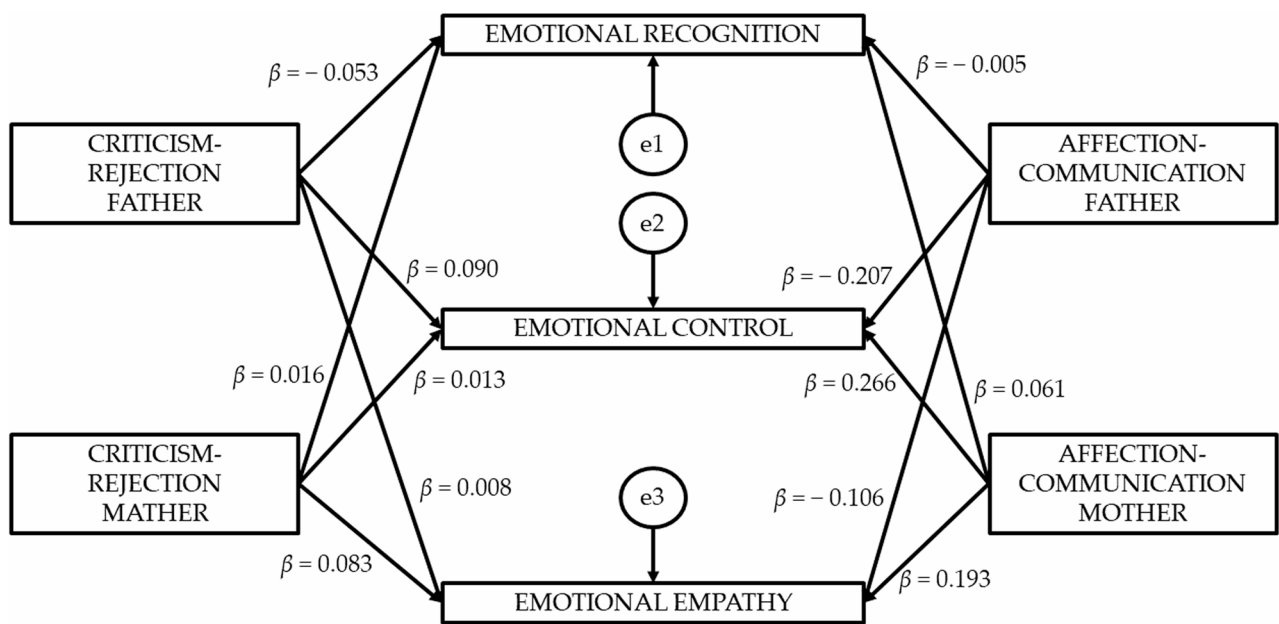


Fig. 3 Theoretical representation of the model with standardized regression weights for male students

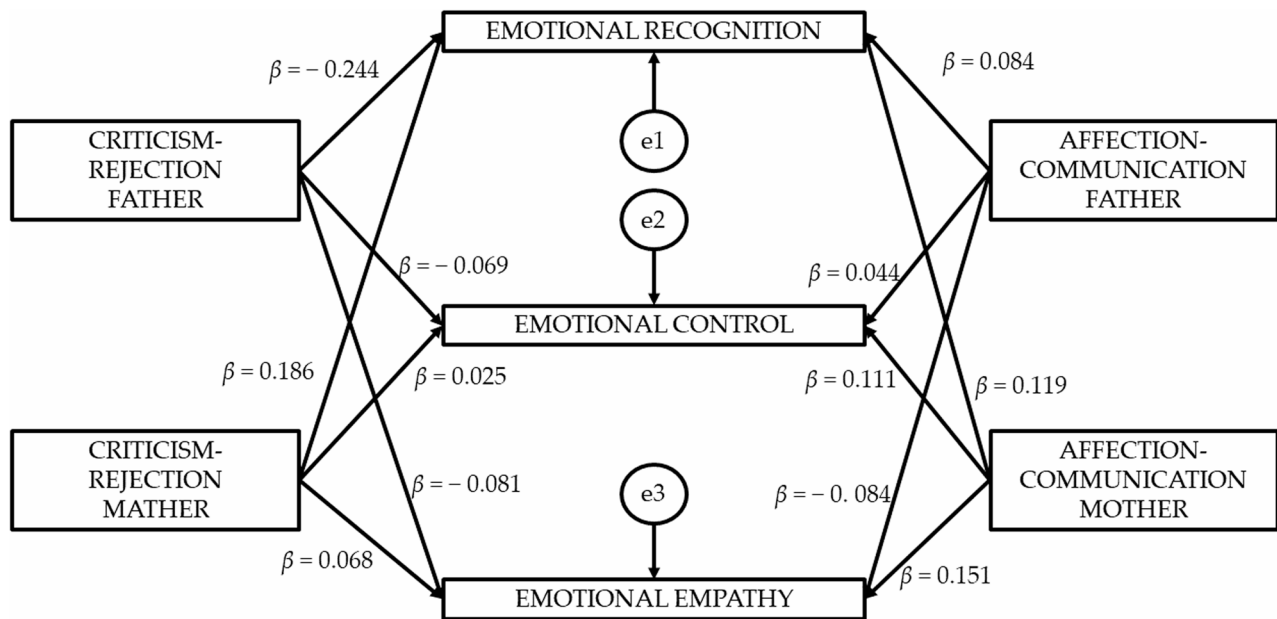


Fig. 4 Theoretical representation of the model with standardized regression weights for female students

obtained for male youth ($\beta = -0.207$) and a positive causal relationship for female youth ($\beta = 0.044$). Finally, statistically significant differences are observed in the mother's affect-communication on control and Emotional Empathy ($p < 0.05$). For both variables there is a greater effect for males ($\beta = 0.266$; $\beta = 0.193$) than for females ($\beta = 0.118$; $\beta = 0.151$).

Discussion

This study examined the causal relationships between parental educational styles on emotional intelligence in elementary school students within physical education, with a focus on gender differences. The results highlight distinct roles of maternal and paternal behaviors in shaping children's emotional recognition, control and empathy. In this discussion these findings are going to be interpreted in the context of existing research and theoretical frameworks.

The correlational analysis revealed several significant relationships among the study variables. The three dimensions of emotional intelligence were positive and significantly correlated with each other. This finding confirms the theoretical coherence of the construct proposed by Mayer and Salovey [4], who described emotional intelligence as a set of interrelated abilities for perceiving, regulating and understanding emotions. Similar associations among these dimensions have been consistently reported in educational context [6, 27].

Regarding parental educational styles, Affection-Communication Mother showed small but significant positive correlations with the three emotional intelligence dimensions. This suggest that maternal warmth, emotional

openness, and dialogue contribute to the development of emotional awareness and empathy in children [47]. These results are consistent with previous studies showing that maternal affection and supportive communication foster children's emotional understanding, regulation and pro-social behaviour [21]. Conversely Criticism-Rejection Mother was also significantly associated with emotional variables, though weakly and positively. This may indicate that children exposed to higher maternal criticism become more emotionally vigilant as a defensive or adaptive response [48]. Similar findings have been reported by Meng et al. [27] and Pinquart [13], who observed that emotionally negative or controlling parenting may heighten children's sensitivity to emotional cues as part of a coping mechanism. However, such vigilance often comes at the cost of emotional well-being, potentially increasing anxiety and self-consciousness [48].

Strong correlations between Criticism-Rejection Father and Criticism-Rejection Mother as well as between Affection-Communication Mother and Affection-Communication Father, suggest that emotional and communicative styles tend to be shared within the family system [49]. This pattern aligns with research indicating that parents' emotional socialization practices are often interdependent and mutually reinforcing [2]. Such parental consistency reflects a stable emotional climate that can either reinforce positive emotional modelling or perpetuate maladaptive emotional patterns [13, 49]. Families with coherent emotional styles tend to provide clearer emotional messages, while inconsistent or conflictual parenting may confuse children's emotional learning and reduce emotional security [22].

Regarding the analysis of causal relationships, Criticism-Rejection Father is negatively predicted by Emotional Recognition. It indicates that paternal criticism or rejection is linked to weaker emotional recognition. This finding supports previous studies showing that paternal criticism diminishes children's capacity to process emotional cues effectively [50]. Children who exposed to high parental criticism exhibited reduced late positive potential amplitudes to emotional faces, indicating less sustained emotional attention [19]. In contrast, Criticism-Rejection Mother positively predicted Emotional Recognition. It suggests that maternal criticism may paradoxically enhance emotional sensitivity [51]. This may be due to greater emotional vigilance, as adolescents exposed to inconsistent maternal comments tend to show greater emotional decoding ability [51, 52].

With respect to affective communication, Affection-Communication Father negatively predicted both Emotional Control and Emotional Empathy. This implies that paternal affection may hinder emotional regulation and empathic understanding, perhaps due to intrusive or overprotective forms of affection [53]. In contrast, maternal Affection-Communication positively predicted emotional recognition, emotional control and emotional empathy. These results are consistent with previous findings showing that maternal warmth promotes adaptive emotion regulation, empathy and social competence [54, 55]. Overall, this pattern highlights the differentiated influence of maternal and paternal behaviors: maternal warmth and communication appear to foster emotional growth, while paternal criticism and excessive expressiveness may pose a risk to emotional functioning [55, 56].

According to multigroup structural equations analysis, for female population criticism-rejection father had a significant negative association with emotional recognition. This suggests that daughters may be more emotionally attuned and therefore more affected by paternal disapproval or emotional distance. Prior studies similarly found that girls tend to internalize paternal rejection more deeply, leading to lower emotional clarity and higher emotional suppression [57]. Conversely, criticism-rejection mother was positively related to emotional recognition among female students. This aligns with findings by Gan et al. [55], who noted that moderate maternal criticism can stimulate self-reflective emotional awareness in daughters who are socially attuned to relational feedback.

According to the analysis of multigroup structural equations, the results indicate that the association between maternal criticism-rejection and emotional recognition differs by gender. For girls this finding can be interpreted as a heightened sensitivity maternal feedback. Previous studies have shown that daughters often

display greater emotional attunement to maternal affective cues, using them to guide emotional understanding and social adjustment [26, 48, 58]. A moderate level of maternal criticism might promote emotional vigilance and a more refined perception of emotions in daughters, as they may become more observant to anticipate maternal reactions [26, 58]. Among boys the relationship between maternal criticism-rejection and emotional recognition is much weaker. These results indicate that boys' emotional recognition is less influenced by maternal criticism. Prior research has reported that sons often rely more on paternal models for emotional regulation and expression, while maternal criticism has a less direct influence on their emotional awareness [26].

The results reveal a significant association between paternal affection-communication and emotional control in male students, while the association for female population is positive. This suggests that for boys, higher levels of communication from the father are related to better emotional control. In contrast for girls the paternal affection communication might play a less critical role in their emotional control. The gender differences observed aligns with prior emphasizing the unique influence of fathers on son's emotional development. Father's affection and communication are crucial in fostering emotional regulation skills in boys, possibly because boys often model their emotional responses on their fathers' behaviors [59, 60]. For daughters, emotional control might be more influenced by maternal behaviors or other socialization factor, which explains the link with paternal affection [59, 60].

Regarding the relationship between affection-communication from the mother and emotional control, the results present a higher and positive relationship for boys. These findings indicate that gender-specific sensitivity to maternal affective communication in regulating emotions. The stronger effect in boys may reflect differential socialization patterns, where boys rely more on maternal cues for developing adaptive emotional control, while girls may utilize a broader social network, including peers or siblings to regulate emotions [54, 57]. Previous research also indicate that maternal warmth and affective engagement are critical for the development of emotional regulation in children, particularly in facilitating the capacity to manage negative affect and stress [48]. Although the relation is positive for both genders, the difference in magnitude suggest that interventions aimed at enhancing emotional control via parental affection may need to account for gender differences in responsiveness. Specifically, boys may benefit more from strategies that promote maternal affective communication, while for girls, additional factors such as peer interaction or paternal engagement may also play significant roles [58].

Although this study provides relevant information, some limitations must be considered. The fact that the design is cross-sectional makes it impossible to establish clear causal relationships between the variables analysed. This type of approach may exaggerate or minimise certain relationships depending on the context in which they are studied. In addition, the use of self-reported questionnaires by children during emotional development may have introduced biases, such as a tendency to respond socially [32]. On the other hand, the sample limits the generalizability of the results to more diverse settings. Finally, the study did not consider other variables that could influence emotional development, such as the type of attachment, the emotional intelligence of mothers and fathers, or the classroom environment, aspects that have been shown to be important in recent research [26, 28].

Regarding the study's limitation, the first one concerns the sampling method. The use of non-probability and convenience sampling means that the findings can not be generalized to the entire population. The cross-sectional design limits the ability to establish the causal relationships. Longitudinal studies are recommended to assess this effect over time. It is also important to note that all the variables were assessed using self-reported questionnaires. However, the instruments used have demonstrated adequate validity and reliability in elementary education students, which partially mitigates this limitation. For future studies, it would be advisable to complement these instruments with technical devices to obtain more objective and precise measurements. Finally, some relevant variables could not be controlled in this study.

Conclusions

This study offers provides empirical evidence that parental educational styles play a decisive role in the emotional development of children within the context of physical education. Affectionate and communicative parenting patterns are positively associated with higher levels of emotional recognition, control and empathy, whereas critical and rejecting styles hinder these emotional skills.

The findings highlight the predominant influence of the maternal figure on children's emotional intelligence and reveal that gender moderates these relationships. Specifically maternal affection has a stronger positive relationship on boys' emotional control and empathy, while girls appear more sensitive to maternal criticism and rejection.

These conclusions highlight that affectionate and communicative parenting fosters child's emotional recognition, control and empathy. Focusing on practical conclusions, physical education teachers can extend these effects by creating supportive, emotionally positive classroom environments. They should model empathy, encourage emotional reflection during activities and

adapt their communication to gender differences. Collaboration with families is also key to ensuring consistent emotional education across home and school. Overall, physical education teachers can use learning strategies to enhance students' social skills, motivation and well-being in physical education contexts.

Institutional review board statement

The study has been approved by a UCAM ethics committee (CE032409). The date of approval was 24 March 2024. In addition, the study followed the ethical principles established in the Declaration of Helsinki.

Informed consent statement

Informed consent was obtained from the legal guardians of the participants.

Authors' contributions

Conceptualization, E.M.-I. and P.V.C.; methodology, F.J.A.M.-and M.A.O.F.; software, E.M.I and M.A.O.F.; validation, M.A.O.F., E.M.-I. and P.V.C.; formal analysis, E.M.-I. and F.J.A.M.; investigation, M.A.O.F., E.M.-I. and F.J.A.M.; resources, F.J.A.M.; data curation, E.M.I. and F.J.A.M.; writing—original draft preparation, F.J.A.M and E.M.-I.; writing—review and editing, E.M.-I. and F.J.A.M.; visualization, P.V.C; supervision, F.J.A.M. and M.A.O.F.; project administration, P.V.C and F.J.A.M.; funding acquisition, F.J.A.M. All authors have read and agreed to the published version of the manuscript.

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Data availability

The data used to support the findings of the current study are available from the corresponding author upon request.

Declarations

Consent for publication

Not applicable.

Competing interests

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