



Emotional competencies and physical activity in primary school children: A comparative study across levels of learning support

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ABSTRACT

Children's emotional development is a determining factor for their school success and overall well-being. Additionally, physical activity is recognized as a relevant contribution in promoting emotional self-regulation, self-esteem, and social inclusion. This aspect is especially important in the inclusive educational context, where it seeks to respond to the needs of students with learning difficulties through diversified support measures. The study aimed to analyse the relationship between differentiation and emotional identification indices and levels of physical activity in primary school children (ages 6–10). Three distinct groups were considered: students without Learning and Inclusion Support Measures (No-LISM), with Selective Learning and Inclusion Support Measures (S-LISM), and with Universal Learning and Inclusion Support Measures (U-LISM). The sample size consisted of 69 children (mean age = 814 ± 1.13 years). Data were collected on sports practice and physical activity using accelerometry, as well as emotional indices were collected through the Inventory of Identification of Emotions and Feelings. The results revealed statistically significant differences in emotional indices between the groups, with No-LISM students presenting higher levels of differentiation and emotional identification. In contrast, students with U-LISM demonstrated higher levels of moderate to vigorous physical activity. It is concluded that, although physical activity is important in the inclusive educational context, its associations on emotional development are not always consistent. These results suggest the need for more structured psychoeducational strategies to enhance the potential impact of physical activity on emotional development, particularly in students with greater support needs.

The development of emotional skills is crucial for the well-being and school success of primary school children, and physical activity (PA) is an important facilitator in this process. Regular PA is associated with emotional and social benefits, including emotional regulation, enhanced self-esteem, and increased socialization.

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According to Self-Determination Theory (SDT), physical activity at school can satisfy basic psychological needs for autonomy, competence, and relatedness, generating intrinsic motivation and well-being (Ryan & Deci, 2024). Recent studies show that motivational profiles based on SDT are associated with a greater desire to exercise and better adaptation to school in children and adolescents (Llanos-Muñoz et al., 2023; Llanos-Muñoz et al., 2023; Manzano-Sánchez, 2023). Therefore, by offering opportunities for physical exercise, schools contribute to strengthening students' autonomy, competence and relatedness. PA should therefore be seen as a practice that contributes to socio-emotional development in inclusive environments. In addition to these benefits, it plays a key role in promoting social adaptation and alleviating anxiety and stress, particularly among children who benefit from Learning and Inclusion Support Measures.

Research indicates that structured PA promotes emotional control, resilience, and self-efficacy (Kliziene et al., 2021; Wang, 2022). Participation in well-designed physical education programs can reduce symptoms of anxiety and aggression while enhancing social and emotional behaviour (Wang, 2022). Furthermore, Vasilopoulos and Ellefson (2021) highlight that the social interaction inherent in physical practice favours emotional regulation from the age of seven, positively influencing academic and social success. Longitudinal studies show that children who are more physically active tend to have less sedentary lifestyles and better emotional indicators, with differences between genders (Griffiths et al., 2016). The results of a meta-analysis focused on Randomized Controlled Trials (Fu et al., 2025) also demonstrate the causal impact of physical activity on the development of social-emotional competencies in children.

PA also facilitates the development of core social values, including cooperation and discipline (Biswas et al., 2016). Moreover, it contributes to the development of emotional intelligence (Gil-Moreno & Rico-Gonzalez, 2023), fostering skills such as self-awareness, empathy, and emotional regulation. These authors argue that psychomotor methodologies are more effective than traditional approaches in promoting emotional competence. The integration of pedagogical strategies oriented towards socio-emotional development in physical education classes can provide more inclusive and positive school environments (Teles, 2024). To maximize the effects of PA, Hazra and Biswas (2016) recommends a multidimensional approach, involving school, family, and community.

In Portugal, legislation has advanced towards a more inclusive education, highlighting Decree-Law No. 54/2018, which provides for pedagogical practices adapted to the needs of students. In this scenario, PA emerges as a strategic tool for school integration and socio-emotional development, especially in students with learning difficulties.

In addition, the Social and Emotional Learning (SEL) framework considers five core competencies: i) self-awareness; ii) self-management; iii) social awareness; iv) relationship skills; v) and responsible decision-making. These competencies can be developed in physical education classes and through structured PA programmes (Gueldner et al., 2020). Recent studies confirm that PA at school increase SEL competencies and lead to greater resilience and well-being (Kalata et al., 2025; Moon et al., 2024). Inclusive schools align PA practices with SEL goals. This combination is in line with policies that seek fairer and better environments for everyone's development (Belaire et al., 2024).

PA is particularly relevant for children with special educational needs (SEN), promoting social inclusion, self-esteem, and emotional regulation (Murphy et al., 2008). Studies indicate that these children face barriers to participation in PA, which can negatively affect their emotional development (Bechara & Grosb, 2016; Rio et al., 2015). However, adapted programs have proven to be effective in overcoming these difficulties (Pilatowicz et al., 2018). Baglama and Demirok (2018) argue that inclusive approaches in physical education can significantly enhance the emotional development of these children. Physical exercise contributes to emotional self-awareness, self-confidence, and resilience (Bechara & Grosb, 2016; Kirimoglu et al., 2016). Regular PA, particularly aerobic sickness, promotes the release of endorphins and promotes emotional well-being (Kutlay et al., 2018). Yang et al. (2022) show that sports practice in schools can reduce problematic behaviours and improve emotional self-regulation in children with SEN. To maximize these benefits, it is essential that programs are tailored to children's motor and emotional needs, with the involvement of educators, families, and health professionals (Demirci & Eraslan, 2020; Yildirim, 2022).

The school inclusion of children with SEN requires an understanding of their socio-affective development. In Portugal, the legislative evolution since the 1980s has promoted the integration of these students into the regular education system, culminating in Decree-Law No. 54/2018, which instituted a more flexible and inclusive model. This diploma eliminated the rigid categorization of needs, proposing universal, selective, and additional support measures in order to ensure an adapted educational response. These measures are defined by teachers, after consultation with parents and/or other professionals working with the students. According to the legislation, universal measures (U-LISM) correspond to the educational responses available to all students, with the aim of promoting participation and improving learning through pedagogical differentiation, curricular adaptations, curricular enrichment, and the promotion of pro-social behaviours. For students whose needs are not met by universal measures, selective measures (S-LISM) are established. These may include differentiated curriculum pathways, curricular adaptations, psycho-pedagogical support, and tutorial support. Finally, additional measures are directed towards students with profound difficulties in communication, interaction, and learning, requiring specialized support resources.

Against this background of differentiated educational support, PA can be understood as an additional pedagogical strategy that fosters inclusion and socio-emotional development. Thus, PA is reinforced as a strategy for integration and emotional development by providing social interactions and opportunities for emotional expression.

In this sense, this study aims to: (1) evaluate the relationship between the differentiation and emotional identification indices in three groups of students (without measures, with selective measures and with universal support measures); (2) to compare PA indicators between these groups; and (3) to analyse the relationship between emotions and PA in each group.

1. Method

1.1. Participants

The sample consisted of 69 children (34 males and 35 females), selected from different classes of a Portuguese primary school, aged between 7 and 12 years (8.14 ± 1.13 years). The participants were divided into three distinct groups: (i) students without measures to support learning and inclusion (No-LISM) ($n = 35$); (ii) students with selective measures to support learning and inclusion (S-LISM) ($n = 21$); and (iii) students with universal measures to support learning and inclusion (U-LISM) ($n = 13$).

1.2. Measures and instruments

1.2.1. Sports practice

The questionnaire on sports practice was developed to assess the level of PA of students and habits related to sports practice. This instrument was validated using the Delphi method (Marques & Freitas, 2018), wherein a panel of experts in physical education, health, and sport analysed the questions and refined them to ensure their clarity and adequacy with the study's objectives.

The final version of the questionnaire comprised both closed- and open-ended questions addressing the following topics: 1) Students' level of PA; 2) Frequency and intensity of physical activities performed both at school and outside of it; 3) Participation in extracurricular sports activities; and 4) PA practices during weekends.

1.2.2. Physical activity

To ensure a rigorous and objective assessment of students' PA, accelerometers (ACTIGRAPH model WGT3X-BT) were used with a 15-second recording interval. The devices were distributed to the students during a typical school week (five days) and worn throughout the school day (8:00 am - 6:00 pm). Accelerometers were positioned on the left iliac crest and recorded the intensity of the PA (light, moderate, and vigorous) during school hours. To classify the intensity of physical activity, the cut-off points proposed by (Trost et al., 2011) were applied, specifically validated for children in the age groups under study. This procedure provided a direct assessment of the students' PA, thereby complementing the information collected indirectly through the questionnaire.

1.2.3. Emotions and feelings

In this study, we assessed differentiation and emotional identification indices. These indices are fundamental components of emotional intelligence models, which focus on how people perceive, understand, and control emotions. This perception, understanding and management of emotions form the basis for social adaptation and academic success (Mayer et al., 2008; Salovey & Sluyter, 1997). In practice, recent interventions in the school context that use new methodologies, such as role-playing or emotional education programmes, contribute significantly to the development of children's emotional intelligence (Armesto Arias et al., 2025). The integration of emotional intelligence into PA programmes reinforces the link between emotional skills and academic performance.

The Inventory for the Identification of Emotions and Feelings developed by Moreira et al. (2012a) was chosen for the present study due to its validity and suitability for the target population, namely school-age children (6–11 years). The instrument offers a simple and accessible approach to assessing children's emotions and feelings. It comprises a series of described situations in which children are asked to identify the emotions that the characters might be experiencing based on their observable actions or words. Each child is required to list the emotions they consider appropriate for each situation, and if they do not perceive any evident emotions, they should respond with "None".

The responses are evaluated using three scales: i) Neutral Valence, in which the child receives 0 points if they identify emotions and 1 point if they do not; ii) Positive and Negative Valence, where 0 to 4 points are assigned depending on the number of emotions identified by the child and their congruence with the presented situation.

The indices of emotional identification and emotional differentiation were calculated based on the sums of the assigned scores, enabling an assessment of the child's ability to identify and differentiate emotions across various contexts. Cronbach's alpha ranged from 0.867 (Negative Emotional Differentiation Index) to 0.741 (Positive Emotional Differentiation Index).

1.3. Data collection

To conduct the present research, a project was developed and subsequently approved by the Regional Directorate of Education of the Autonomous Region of Madeira, as well as by the administration of the school where data collection took place.

The study was presented to the legal guardians of the participating students, and informed consent was obtained. All assessments were carried out by trained personnel, including the evaluation of body composition indicators, the administration and processing of accelerometry data, and the application of the Inventory for the Identification of Emotions and Feelings. The questionnaires were administered at the beginning of the data collection phase (last week of January 2025) in printed format, and responses were provided individually.

1.4. Statistical analysis

Data were analysed using SPSS software, version 29.0, with the level of significance set at 5 %. The initial analysis involved descriptive statistics, including mean, standard deviations, and absolute and relative frequencies, to characterize the sample across the

variables under study. The chi-square test and the Kruskal-Wallis test were employed to assess the differences among the three student groups: i) No-LISM; ii) with S-LISM; and iii) with U-LISM. The chi-square test was applied to qualitative variables (nominal and ordinal), while the Kruskal-Wallis test was used for quantitative variables. When the Kruskal-Wallis test revealed statistically significant differences between groups, post-hoc analyses were performed using Dunn's test with Bonferroni correction for multiple comparisons to determine which groups the differences occurred. Spearman's correlation coefficients were calculated to examine the association between PA variables and emotional indices.

2. Results

2.1. Sociodemographic, body composition, and emotion

The sample had a balanced sex distribution, comprising 49.3 % boys and 50.7 % girls. Most students (52.2 %) benefited from school social support. The mean height of the participants was 134.03 ± 9.19 cm, and the mean weight was 31.96 ± 8.34 kg. The average age was 8.14 ± 1.13 years.

Analysis of the data across the three student groups (No-LISM, S-LISM, and U-LISM) revealed no statistically significant differences ($p > 0.05$) in sex distribution, mean age, or school social support status. However, statistically significant differences were observed among the groups in all four dimensions of Identification of Emotions and Feelings ($p < 0.05$).

On average, students in the No-LISM group exhibited higher values across all emotion indices, while students with U-LISM showed the lowest values ($p < 0.05$) (Table 1). For the positive and negative emotional differentiation indices, No-LISM students had significantly higher values compared to both the S-LISM group ($p = 0.004$) and the U-LISM group ($p = 0.023$).

In the total emotional differentiation index, significant differences were observed among the three groups ($p = 0.026$), with No-LISM students presenting the highest mean values, followed by students with S-LISM, and students with U-LISM showing the lowest mean values. Regarding the emotional identification index, statistically significant differences were found only between the No-LISM group and the U-LISM ($p = 0.008$), with the latter presenting lower average values (Table 1).

2.2. Physical activity

Considering moderate to vigorous PA, significant differences were observed among the three groups ($Z = 7.226$; $p = 0.027$). On average, students with U-LISM (102.92 ± 18.46) exhibited higher levels of moderate to vigorous physical activity compared to the No-LISM group (84.74 ± 18.20) and the S-LISM group (81.58 ± 26.51) (Figure 1).

A small proportion of participants engaged in active transportation on the home-to-school route (11.6 %), with an average duration of 5.25 ± 2.77 min per day. Approximately three-quarters (75.4 %) participated in organized PA outside of school, averaging 22.51 ± 12.87 min per day. Additionally, the majority (69.6 %) reported engaging in physical activities during the weekend, such as cycling, walking, or playing ball games. Most participants considered themselves to be active or very active (76.8 %). An association between age was with MVPA ($r = -0.359$, $p < 0.001$), PEDI ($r = 0.394$, $p < 0.001$), NEPI ($r = 0.400$, $p < 0.001$), NEDI ($r = 0.439$, $p < 0.001$) and EII ($r = 0.377$, $p < 0.001$).

Statistically significant differences were found only in leisure-time PA on weekends, with students classified as U-LISM reporting the lowest levels (Table 2).

Table 1

Characterization of the sample in sociodemographic indicators, body composition, and emotional indexes: an analysis by group of measures ($n = 69$).

	Total ($n = 69$)	No-LISM ($n = 35$)	S-LISM ($n = 21$)	U-LISM ($n = 13$)	χ^2/Z	p	Between groups
Sex (Men)	34 (49.3 %)	15 (42.9 %)	12 (57.1 %)	7 (53.8 %)	1.206	0.547	—
Age	8.14 ± 1.13	8.03 ± 1.10	8.43 ± 1.29	8.00 ± 0.91	1.116	0.572	—
SSS: No Tier	33 (47.8 %)	17 (48.6 %)	9 (42.9 %)	7 (53.8 %)	5.277	0.509	—
SSS: Tier 1	8	2 (5.7 %)	3 (14.3 %)	3 (23.1 %)			
SSS: Tier 2	13	6 (17.1 %)	5 (23.8 %)	2 (15.4 %)			
SSS: Tier 3	15	10 (28.6 %)	4 (19.0 %)	1 (7.7 %)			
Height	134.03 ± 9.19	135.19 ± 7.52	133.70 ± 12.06	131.43 ± 8.01	2.259	0.323	—
Weight	31.96 ± 8.34	32.70 ± 7.91	30.52 ± 7.81	32.31 ± 10.47	0.972	0.615	—
PEDI	8.06 ± 2.24	8.91 ± 2.17	7.33 ± 1.83	6.92 ± 2.25	10.864	0.004*	No-LISM>U-LISM
NEDI	6.80 ± 2.24	7.23 ± 2.10	6.52 ± 2.02	6.08 ± 1.75	2.914	0.023*	No-LISM>S-LISM No-LISM>U-LISM
TEDI	14.86 ± 3.87	16.14 ± 3.90	13.86 ± 3.34	13.00 ± 3.61	7.316	0.026*	No-LISM>S-LISM No-LISM>U-LISM
EII	17.86 ± 4.57	19.37 ± 4.51	16.86 ± 4.30	15.38 ± 3.82	9.568	0.008*	No-LISM>U-LISM

Legend: SSS – School Social Support; No-LISM – Students without Special Educational Needs; S-LISM – Students with Selective Learning and Inclusion Support Measures; U-LISM - Students with Universal Measures to Support Learning and Inclusion; PEDI - Positive Emotional Differentiation Index; NEDI - Negative Emotional Differentiation Index; TEDI - Total Emotional Differentiation Index; EII – Emotional Identification Index;

* $p < 0.05$.

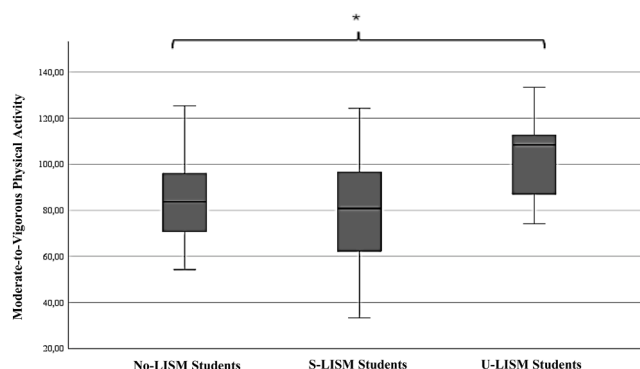


Figure 1. Time in moderate to vigorous PA daily, analysis by level of measures to support learning and inclusion ($n = 69$).

Legend: * = $p < 0.05$

Table 2

Characterization of the sample in PA indicators: an analysis by level of measures to support learning and inclusion ($n = 69$).

		Total ($n = 69$)	No-LISM ($n = 35$)	S-LISM ($n = 21$)	U-LISM ($n = 13$)	χ^2/Z	p
Active commuting between home and school	Yes n (%)	8 (11.6 %)	3 (8.6 %)	3 (14.3 %)	2 (15.5)	0.643	0.725
	Duration (min.day)	5.25 ± 2.77	4.00 ± 3.60	6.67 ± 2.89	5.00 ± 0.00	0.729	0.694
PA Organized outside the school	Yes n (%)	52 (75.4 %)	30 (85.7 %)	13 (61.9 %)	9 (69.2 %)	4.332	0.107
	Duration (min.day)	22.51 ± 12.87	22.74 ± 13.25	22.41 ± 13.90	21.90 ± 11.43	0.023	0.989
Leisure PA at the weekend	Yes n (%)	48 (69.6 %)	27 (77.1 %)	16 (76.2 %)	5 (38.5 %)	7.325	0.026
PA Level (self-reported)	Not very active	3 (4.3 %)	1 (2.9 %)	1 (4.8 %)	1 (7.7 %)	3.814	0.702
	Neither too much nor too little active	13 (18.8 %)	4 (11.4 %)	5 (23.8 %)	4 (30.8 %)		
	Active	23 (33.3 %)	13 (37.1 %)	6 (28.6 %)	4 (30.8 %)		
	Very active	30 (43.5 %)	17 (48.6)	9 (42.9 %)	4 (30.8 %)		

Legend: No-LISM – Students without Special Educational Needs; S-LISM – Students with Selective Learning and Inclusion Support Measures; U-LISM – Students with Selective Learning and Inclusion Support Measures;

* $p < 0.057$.

2.3. Association between the indices of emotions and feelings with physical activity

There was no significant relationship between the indicators of PA and the indices of emotions and feelings ($p > 0.05$) (Table 3). Moreover, moderate to strong associations were found among the indices of emotions and feelings, with Spearman's correlation coefficient ranging from 0.607 to 0.896 ($p < 0.05$).

Analysis of the associations by level of Learning Support and Inclusion Measures revealed significant relationships across all three student groups, with stronger associations observed among No-LISM students. Among students with U-LISM, time spent in organized physical activities outside of school (OPA-OS) was significantly associated with both the PEDI ($r = 0.710$; $p < 0.05$) and EII ($r = 0.707$; $p < 0.05$), indicating that greater participation in these activities was linked to higher levels of both indices (Table 4).

Table 3

Relationship between PA indicators and emotions and feelings indices ($n = 69$).

	MVPA	OPA-OS (time)	PEDI	NEDI	TEDI
PEDI	N.S.	N.S.			
NEDI	N.S.	N.S.	0.607***		
TEDI	N.S.	N.S.	0.882***	0.896***	
EII	N.S.	N.S.	0.779***	0.755***	0.844***

Legend: MVPA – Moderate to vigorous PA; OPA-OS – Organized PA, outside of school; PEDI - Positive Emotional Differentiation Index; NEDI - Negative Emotional Differentiation Index; TEDI - Total Emotional Differentiation Index; FDI – Emotional identification index; N.S. – not significant; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4

Relationship between PA indicators and emotions and feelings indices, a level-by-level analysis of measures to support learning and inclusion ($n = 69$).

		MVPA	OPA-OS (time)	PEDI	NEDI	TEDI
No-LISM Students	PEDI	N.S.	N.S.			
	NEDI	N.S.	N.S.	0.676***		
	TEDI	N.S.	N.S.	0.897***	0.919***	
	EII	N.S.	N.S.	0.796***	0.790***	0.856***
Students with S-LISM	PEDI	N.S.	N.S.			
	NEDI	N.S.	N.S.	0.450*		
	TEDI	N.S.	N.S.	0.773***	0.896***	
	EII	N.S.	N.S.	0.614**	0.707***	0.753***
Students with U-LISM	PEDI	N.S.	0.710*			
	NEDI	N.S.	N.S.	0.594*		
	TEDI	N.S.	N.S.	0.921**	0.846**	
	EII	N.S.	0.707*	0.827**	0.848**	0.915**

Legend: MVPA – Moderate to vigorous PA; OPA-OS – Organized PA, outside of school; PEDI - Positive Emotional Differentiation Index; NEDI - Negative Emotional Differentiation Index; TEDI - Total Emotional Differentiation Index; FDI – Emotional identification index; N.S. – not significant;

* $p < 0.05$;

** $p < 0.01$; *** $p < 0.001$.

3. Discussion

The results of the present study exhibited significant differences among three groups of students (No-LISM, S-LISM, and U-LISM) in the indices of emotional differentiation and identification. It is particularly noteworthy that No-LISM students presented higher values across all emotional dimensions analysed, whereas students with U-LISM reported the lowest values. These findings are consistent with previous research showing that children who have fewer opportunity to engage in structured physical activity struggle with emotional self-regulation. Experimental interventions show that supervised physical activity programs lead to significant increases in these competences (Fu et al., 2025; Song et al., 2025).

The significant difference observed in the indices of positive and negative emotional differentiation between the groups suggests that No-LISM students possess a more developed ability to distinguish and understand their emotions, which may reflect more robust emotional development. Previous studies have demonstrated that emotional differentiation is strongly correlated with psychological well-being and academic success (Barrett et al., 2001; Moreira et al., 2012b). Thus, the present findings align with the literature, indicating that children who benefit from learning support measures and curricular adaptations may encounter challenges in managing and recognizing their emotions (Graziano et al., 2007).

For the emotional identification index, a significant difference was observed only between the No-LISM and U-LISM groups. This finding reinforces the hypothesis that students with greater educational support may experience increased difficulties in perceiving and interpreting emotions, both their own and those of others. Studies suggest that emotional identification is closely linked to social interaction and emotional intelligence, which are fundamental for effective social and academic adjustment (Mayer et al., 2008).

The trend observed, wherein students with U-LISM presented the lowest values, may be related to increased challenges in emotional regulation, which is frequently identified as an obstacle to effective learning in inclusive contexts (Denham et al., 2010). However, in addition to the idiosyncratic characteristics of students, it is equally important to consider the contextual factors that influence their school experience, such as teachers' expectations regarding student behaviour and attitudes, as these may affect the quality of classroom interactions and the regularity of social-emotional learning opportunities (Shriver & Elias, 2024). In this regard, it should be added that a lack of resources, class heterogeneity and inclusive policies, even when considered, may limit the effectiveness of support measures (Belaire et al., 2024). Thus, the lower levels of emotional skills observed may result from a combination of personal and environmental factors.

This difference between groups may indicate the potential need for more structured emotional support for students receiving universal support measures, with a focus on enhancing emotional differentiation and emotional identification as an integral component of their academic and social development.

Overall, the results underscore the importance of psychoeducational intervention targeting the emotional development of students, particularly those identified with universal and/or selective support measures. Developing programs that promote emotional differentiation may serve as an effective strategy to improve both academic performance and emotional well-being in these populations (Durlak et al., 2011). Regarding PA, significant differences were observed in the practice of moderate to vigorous PA across the three groups, with students with U-LISM presenting the highest levels, followed by No-LISM students and, lastly, students with S-LISM.

Scientific research has demonstrated that PA plays a crucial role in children's motor, cognitive, and emotional development, particularly within the school context (Ekelund et al., 2012). The higher levels of PA observed among students with U-LISM may be attributed to their younger average age. Several studies indicate that younger children tend to be naturally more active, owing to higher energy levels and a greater propensity for spontaneous motor activities. Furthermore, physical activity generally declines with age due to factors such as changing interests, increased academic demands, and reduced encouragement for active play (Telama et al., 2014). Therefore, the greater PA levels in these students likely reflect, to a significant extent, a natural age-related tendency (Corder et al., 2019).

The data also indicated that most students perceived themselves as active or very active, consistent with trends reported in child populations (Guthold et al., 2020). These self-reported perceptions are supported by accelerometer measurements, which showed a daily average of moderate to vigorous physical activity exceeding the 60 min recommended by the World Health Organization (WHO) for children and adolescents. Thus, the objective data validate students' subjective assessments of their physical activity levels, demonstrating that, regardless of group, the majority meet or surpass the recommended minimum.

Conversely, no statistically significant differences were found in participation in organized PA outside of school across groups, suggesting that involvement in these activities may be influenced by factors such as financial resources, parental support, or access to sports facilities (Beets et al., 2010). Additionally, the low adherence to active transport with only 11.6 % of students reporting walking to school. This is particularly important given evidence that active mobility contributes substantially to total daily physical activity and has positive effects on children's cardiovascular and metabolic health (Larouche et al., 2014).

Regarding leisure-time PA on weekends, significant differences were observed between groups, with students with U-LISM reporting lower participation. This data may reflect perceived barriers to engaging in recreational activities, such as reduced family incentive or limited access to outdoor leisure spaces (Hinkley et al., 2012). No significant association were found between the emotional indices and PA levels. This contrasts with previous studies reporting a positive relationship between PA and emotional well-being in children and adolescents (Lubans et al., 2016). A possible explanation for this discrepancy may lie in the measurement tool employed: the inventory of Identification of Emotions and Feelings (Moreira et al., 2012b). It assesses students' ability to identify and differentiate emotions but does not directly assess emotional experience or psychological well-being.

Thus, in addition to requiring specific emotional processing skills inherent to a certain cognitive and social maturity, the ability to identify and differentiate emotions may not be consistent with the socio-emotional benefits most often associated with physical activity, such as self-esteem or emotional regulation.

Several studies warn that discrepancies between assessment tools and theoretical constructs may limit the identification of associations between variables (Jiang et al., 2025; Kalata et al., 2025; Moon et al., 2024). In this sense, the absence of a positive relationship between PA and emotional variables should be interpreted with caution, recognising both the complexity of the phenomena studied and the limitations inherent in the measures used.

Moderate to strong associations were identified between the indices of emotions and feelings, with Spearman's correlation coefficients ranging from 0.607 to 0.896 ($p < 0.05$). These findings suggest that children exhibiting greater emotional differentiation also tend to demonstrate greater emotional identification, supporting previous research that highlights the interrelationship between emotional regulation and affective expression during childhood (Morris et al., 2007).

Among students with U-LISM, a significant relationship was observed between time spent in organized activities outside of school and both the positive emotional differentiation index ($r = 0.710$; $p < 0.05$) and the emotional identification index ($r = 0.707$; $p < 0.05$). These results suggest that participation in structured extracurricular activities may play a crucial role in promoting emotional development, potentially through enhanced social interaction and increased opportunities for emotional expression in less formal settings (Mahoney et al., 2005).

The results of this research have practical implications for schools. Thus, they will be able to implement psychoeducational strategies in physical activities, both curricular and extracurricular. Guan et al. (2023) and Brioa Saez et al. (2025) report that programmes combining PA with skills training, such as self-awareness, emotional regulation and cooperation, have demonstrated benefits in terms of resilience, well-being and school adaptation. Collaboration between physical education teachers and educational psychologists can reinforce this integration, ensuring that support measures are not limited to academic performance but include consistent opportunities to participate in physical activities geared towards socio-emotional goals.

4. Conclusion

The study revealed significant differences in emotional differentiation and identification indices among the three groups, with No-LISM students presenting higher values. Differences in PA levels were also observed, with U-LISM students reporting the highest engagement in moderate to vigorous PA, followed by No-LISM students. However, no significant relationship was found between emotional indices and PA.

The strong correlation between emotional differentiation and identification is notable, as is the positive association between participation in organized extracurricular activities and emotional development in students with U-LISM. These results underline the importance of educational strategies that promote emotional development and PA.

4.1. Study limitations

This study has several limitations that should be considered when interpreting the results.

First, the small size and geographical restriction of the sample, particularly with regard to the U-LISM group, also constitutes a limitation of the study, which prevents its generalisation to other educational and sociocultural contexts. Nonparametric tests were used because normality assumptions were violated, variances were heterogeneous across groups, and group sizes were unequal and small. While appropriate in these circumstances, nonparametric techniques can reduce statistical power and raise the risk of Type II error. As a result, non-significant data should be considered with caution, and more research with larger sample is recommended. Additionally, the study did not control for variables that could influence both PA and emotional development, such as family support or individual motivation to engage in physical activities.

Although the Inventory of Identification of Emotions and Feelings is appropriate for the students' age group, it may not fully reflect

the complexity of the emotions experienced by children in everyday contexts. PA assessment was limited to the school period and did not encompass all daily PA throughout the day, especially occurring outside the school environment. Moreover, the self-reported nature of PA assessment may be subject to social desirability bias or inaccurate recall.

In future studies, the moderating role of contextual variables, such as socioeconomic status or school social support, in the relationship between physical activity and emotional skills should be considered. According to the literature, on the one hand, children from higher socioeconomic situations have more opportunity to practice due to improved access and assistance (Fuentealba-Urra et al., 2021). Children from socioeconomically disadvantaged families, on the other hand, are two to three times more likely to experience emotional and behavioral issues and have lower levels of mental health and well-being (Kennewell et al., 2022).

Finally, it should be noted that, due to the cross-sectional design of the study, it is not possible to guarantee that physical activity leads to changes in emotional indices. The results only show associations observed at a specific point in time. These associations may be influenced by contextual and individual factors that were not controlled for. Longitudinal and experimental studies are needed to better understand the mechanisms underlying these associations and to confirm whether there are causal effects.

CRediT authorship contribution statement

Filipa Antunes: Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Hélio Antunes:** Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ana Rodrigues:** Writing – review & editing, Visualization, Validation, Supervision, Software, Methodology, Data curation. **Bebiana Sabino:** Writing – review & editing, Software, Resources, Methodology, Investigation, Formal analysis, Data curation. **Sadaf Ashraf:** Writing – review & editing, Visualization, Supervision, Formal analysis. **Duarte Sousa:** Writing – review & editing, Visualization, Validation, Supervision. **Joana Carvalho:** Writing – review & editing, Visualization, Validation, Supervision, Project administration, Conceptualization.

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