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Psychomotor intervention programme in an inclusive preschool setting: a pilot study

Programa de intervención psicomotriz en un contexto preescolar inclusivo: un estudio piloto

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Abstract

Social inclusion and behaviour challenges in naturalistic settings require targeted interventions when general support is insufficient. Psychomotor interventions have integrated features suitable for preschool children; however, further research is needed to establish their effectiveness. This pilot study aimed to evaluate the feasibility and social validity of a selective psychomotor intervention programme on psychomotor and socio-emotional skills of preschool children (aged 4-6 years) with autism spectrum disorder (n=4) and neurotypical development (n=17). A sequential mixed-methods pre–post study without a control group investigates the preliminary effects on neuro-psychomotor functions, social skills, and problem behaviours. Data from focus groups and observations were also explored after a 12-session group-based intervention that included expressive and action-oriented bodily experiences. A significant improvement in neuro-psychomotor functions was found (z= –3.921, p<.001, r=.86), despite no considerable differences in the social and behavioural skills reported by parents and teachers. These findings provide an outlook on the psychomotor intervention programme's validity and potential benefits for further study replication.

Keywords: preschool education; autism spectrum disorder; psychomotricity, psychomotor skills, social-emotional skills

Resumen

La inclusión social y los desafíos de conducta en contextos naturalistas requieren intervenciones específicas cuando el apoyo general resulta insuficiente. Las intervenciones psicomotoras han integrado características adecuadas para niños en edad preescolar; sin embargo, se necesita más investigación para establecer su eficacia. Este estudio piloto tuvo como objetivo evaluar la viabilidad y la validez social de un programa de intervención psicomotora selectiva sobre las habilidades psicomotoras y socioemocionales de niños en edad preescolar (de 4 a 6 años) con trastorno del espectro autista (n=4) y con desarrollo neurotípico (n=17). Un estudio secuencial de métodos mixtos con diseño pre–post sin grupo de control investiga los efectos preliminares sobre las funciones psicomotoras, las habilidades sociales y las conductas problemáticas. También se analizaron datos procedentes de grupos focales y observaciones después de una intervención grupal de 12 sesiones que incluía experiencias corporales expresivas y orientadas a la acción. Se encontró una mejora significativa en las funciones psicomotoras (z= –3.921, p<.001, r=.86), a pesar de no observarse diferencias notables en las habilidades sociales y conductuales informadas por padres y maestros. Estos hallazgos ofrecen una perspectiva sobre la validez del programa de intervención psicomotora y sus posibles beneficios para futuras réplicas de estudio.

Palabras clave: educación preescolar; trastorno del espectro autista; psicomotricidad; habilidades psicomotrices; habilidades socioemocionales.

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Introduction

Early childhood represents a critical window where environmental experiences fundamentally shape psychomotor and socio-emotional development (Luby et al., 2020; Peyre et al., 2024), influencing how children perceive and relate to themselves and the world (Ciaunica et al., 2021). Consequently, preschools serve as vital inclusive settings for whole-school interventions that promote lifelong well-being and equitable education (EASNIE, 2018; WHO & UNESCO, 2021). By providing a naturalistic foundation for basic education, these environments allow for early support that avoids the stigma of labeling while proactively addressing mental health (Cefai et al., 2022) and educational needs (Silva et al., 2016).

As a high-risk population, children with disabilities require selective preventive interventions that incorporate components specifically designed to address their unique needs (Cefai et al., 2022; Eapen, 2014). As a selective preventive psychomotor intervention, the *Psicomotricidade IE!* programme was designed to improve psychomotor and social-emotional competencies. Particularly, children with autism spectrum disorder (ASD) face various challenges in their social inclusion at school (Olsson & Nilholm, 2023; Rodriguez et al., 2021), which is a determinant of mental health and well-being in early childhood (van Bergen et al., 2019). A higher prevalence of behavioural problems (Lai et al., 2019; Major et al., 2017), fewer social (Major et al., 2017; Pascoe et al., 2023) and motor skills (Bhat, 2021) are identified in children with ASD compared with their peers with neurotypical development (ND).

Embracing developmental and neurophysiological perspectives, *Psicomotricidade IE!* programme provides intentional motor and social opportunities facilitated by the psychomotor therapist and peers. The purpose is for children to explore, experience, and feel competent in their bodily interaction with the environment (Frazão et al., 2022). The developmental perspective supporting this programme considers that bodily experiences promote embodied learning (and, hypothetically, behavioural change). As a background, embodiment theory emphasises that embodied learning involves living experience and acting meaning, and it is constructed through embodied action (Marshall, 2016; Marshall et al., 2021) and physical engagement (Goldstein et al., 2022).

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From a neurophysiological perspective, the sense of self and identity is rooted in body memory, in which sensations collected by the body are stored as implicit memory, with the bodily self-emerging from multisensory brain mechanisms that integrate exteroceptive and interoceptive body signals (Repetto et al., 2023). However, the mirror mechanism, a neural mechanism that matches action perception to action execution, is dysfunctional in autism spectrum disorder (Gallese et al., 2013). Potentially, it justifies (Gallese et al., 2013) that motor difficulties are present in more than 80% of children diagnosed with autism spectrum disorder (Bhat, 2021) and social difficulties (Khalil et al., 2018). Additionally, autonomic nervous system dysfunction (i.e., vagal regulation of the heart, higher respiratory sinus arrhythmia) is connected to social and behavioural problems (social engagement deficits) in ASD (Patriquin et al., 2019) and is comorbid with higher levels of anxiety and stress (Taylor et al., 2021).

Psychomotor interventions have integrated features suitable for the social-emotional development of preschool children (Bräuninger & Röösli, 2023; Veiga et al., 2023). Other studies that intentionally targeted motor and social-emotional skills in preschool contexts found statistically significant improvements in social skills and emotional expressiveness, but not in fundamental motor skills, emotional knowledge, or emotional regulation (James et al., 2020). Another study reported significant improvements in motor proficiency but no significant improvements in self-perception (Anna et al., 2016). However, the evidence is inconclusive not only for supporting movement-based interventions for children with ASD (Hume et al. 2021) but also for supporting school-based interventions to increase social inclusion (Tsou et al., 2024). There is a need to evaluate the effectiveness of psychomotor intervention studies in ASD (Frazão et al., 2023). Thus, the design of the psychomotor intervention programme presented below aims to contribute to the study of the effectiveness of body-focused interventions for preschool children, while considering the needs of children with ASD in an inclusive setting.

This pilot study aims to examine the practicality of implementation, the effects of intervention, and the perceived acceptability and value of the programme in inclusive preschool education contexts. This analysis contributed to a planned subsequent quasi-

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experimental study and other replications. More specifically, the following two questions were covered:

(1) What are the preliminary effects of the *Psicomotricidade IE!* programme on neuro-psychomotor, social skills, and behavioural problems of preschool children (with ND and ASD), comparing pre-post assessment?

(2) How is the social validity of the programme perceived by children, parents, and teachers?

Methods

Participants

The study sample included 21 children from four different classroom groups of three preschools (Table 1). Children with ND (n=17) were randomly selected from the respective class group of each child with ASD (n=4). The children with ASD were identified, with the consent of their parents, at Centro Hospitalar de Leiria, EPE pediatric consultations.

Table 1. Participants characteristics

Children (N)	21
Classroom 1 (n)	6
Classroom 2 (n)	6
Classroom 3 (n)	4
Classroom 4 (n)	5
Ages (mean; [min,max])	61.95 [46;83] months
Sex	11 female 10 male

The inclusion criteria were as follows: classrooms with at least one child with a diagnosis of ASD; children aged between 4 - 6 years and attending public or private preschool, children with ND having no health problems before the start of the programme activities, and children with ASD having been diagnosed by a paediatrician based on the Diagnostic and Statistical Manual of Mental Disorders - Fifth Edition (APA, 2022) criteria and positive Autism Diagnostic Observation Schedule - Second Edition (Lord et al., 2015), without a second disorder such as visual and hearing impairments. The

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exclusion criteria were not having attended three or more programme sessions, having a health problem, and/or having a psychomotor intervention outside the programme during the research period.

Measures

This study used a mixed-method sequential exploratory design consisting of two stages: quantitative and qualitative (Palinkas et al., 2019). The preliminary effects of the programme on participants' psychomotor and social-emotional skills were analysed in the quantitative step. In addition, social validity was analysed based on session logs and focus group interviews.

Neuro-psychomotor functions

The Portuguese version of the *Batterie d'Évaluations des Fonctions Neuro-Psychomotrices de l'enfant* (NPmot.pt, Amorim et al., 2022) assessed nine neuro-psychomotor functions of children aged 4-8 years: tonus, gross motor skills, laterality, manual praxis, tactile gnosis, hand-eye coordination, spatial orientation, rhythm, and auditory attention. A trained psychomotor therapist rated the 52 items by assigning two grades (one quantitative and another qualitative). The assessment was conducted in a separate preschool room and completed in 60-90 minutes. The quantitative referred to the child's speed, and the qualitative to the child's quality of movement, which ranged from 0 (does not perform) to 2 or 4 (best performance, depending on the item). The internal consistency of the Portuguese version, as measured by Cronbach's alpha, was above .79, except for digital gnosis (alpha = .45) (Amorim et al., 2022).

Social skills and behavioural problems

The Portuguese version of the Preschool and Kindergarten Behaviour Scales - Second Edition (PKBS-2) (Merrell et al., 2020) evaluated social skills and behavioural problems of children aged 3–6 years and was completed by parents and teachers. The 76 items are divided into two major scales: 34 items for social skills and 42 items for problem behaviours. Items are rated based on a four-point Likert scale (0 "never", 1 "rarely", 2 "sometimes" and 3 "often"). Several exploratory and confirmatory analyses led to the use of three social skills subscales (cooperation/social adjustment, social interaction/empathy, and social independence/assertiveness) and two problem behaviour subscales (externalizing and internalizing problems). In this study, item 34 of the social

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skills scale was excluded due to a printing error in the documents provided to parents and teachers. Several reliability and validity studies with Portuguese samples have been conducted (Major et al., 2016, 2017), showing alpha coefficients for the social skills total scale between .88 and .95, and for the total scale for problem behaviours, .95 and .97 for parents and teachers, respectively.

Social validity

During the programme's implementation, the psychomotor therapist completed record sheets relating to the children's adherence, observed behaviours, accommodations, and adaptations.

In the final evaluation, a focus group interview design was used to determine the perceptions of children, teachers, and parents and to obtain in-depth information on the programme's satisfaction and impact in promoting an inclusive environment. The semi-structured interview protocols were based on the *Inclusive Early Childhood Education Environment Self-Reflection Tool*(EASNIE, 2017). The group interviews were conducted by the first author, who was familiar with the interviewees. Interviews with a group of teachers and four classroom groups of parents were conducted online, lasted 30-60 minutes, and were audio-recorded. The interviews with children were conducted in groups of four or five, lasted between 7 and 15 minutes, took place in the room where the programme sessions occurred, and were audio recorded. In the interview transcriptions, letters were used to identify the interviewees.

Procedure

This study was approved by the Committee for Ethics of Centro Hospitalar de Leiria, EPE (reference 10 on 14/12/2021). All participants gave written informed consent/assent to participate, and anonymity and confidentiality were guaranteed. The first author collected the data.

The first step was to examine the child's health reports through separate meetings with the parents and teachers of the children with ASD. Once all the criteria for participating in the study had been met, the other children and parents in the class group were asked for their consent. Although all children participated in the intervention sessions, assessment was conducted only with a subset of children selected by the teachers through a non-probabilistic procedure, aiming for an approximately balanced

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representation of genders and ages. The initial assessment was conducted two weeks apart, followed by the 12-week intervention programme, and the post-intervention assessment was conducted over the following two weeks. A trained psychomotor therapist performed the assessment and intervention between March and June 2022.

Intervention programme

Psicomotricidade IE! programme (independent variable) was developed for preschool children in educational settings. The programme's main objectives were 1) to develop psychomotor and social-emotional skills through bodily play experiences and 2) to support teachers and parents in promoting these skills in different contexts.

Principles

Psicomotricidade IE! programme is relationship-based, with the strength of social engagement and inclusive environment being paramount, and is focused on the development of psychomotor and social-emotional skills. The programme is inspired by the Promoting Mental Health in Schools (PROMEHS) programme, which incorporates the knowledge of evidence-based practices in early childhood development and health promotion (European Commission: Directorate-General for Education, Youth, Sport and Culture et al., 2021; Hume et al., 2021), centred on seven guiding principles (Frazão et al., 2025): *prevention and health education*; *universal design and inclusive environment*; *integrative developmental approach; child-centred and respectful of their individuality*; *intervention based on body and movement experiences; the relationship with the psychomotor therapist*; and, *involvement of parents and teachers*.

Structure

The manual for psychomotor therapists (Frazão et al., 2025) provides information for implementation. It includes theoretical guidelines and specific strategies that promote the inclusion of children with communication and relationship difficulties, namely, children with ASD. The programme is organised in 12 sessions of 45 minutes, which take place once a week in the preschool with the attendance and support of the preschool teacher and/or educational assistant. The manual for psychomotor therapists includes the main themes, objectives, expected learning outcomes, materials, resources (e.g., music, stories, pictograms), and detailed session descriptions, organized into five steps. The manual also includes a guide for parents (invited to be involved in the programme).

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Each session plan is organised according to the objectives in the motor domain with neuropsychomotor functions such as tonus, gross motor skills, laterality, manual praxis, digital gnosis, hand-eye coordination, spatial orientation, rhythm, and auditive attention (Amorim et al., 2022; Vaivre-Douret, 2006) and social-emotional domain including five core social-emotional learning (SEL) competencies, self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2020). Accommodations and adaptations are suggested (including guidelines for adapting the group to the individual session).

In *the Psicomotricidade IE!* programme, each session is divided into five stages. In the first stage, an *initial dialogue* is held with the children, greeting them, listening to how they are doing, and recalling some moments from the previous session. In the second stage, the *body is activated* through the ritual of singing a song accompanied by rhythmic gestures and mirroring animal movements. In the third stage, a *story* follows the session's theme, accompanied by a demonstration that illustrates the instructions and possibilities for action to achieve the expected results. The proposed activities occur alone, in pairs, and in groups, depending on the activity type. Participants experience movement, expression, and exploration games using stories, songs, and materials (e.g., hoops, balls). In the fourth stage, a *relaxation* moment is promoted through mindful movements and touch. In the last stage, some questions are asked about the activities aimed at *reflection* and transfer to everyday life.

Each session is repeated once before moving on to the next theme, with different strategies proposed for each moment that the psychomotor therapist can adapt according to the children's needs and interests. The programme also envisages that the group sessions are adapted for individual sessions with children with ASD in a one-to-one relationship to promote predictability and consolidation of the skills developed in the group session. Therefore, in addition to the twelve group sessions, individual sessions with the children with ASD were provided, which means that children with ASD had a weekly group session and a weekly individual session. To integrate the skills, the suggested activities were repeated in a two-week cycle to be performed in the classroom and at home. One week, children are invited to make a free drawing about the session mediated by teachers, and on the other week, parents are invited to participate, engaging

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their children with activities related to the programme objectives at home (following the guide for parents).

Data analysis

Statistical Package of Social Sciences (SPSS) software, version 28, was used to analyse the data. A p-value < 0.05 was considered to indicate statistical significance. Missing data were found at the pre-intervention time point (18 – 28% of the sample had at least one missing) and at the post-intervention time point (23 – 29% of the sample had at least one missing) in parents' scales. Pairwise deletion was performed. The internal consistency for the total score of the NPmot.pt and PKBS-2 scales pre-post was above .90, which is considered excellent (Kline, 2010), except in PKBS-2 social skills reported by parents (alpha =.69). The Shapiro–Wilk test was used to assess the normality of the data. The normality assumption was not confirmed except for PKBS-2 for parents. The Wilcoxon test was applied to examine the effect of the intervention on participants' skills development across the two time points. The qualitative stage involved content analysis. All interviews were digitally recorded and transcribed verbatim using the Word transcribe tool. The first author reviewed the transcribed interviews for accuracy. Qualitative coding was conducted in MAXQDA software, version 24. A deductive ("theoretical") thematic analysis was conducted, according to (Braun & Clarke, 2006). In this analysis, the main themes were previously identified in the interview protocol. Peer debriefing with supervisors during which coding decisions and emerging interpretations were discussed, as well as the systematic use of verbatim participant quotations to support analytic claims, is presented in the supplementary material (appendix D). The following studies will analyse other relevant themes that appear during interviews.

Results

Psychomotor and social-emotional skills

Regarding neuro-psychomotor functioning, the median score on the NPmot.pt battery (table 2) increased from pre-intervention (Md=181.00, n=21) to post-intervention (Md=194.00, n=21). The results of the Wilcoxon signed-rank tests showed a statistically significant positive difference ($z=-3.921$, $p<.001$, $r=.86$) for all the children. Furthermore, when the subtests of neuro-psychomotor skills were examined in detail, statistically

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significant differences were found for tonus (p=.002), gross motor skills (p=.006), manual praxis (p=.003), tactile gnosis (p=.017), and rhythm (p=.002) functions. In contrast, no statistically significant differences were found for hand-eye coordination, laterality, spatial orientation, or auditory attention (p>.05).

Table 2. Results of pre-post-test comparison (Wilcoxon-test) on psychomotor functions (NPmot.pt)

	Md Pre	**Md Post**	**Z**
NPmot.pt total (n=21)	181.00	194.00	-3.92***
Tonus	77.00	79.00	-3.29***
Gross motor skills	42.00	46.00	-2.73**
Laterality	10.00	10.00	-1.38
Manual praxis	22.00	26.00	-2.98**
Digital gnosis	4.00	4.00	-2.39*
Hand-eye coordination	7.00	7.00	<.001
Spatial orientation	3.00	2.00	-0.05
Rhythm	13.00	18.00	-3.03**
Auditive attention	2.00	3.00	-1.26

*Md – median; *** p<.001;** p<.01;*p<.05;*

Regarding the PKBS-2 (table 3), the median scores remained unchanged for the PKBS-2 social skills subscale and decreased for the PKBS-2 behavioural problems subscale, which was consistent among parents and teachers. No statistically significant differences were identified in scales and subscales of PKBS-2 (p>.05).

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Table 3. Results of pre-post-test comparison (Wilcoxon-test) on social skills and behavioural problems (PKBS-2) reported by parents and teachers

	Parents ratings (n=12)			**Teachers ratings (n=21)**		
	Md Pre	**Md Post**	**Z**	**Md Pre**	**Md Post**	**Z**
PKBS-2 social skills	82.00	82.00	-.59	85.00	85.00	-.14
Social independence/ assertiveness	34.00	35.00	-.71	32.00	32.00	-.49
Cooperation/ social adjustment	26.00	25.00	-.13	31.00	28.00	-1.17
Social interaction/ empathy	22.50	23.00	-1.94	22.00	22.00	-1.19
PKBS-2 behavioural problems	48.00	45.00	-1.34	17.00	16.00	-1.34
Internalizing problems	17.00	16.00	-1.37	5.00	8.00	0.57
Externalizing problems	35.00	28.00	-1.14	12.00	9.00	0.15

*Md – median; *** p<.001;** p<.01;*p<.05;*

Social validity

The following findings were obtained from the therapist's logs and the focus group interviews conducted with the children (with ASD and ND), their parents, and their teachers. The main themes identified concerning the perceived inclusive environment of this programme are systematized below and illustrated in Appendix D.

Overall welcoming atmosphere. Teachers and parents stated that the children felt welcomed and that the setting was a caring and appealing place for them.

Inclusive social environment. Teachers and parents stated that the children were encouraged to respect differences in the peer group; interaction and play were facilitated for all. When the children were asked what they did not like, they reported difficulty managing conflicts in the group.

Child-centred approach. Teachers and parents stated that school and home activities were built on children's interests and choices. The sessions children enjoyed the most were those that involved dancing like the animals (sessions 5 and 6) and playing construction games (sessions 11 and 12). The children's interviews highlighted that they

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would like to play in more varied ways with the animals and heroes/cartoons and experience different types of movements during their play (e.g., to run more).

Child-friendly physical environment. Teachers and parents identified some aspects of a safe setting for all children that enabled them to participate.

Inclusive teaching and learning environment. Teachers and parents stated that their participation in the programme contributed to better observing and monitoring children's engagement, learning, and support needs.

Family-friendly environment. Teachers and parents stated that they felt engaged. However, both agreed that the parents wanted to be better informed about the programme in general and the activities they had experienced. Parents also recognized the importance of being involved in their children's engagement and learning when performing the proposed activities at home.

From the diary logs, the psychomotor therapist responsible for programme implementation described the need to make adaptations and accommodations in sessions 9 and 10, requiring different approaches according to the group in question (some groups were more prepared for the activity as planned, and others required a simplification of the activities). The way the session was structured required emotional self-regulation and social relationship mobilization skills that differed across class groups. The session logs also suggest that major accommodations and adaptations occurred within class groups, revealing more externalized behavioural problems. In addition, strengthening the therapeutic relationship in individual sessions with children with ASD improved knowledge, leading to new strategies to explore each child's strengths and difficulties. This allowed intentional adjustments in the group sessions to accommodate the specific needs of the children with ASD.

Discussion

This study aimed to explore the effects of a psychomotor intervention programme on motor and social-emotional skills in preschool children (those with ASD and ND) and to add support relative to the programme's social validity for further replication.

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Psychomotor and social-emotional skills

Psicomotricidade IE! programme combines action-oriented and expressive-oriented playful bodily and relaxation experiences targeting psychomotor and social-emotional skills. The results of the present study suggest that *Psicomotricidade IE!* increases preschoolers' neuro-psychomotor functions. In particular, the programme significantly improved tonus function, gross motor skills, manual praxis, tactile gnosis, and rhythm. Anna et al. (2016) reported comparable improvements in motor proficiency after a preschool-level psychomotor intervention, suggesting that repeated, body-oriented activities are sufficient to raise psychomotor skills. Thus, targeting these functions directly - expressive bodily play, rhythmic songs, story-driven movement, mindful relaxation, parent-home activities – suggests action mechanisms for the observed gains (Frazão et al., 2022; Goldstein et al., 2022).

Despite the lack of statistical significance, there was also a decrease in behavioural problems assessed by parents and teachers. The social skills do not appear to increase or decrease, as assessed by parents and teachers. The findings contrast with other group psychomotor intervention programmes, which have been shown to significantly improve social-emotional skills in preschool children (Bräuninger & Röösli, 2023; Moschos et al., 2023; Veiga et al., 2023). This discrepancy may reflect differences in dosage, fidelity of the social-emotional components, or the sensitivity of the outcome measures. In this programme, manualised activities were designed to target psychomotor and social-emotional skills; however, it can be proposed that the socio-emotional dimension should be further reinforced by planning activities with greater focus on direct observation of these skills and by increasing the intensity and duration of the intervention (Durlak et al., 2022).

Social validity was assessed based on the psychomotor therapist diary logs from each session and focus group interviews with children, parents, and teachers. Overall, the children expressed enjoyment and satisfaction during the sessions. As recommended in systematic reviews of social validity assessment on behaviour interventions for young children with problem behaviour, assessing social validity on the front end may be beneficial (Park & Blair, 2019). This pilot study is the first step toward a future

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experimental study that will integrate all these social validity suggestions, including ideas regarding the types of activities suggested by children.

This programme seems to meet the quality requirements of inclusive early childhood education for all children (EASNIE, 2017). In further studies, the diverse ways used in the sessions to facilitate communication for all children (e.g., pictures, graphic signs, drawing) could be fostered in the final interviews to obtain accurate feedback from children who were minimally verbal (children with ASD in the case of our sample) (Lund et al., 2021). Parents' perceptions reflect satisfaction with their involvement in the *Psicomotricidade IE!* programme, although they would like the opportunity to attend school sessions. Other motor intervention studies have shown that parental involvement effectively mediates improvements in basic motor skills in preschool children (Stevenson et al., 2023). However, in future studies, it is important to consider additional mechanisms to help parents feel more involved in the psychomotor intervention programme (e.g., by promoting parent participation in some sessions through photos/videos of group activities). Regarding children's social inclusion, it would have been important to explore further respondents' perceptions of social connectedness and a sense of belonging as critical factors in improving school experiences for children with ASD (El-Salahi et al., 2023)

Teachers' perceptions seem to reinforce the importance of creating high-quality, structured programmes to ensure that all children have access to motor and social-emotional learning opportunities (Arufe-Giráldez, 2020) in inclusive preschool settings (Phillips et al., 2023), particularly when general support is insufficient (EASNIE, 2017). This targeted intervention highlights the impact of the specificity of the psychomotor therapist's relationship and intervention in complementing teachers' work in promoting motor and social-emotional skills in preschool. The work of the psychomotor therapist may operate as an informal teacher and parent training through modelling behaviours, strategies, and activities organized in an inclusive environment. In the overall design of this programme, the individual intervention appeared to be a valuable addition to the group intervention.

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Limitations and future directions

There are limitations that are consistent with the pilot nature of the current study, including a small sample of children, the absence of a control group, and the multiplicity of subscales. It is difficult to determine whether the improvements are attributable to the intervention or to other variables, namely, regular educational practices. These limitations are being addressed in our current quasi-experimental study of the *Psicomotricidade IE!* programme.

The missing data in parents' reports restricts the analysis of the programme's effects. The time required to conduct the psychomotor assessment directly affects the sample size. A contingency plan is recommended to address any potential parental concerns and to reinforce the assessment team.

As the qualitative analysis relied on a single coder, coding reliability may be limited. Future studies should incorporate multiple trained coders and formal assessments of inter-coder agreement (Palinkas et al., 2019).

A deeper exploration of quantitative and qualitative results in a more balanced sample could provide deeper knowledge about the social inclusion of children with ASD. However, the results emphasise the importance of early intervention programmes within a psychomotor framework in promoting holistic development in all preschoolers (Alonso-Vargas et al., 2022).

Future research should further explore the long-term effects of psychomotor interventions on various aspects of development (with ASD and ND), as well as investigate the mediators (influences of inclusive pedagogical and parental education practices). The use of other instruments to directly assess social-emotional learning factors, such as the Social Skills Improvement System Brief Scales (Anthony et al., 2022), may be more reliable for measuring the programme's effects. Furthermore, multilevel modelling or stratified analyses by classroom to test whether effects on psychomotor or social-emotional outcomes differ across classroom groups is recommended (Tsou et al., 2024).

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Conclusion

The findings of this mixed-methods pilot study indicate that a psychomotor intervention program may be beneficial for preschool children, both with ASD and ND, within an inclusive educational setting. Notably, improvements were observed in psychomotor functions, namely tonus, gross motor skills, manual praxis, tactile gnosis, and rhythm. The program's social validity is further supported by reports of enjoyment from children, as well as observations from teachers and parents who described the environment as welcoming and inclusive. This pilot study highlights the potential value of targeted psychomotor programs integrated into routine preschool activities in addressing the specific needs of children with ASD, thereby fostering a more inclusive preschool environment. Psychomotor therapists, as specialized professionals, can offer unique expertise to multidisciplinary teams, particularly when universal interventions are insufficient. Future research should replicate this study using a control group, refine assessment and intervention methodologies, and address the identified limitations to provide more robust evidence in forthcoming quasi-experimental and controlled trials.

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