



# Promoting social-emotional skills and reducing behavioural problems in children through group psychomotor therapy: A randomized controlled trial

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## ABSTRACT

This RCT examined psychomotor therapy's efficacy on promoting social-emotional skills and reducing behavioural problems. The multicentred study randomized children (1st/2nd grade) into intervention (IG) and wait-listed control groups (WG). Five children were excluded from data analysis. Overall, 28 children ( $M_{\text{age}} = 7.55$  years,  $SD = 0.78$ ) participated, 15 in the IG ( $M_{\text{age}} = 7.62$  years,  $SD = 0.91$ ) and 13 in the WG ( $M_{\text{age}} = 7.47$  years,  $SD = 0.63$ ). Due to the distribution of data, a non-parametric procedure (Wilcoxon-test) was used for data analysis in both groups. In pre-test and post-test, all children completed the IDS-2 functional Social-Emotional Skills Scale (IDS-2 SEK), their parents filled out the child behavioural checklist (CBCL / 6–18 R). Results: When comparing t1 ( $Md = 50.00$ ) with t2 ( $Md = 57.00$ ), only the IG ( $z = -2.217$ ,  $p = 0.013$ ,  $n = 14$ ) but not the WG improved significantly in *Socially Competent Behaviour*. The significant improvement in the IG had an effect size of  $r = .57$ , which is defined as a large effect. Both groups improved in the functional domain *Social-Emotional Skills*. The CBCL showed a decrease in scores for *Total Problems* and *Internalizing Problems* in WG parents' but not in IG parents' reports at t2 compared to t1.

## Introduction

### *The need for social-emotional skills provision in schools*

Worldwide, 10–20% of children and adolescents experience behavioural problems (Voß & Gebhardt, 2017) and mental disorders (World Health Organization, 2019). The number of children with social-emotional needs seems to increase constantly (Statistische Veröffentlichung der Kultusministerkonferenz, 2010). Social-emotional skills or competence<sup>1</sup> (SEC) is often used as an umbrella term, but it consists of two constructs which are not easily conceptualized and measured "... because the term refers to a set of different capabilities" (Schoon, 2021):

Social competence describes the availability and application of cognitive, emotional, and motor behaviours that can lead to a long-term favourable relationship between positive and negative consequences in interpersonal situations. Emotional competence describes the ability to be aware of one's own feelings, to express them, and to control them

independently. The identification and comprehension of emotions of other people are also described as emotional competence (Hogrefe., 2023).

SEC "shape human thought, feelings and behaviour and influence a wide range of life events and outcomes" (Chernyshenko et al., 2018, p. 118), and correlate with social behaviour, psychological and physical health, and academic performance (Hogrefe., 2023). SEC are perceived as protective qualities against behavioural problems in children exposed to risk factors (Catalano et al., 2002). If SEC are not sufficiently promoted, the prognosis for children is rather poor (Steinhausen, 2010), and a lack of SEC can negatively impact children's social integration, educational development (Gooren et al., 2011), linguistic competencies (which are relevant for communicating thoughts and feelings) (Hogrefe., 2023), and school environment (Preuss-Lausitz, 2005). Social and emotional skills have a high impact on depression and obesity (Organisation for Economic Co-operation and Development, 2015), and deficits in SEC are associated with crime, substance abuse and psychopathologies (Hogrefe., 2023). When it comes to mental health,

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<sup>1</sup> The terms social-emotional skills and social-emotional competencies are both used interchangeably.

children and adolescents in Switzerland are underserved and the need for more treatment options has been highlighted (Stocker et al., 2016).

### *Psychomotor therapy – a short introduction and its connection to the arts therapies*

The [European Forum of Psychomotricity, \(2023b\)](#) describes psychomotricity<sup>2</sup> as follows:

Based on a holistic view of mankind, which presumes the unity of body, mind and spirit, the name Psychomotricity explains the mutual influence of cognition, emotion and movement and their influence on the development of an individual's competency within a psychosocial context. Departing from this theoretical premise different countries and regions across Europe have developed specific practices which place the individual's actions in this mutual influence into the foreground.

The Forum also defines a psychomotor therapist as "(...) an expert in the field of movement and body-oriented intervention to improve psychosocial functioning and mental health in babies, children, adolescents, adults and elderly people."

Psychomotor therapy (PMT) enhances the mind-body connection (Véron et al., 2021), thus has close connections in particular to dance movement therapy, which the [European Association of Dance Movement Therapy, \(2023a\)](#) explains is "(...) the therapeutic use of movement to further the emotional, physical, spiritual and social integration of the individual". PMT in Switzerland may be of particular interest to practitioners of arts therapies internationally as it is a good example of a well-established school service and has many connections to the arts therapies: PMT provides a body, movement-oriented therapy for children and young people with special needs in the areas of social, emotional and motor development ([psychomotorik schweiz, 2023](#)) and includes creative expression, therapeutic dance and psychodrama interventions. It promotes the perception of inner images and ideas and the symbolization of inner sensations through nonverbal expression. Body perception and movement expression in PMT are understood as an indicator of conscious and unconscious emotions, feelings, and moods (Blos, 2017).

### *Psychomotor therapy in school for children with social-emotional needs*

Children express themselves through movement and nonverbal expression, so understanding children through their body language is of great importance to teachers and movement therapists in being able to recognize children in distress, especially in terms of internalizing problems (Bräuninger et al., 2021). An online survey in German-speaking Swiss cantons revealed that teachers are highly convinced of the success of PMT in school, and rated its effectiveness even more highly when the therapy took place in the therapy room in comparison to preventive or integrative forms offered in the classroom (Vetter & Sandmeier, 2016). With the consent of parents, children are signed up by their teachers to the school's PMT department: if the PMT assessment confirms a need for therapy, treatment goals and interventions are jointly described. Many Swiss cantons define PMT by law as a treatment option in educational settings for children with motor and social-emotional needs. PMT is

... suitable for children, adolescents and adults who have motor or emotional problems, behavioural problems, or difficulties in their relationships with others. It deals with the interrelationship of perception, feeling, thinking, moving and behaviour. ... The moving body is therefore at the centre of psychomotricity. At the same time, psychomotricity always keeps the whole person in mind; in addition

to the physical level, it also considers the mental, social, and cultural influences that shape a person. ([psychomotorik schweiz, 2023](#)).

The general aim of PMT in school is (among others) to increase children's movement repertoire (for example *strength control*: the child can climb up the wall bars and jump down; *expression*: the child can improvise through movement expression and use more space); to foster gross and fine motor skills (for example *dynamic balance*: the child can balance on a bench; *eye-hand-coordination*: the child can adapt his/her graphomotor strength to the pencil) and to support social and emotional competences (for example *social interaction*: the child can control its impulses and engage in the movement game lead and follow; *emotional independence*: the child can improvise with open movement tasks). Body and movement experiences form the basis for building self-confidence and self-esteem in children and becoming self-efficient (Zimmer, 2019).

The school environment offers an ideal setting for promoting SEC, as it is accessible to all children (Beilmann & Raabe, 2009) and problems in SEC can be observed in the classroom (Tröster & Reineke, 2007). Likewise, behavioural problems, which often seem to be related to attachment issues, can be addressed by means of a psychomotor educational model to stimulate healthy attachment relationships (Brands-Zandvliet & Eisenga-Oppenheim, 2021). The integration of PMT into the Swiss school setting represents an opportunity for promoting SEC, as it is offered to all age groups. However, most therapists work in primary schools and particularly with children from the first and second grades. The results of a Switzerland-wide online survey of therapists listed the following indications as the main reasons for signing children up for PMT: self-confidence (31.6% very often, 39.8% often), emotional problems (20.5% very often, 47.4% often) and social problems (19.9% very often, 43.9% often), in addition to graphomotor and motor problems (Widmer & Bräuninger, 2020). In Germany, the system of psychomotor effect documentation showed similar indications for PMT, namely psychomotor development, social problems and eating disorders (Klein et al., 2006). PMT strengthens self-efficacy, self-assurance, and competences in psychomotor and social-emotional dimensions (Eggert & Reichenbach, 2004; Fischer, 2011), and movement experiences and play positively influence the development of SEC and relationship building in children (Zimmer et al., 2020). The necessity and acceptance of PMT in treating children's SEC seems obvious.

Major influences on PMT in Switzerland<sup>3</sup> are the *functional, neuro-psychological perspective* (for example Psychomotor Exercise Treatment by Kiphard (1980), the *knowledge-structuring, competence-theoretical self-concept-oriented perspective* (for example the action-oriented approach by Schilling, 2020, and the child-centred psychomotor development by Zimmer, 2019) and the *understanding perspective* by Seewald (2007). PMT group interventions in school settings take place in structured, ritualized, variable and/or free phases which are adapted to the current needs of the group (Köckenberger, 2016; Zimmer, 2019). Creative props and PMT devices (pedalos, roller boards, trampolines, etc.) enable the child to adjust to the material and to interpret its meaning (Zimmer, 2019). In playing and moving together, children's imagination is fostered, and problem solving (Andersen, 2016) and learning competences (Hauser, 2021) are supported. In play, one's own real and imaginary world can be expressed symbolically (Seewald, 2007). Various types of games (functional games, construction games, role and symbol games, rule games, etc.) focus on the community experience (Weinberger, 2015). Playing and moving together fosters interaction, thereby children's self-confidence and social skills are strengthened (Hüther, 2006) and their self-concept and self-awareness are expanded through the positive comparison with others (Fischer, 2019). Self-consciousness can be gained through body and movement experiences. The creation of movement stories and movement parcourse

<sup>2</sup> Here both the terms psychomotricity and psychomotor therapy are used synonymously; depending on the country, one or the other term is employed.

<sup>3</sup> For further information please see [https://psychomot.org/wp-content/uploads/2011/10/list-of-textbooks\\_2012.pdf](https://psychomot.org/wp-content/uploads/2011/10/list-of-textbooks_2012.pdf)

promote perception of self and others, motor skills, and recognition of the individual in the group (Fischer, 2019). Psychomotor therapy offers space for "the process of self-discovery and creative testing of one's own possibilities and limits" (Kiphard 1984, p. 167<sup>4</sup>). Artistic interventions promote self-regulation and social skills, and support mutual relationships and sensing the others (Weinberger, 2015).

#### *Evidence-based psychomotor therapy for children with social, emotional, and behavioural problems*

Preliminary studies support the efficacy of PMT: a systematic review by Moschos and Pollatou (2022) examined the effect of psychomotor intervention programmes (PIPs) in children aged three to 10 years without neurological, sensory, or motor problems and found 1489 works, of which 12 met the inclusion criteria. The results showed that PIPs positively affect motor, social and emotional skills, particularly in children of kindergarten and preschool age. A scoping review by Frazão et al. (2021) studied the effect of psychomotor interventions (individual or group) in three- to six-year-old children with autism spectrum disorder (ASD) and included experimental, quasi-experimental, observational, and descriptive studies. Of the 1351 search results, 14 works were applicable in the analysis. Outcomes in the social and psychomotor development, peer interaction and verbal communication domains were identified, although none of them reported statistically significant results.

A randomized controlled trial (RCT) tested the efficacy of a PMT intervention on behavioural and emotional problems in children with selective mutism (Esposito et al., 2017). The 138 participating children were randomly assigned to either 45-minute individual psychomotor interventions three times per week over six months ( $n = 67$  children, mean age  $7.84 \pm 1.15$ ) or a control condition ( $n = 71$  children, mean age  $7.75 \pm 1.36$ ), in which parents only received behavioural and educational counselling at baseline. All children were tested in a pre- and post-test comparison for behavioural and emotional problems (Child Behavior Checklist [CBCL]; Döpfner et al., 2014) and selective mutism severity (Selective Mutism Questionnaire [SMQ]; Bergman et al., 2008). The results for the interactional effects group  $\times$  time revealed a significant reduction in CBCL levels in the group who received individual psychomotor interventions in regard to social relationships and anxiety/depression, as well as social and overall problems ( $p < 0.001$ ), withdrawal ( $p > 0.007$ ), internalization problems ( $p > 0.020$ ), in the SMQ score ( $p < 0.001$ ) and in the severe mutism symptoms in all situations (school:  $p > 0.005$ ; family:  $p > 0.02$ ; social:  $p > 0.05$  situations, when compared to the control condition.

Two pilot intervention studies with a pre- and post-test design examined whether a PMT intervention lasting six months had a positive effect: Amft et al. (2013) tested SEC outcomes in five- to nine-year-old children ( $N = 46$ , of whom 38 were boys, with a mean age of 6.11 years) with the SEC Intelligence and Development Scales (IDS; Grob et al., 2009). The results revealed an improvement in SEC after 20 PMT sessions in the pre- and post-test comparison ( $p > .001$ ). A mixed-methods pilot study (Ruploh et al., 2013) evaluated whether a psychomotor intervention in preschool children would improve their self-concept development in the areas of perception, social-emotional skills, and motor skills. The children ( $N = 14$ , mean age 5.4, seven boys/seven girls) were asked to self-report and fill out a standardized questionnaire (Frankfurt children self-concept scales [FKSI]; Deusinger, I. M.) and their parents and educators were interviewed. The pre- and post-test comparison showed positive changes in several FKSI self-concept scales (anxiety, self-confidence, moral orientation/self-esteem) and no changes in other subscales (self-assertiveness/assertiveness, appreciation by others, and contact and amiability). Most statements by parents and educators were in the

positive range and concerned the children's physical performance and confidence.

Another study with an individual crossover design compared the efficacy of a PMT sensorimotor training over four months (20 sessions) in comparison to cognitive behavioural therapy in 12 children diagnosed with attention deficit hyperactivity disorder (ADHD) (Banaschewsky et al., 2001). PMT slightly improved sensorimotor coordination, whereas cognitive behavioural therapy (CBT) enhanced cognitive impulse control. Hyperactivity and concomitant anxiety-depressive or aggressive symptoms were significantly ameliorated by sensorimotor training, but not by CBT.

A quasi-experimental intervention study with a control group and a pre- and post-test design evaluated the effectiveness of the 10-week psychomotor prevention programme *Bewegungsbasiertes Programm zur Förderung von emotionalen und sozialen Kompetenzen (BESK)*, an exercise-based programme to promote emotional and social skills when starting school (Widmer et al., 2022). The programme was evaluated in 12 classes (six intervention classes, six control classes,  $N = 213$ ) in terms of prosocial behaviour by means of the teachers' evaluations (Strength and Difficulties Questionnaire [SDQ-L]; Goodman, 2001). The results showed an improvement in prosocial behaviour with an effect size of  $d_{\text{korr}} = 0.30$ , and the interaction between group and time revealed a significant effect ( $p < 0.05$ ).

An intervention study investigated body experience in children with mild intellectual disabilities (ID) ( $N = 31$ , eight to 12 years old, mean  $[M] = 9.9$ , standard deviation  $[SD] = 1.3$ ) with or without externalizing disorders (Emck et al., 2012). The results found that 41% of the children demonstrated problems in body experience, measured by the *PsyMot* diagnostic procedure (Emck & Bosscher, 2010) and body experience questionnaire. These issues were significantly higher in children with ID and externalizing disorders compared to those with ID only. PMT seemed particularly important for children with ID who also showed behavioural problems.

The proof of the efficacy of intervention is important in legitimizing the use of public funding (Gesundheitsforum Schweiz, 2019). However, PMT still lacks more RCTs to increase the knowledge regarding its efficacy. This pilot RCT aimed to address this gap and evaluated the outcome of a PMT group intervention in children who were referred to PMT by their teachers because of social-emotional and behavioural problems.

#### **Purpose of this study**

This pilot RCT was part of a mixed-methods study that combined the multi-centred RCT with a pre- and post-test design and a qualitative descriptive element, which will be reported elsewhere (Bräuninger et al., 2023). The group setting promotes frustration tolerance, independence, curiosity in other children (Aichinger & Holl, 2010), and structure and flexibility (Köckenberger, 2016). The use of material (pedalos, roller boards, swing cloths, trampolines, etc.) requires the ability to adjust (Zimmer, 2019). Play interventions reflect children's imaginary world (Seewald, 2007), movement experiences foster self-confidence, self-concept, and self-awareness (Fischer, 2019), and perception exercises promote mindfulness in oneself and others (Chermette, 2021).

The present paper focuses on the following research question: is PMT an effective therapy for treating social-emotional and behavioural problems in primary school children (in the first and second grades)? The following hypotheses were tested:

**Hypothesis 1.** SEC in the PMT intervention group (IG), but not in the wait-listed control group (WG), improved from pre-test t1 to post-test t2 as a short-term effect of PMT.

**Hypothesis 2.** Behavioural problems in the IG, but not in the WG, improved from t1 to t2 as a short-term effect of PMT.

<sup>4</sup> translated by the authors

## Method

### Recruitment

Headteachers in German-speaking Swiss cantons were informed about the research and asked to support this study. School psychomotor therapists and teachers notified the parents of those children who met the inclusion criteria.

### Inclusion criteria for children

- The study participants were primary school children (in the first and second grades)
- Children with social-emotional needs and/or behavioural problems (as assessed by teachers who enrolled these children in PMT; the children could additionally need support in psychomotor areas)
- Written consent from parents/legal guardians
- Verbal consent from children.

### Exclusion criteria

- Children who had received PMT or psychotherapy in the last 12 months prior to this study.

### Inclusion criteria for psychomotor therapists.

- Psychomotor therapists needed to have a BA in PMT or be in their last year of PMT BA studies.

### Randomization

After written informed consent was obtained from the parents/legal guardians, the children were randomly assigned by the project management to either the IG or WG. Before they were tested, the children were asked for their verbal consent to participate in this study.

### Data collection/instruments

All children (both groups) and their parents/legal guardians were tested at pre-test t1 and post-test t2 (approximately five months after t1). The data collection took place between 08/2020 and 03/2022.

**Social-emotional skills:** The functional domain SEC of the IDS-2 (Grob & Hagemann-von Arx, 2018) was used to assess social-emotional skills. The three SEC subtests involve viewing photos/pictures and hearing stories, administered by the test leaders: (1) identifying emotions (recognizing and naming emotions in 10 photos based on the primary facial expressions of joy, sadness, anger, fear, surprise), (2) regulating emotions (stating emotion regulation strategies for negative emotions including anger, fear and sadness) and (3) socially competent behaviour (naming socially competent behaviour shown in pictures of social situations where a story has been told about them). IDS-2 studies are available regarding the different language versions and on the construct, criterion, and differential validity. The SEC's confirmatory factor analysis and intercorrelations in the norm sample found low correlations between the subtests ( $r = .25-.41$ ), but high correlations of subtests with a total score of SEC ( $r = .65-.84$ ).

**Behavioural problems:** The CBCL/6–18 R (Döpfner et al., 2014) is a standardized assessment to be completed by parents/legal guardians. It includes 113 items covering behavioural and emotional problems in children and adolescents aged six to 18 years (scored on a three-point Likert scale where 0 = absent, 1 = occurs sometimes, 2 = occurs often). The CBCL contains eight narrow-band syndromes (anxious/depressed, withdrawn/depressed, somatic complaints, and social, thought, and attention problems, as well as rule-breaking and aggressive behaviour) and three broadband scales (internalizing, externalizing, and total problems). The internalizing problems include anxious/depressed,

withdrawn/depressed, and somatic complaints. The externalizing problems consist of rule-breaking behaviour and aggressive behaviour. The total problems encompass internalizing and externalizing, social, thought, and attention problems. Further data analysis allows for an assessment of conspicuous/inconspicuous in relation to the three broadband scales: for these scales, a T-score above 63 is in the clinical range, while scores from 60 to 63 are defined as the transitional range.

### Intervention

The IG received in total 14–15 group PMT sessions in the PMT room in the respective school of the therapists (one hour/45 min per week over four months). The WG received group PMT after post-test t2 for approximately the same length (four months). So far, no studies or evidence-based manuals exist regarding the efficacy of specific PMT interventions for promoting SEC and reducing behavioural problems. Therefore, the therapists had the freedom to apply different approaches, methods, and techniques and to conduct the groups in the way they decided was best for the groups' needs. To document the PMT interventions they applied and evaluate which might be successful, they were asked to record their interventions after each session in the intervention checklist PMT (the categories included, for example, the materials used, plays applied, movement and perception experiences, creative and arts-based interventions employed, therapeutic attitudes, leading styles, etc.) (Bräuninger et al., 2023).

### Statistical analysis

The IBM SPSS Statistics version 28.0.1.0 was used for the data analysis. Due to the distribution of the data, a non-parametric procedure was administered for the data analysis. To compare results from the pre- and post-tests in both groups, the Wilcoxon test was applied. The level of significance was set at  $p > .05$ .

### Procedure

Five female psychomotor therapists from five Swiss primary schools (German-speaking cantons) participated in this study (four with BA degrees and one BA PMT student in her final year). They conducted six IGs with two to eight children per group. The PMT group included IG children and some who did not participate in this research. At t1 and t2, test leaders from the university administered the IDS-2 SEK to all recruited children at the school on site. At the same time, parents/legal guardians were asked to complete the CBCL questionnaire.

### Demographics

Primary school pupils (first and second grade) and two children in kindergarten took part in this research. The kindergarten children were able to attend because of their age. The project management randomized the participating children ( $N = 33$ ) into the IG or WG. Five children had to be excluded from the data analysis: two had received PMT prior to this study, one dropped out, and two children were randomized into the WG, but after group allocation their parents wanted them to start PMT immediately. The Consolidated Standards of Reporting Trials (CONSORT) flow diagram shows the enrolment of participants, their allocation to treatment, and data analysis (see the CONSORT flow diagram). The final sample consisted of 28 children ( $M_{age} = 7.55$  years,  $SD = 0.78$ , 20 boys), including the IG ( $n = 15$ ,  $M_{age} = 7.62$  years,  $SD = 0.91$ ) and WG ( $n = 13$ ,  $M_{age} = 7.47$  years,  $SD = 0.63$ ; see Table 1). Diagram 1.

## Results

### Descriptive statistics for social-emotional skills and behaviour problems

The results revealed that on the total SEC scale of the IDS-2 SEK,

**Table 1**  
Gender, age, and school grades of children.

		PMT intervention group (IG)	Wait-listed control group (WG)
n		15	13
gender	male	11	9
	female	4	4
school grade	second grade	8	8
	first grade	5	5
	kindergarten	2	0
age	M (SD)	7.62 (0.91)	7.47 (0.63)

59.3% of all the children scored in the average range, 37% had a score classified as below average (T-value < 40), and one child was in the above-average range (3.7%) at t1. In the post-test t2, 78.6% of all the children reached a score in the average range, 14.3% below and 7.1% above average.

According to the parents' CBCL assessment at t1, the results furthermore disclosed that 48% of all the children scored higher than 63 (clinical range), 4% scored between 60 and 63 (transitional range), and approximately 48% scored below 60 (normal range) in relation to internalizing problems. About 20% children scored in the clinical range in regard to externalizing problems and 32% regarding total problems. At t2, the score of some children improved from the clinical range to the transitional or even normal range (see Fig. 1).

**Pre- and post-test comparison of social-emotional skills: Table 2**

shows the pre- and post-test comparison in the social-emotional competencies of the IDS-2 SEK: the IG and WG were comparable at t1. Children from both groups significantly improved in their SEC total scores at t2 compared to t1, and the scores progressed more in the IG (IG:  $z = -2.867, p < .001, n = 14$ ; WG:  $z = -2.364, p = 0.008, n = 13$ ). The effect sizes in both groups were large effects, whereas the effect was larger in the IG ( $r = .74$  vs.  $r = .66$  in the WG). The IG increased significantly at t2 in the subtest related to socially competent behaviour (mean deviation  $Md = 57.00$ ) compared to t1 ( $Md = 50.00$ ) ( $z = -2.217, p = 0.013, n = 14$ ), whereas the scores of the WG did not change significantly at t2 compared to t1. The significant improvement in the IG had an effect size of  $r = .57$ , which is defined as a large effect, according to Cohen (1988). Hypothesis 1 can thus be confirmed.

**Pre and post-test comparison of behavioural problems:** The IG and WG differed at t1 regarding behavioural problems, though the difference was not significant: the WG had higher baseline values ( $Md = 64$ ) than the IG ( $Md = 58$ ). Table 3 shows the results of the Wilcoxon test on behavioural problems. The WG parents reported a significant decrease in total problems ( $z = -2.316, p = 0.012, n = 10$ ) and internalizing problems ( $z = -2.214, p = 0.016, n = 10$ ) at t2 compared to t1. The IG parents also reported improvements, but these were not significant. Hypothesis 2 cannot be confirmed because it states that behavioural problems in the IG but not in the WG improve from t1 to t2 as a short-term effect of PMT.

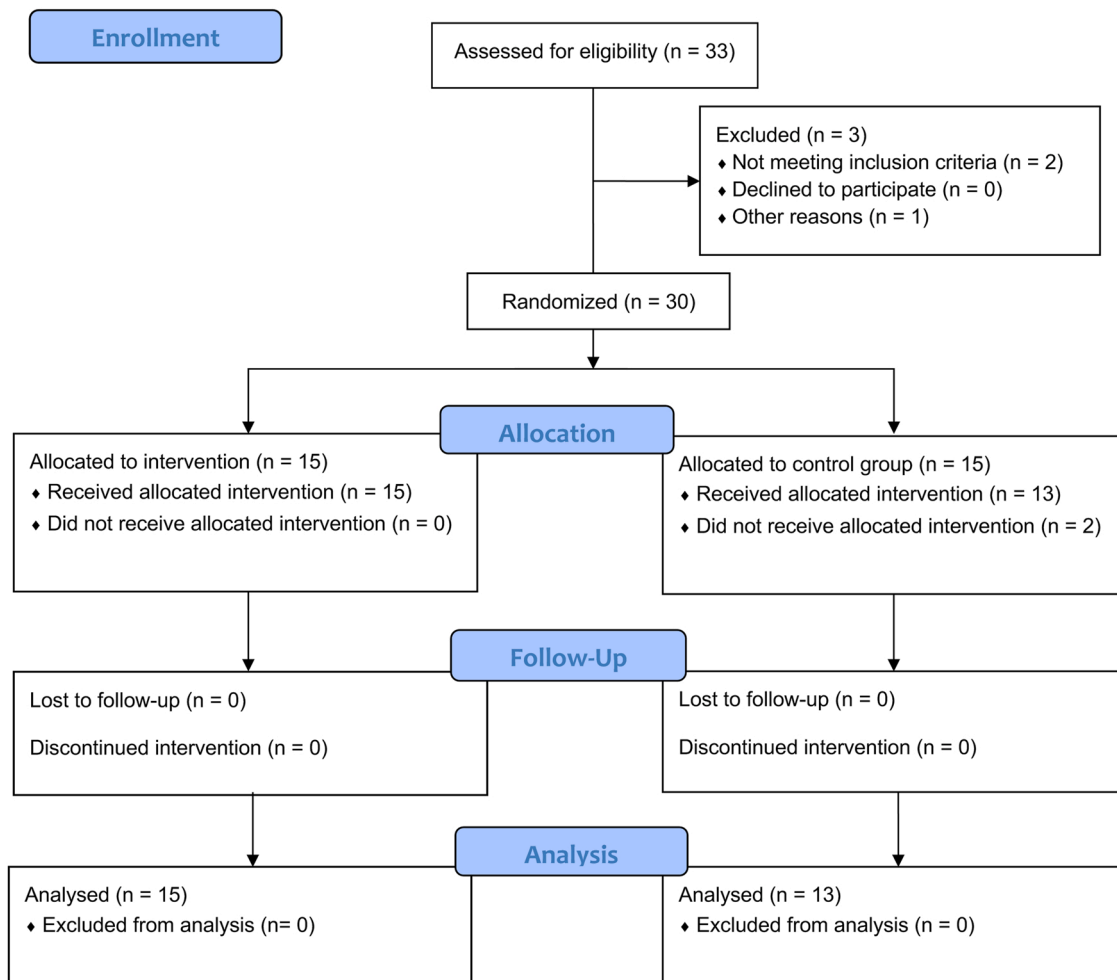


Diagram 1. - .

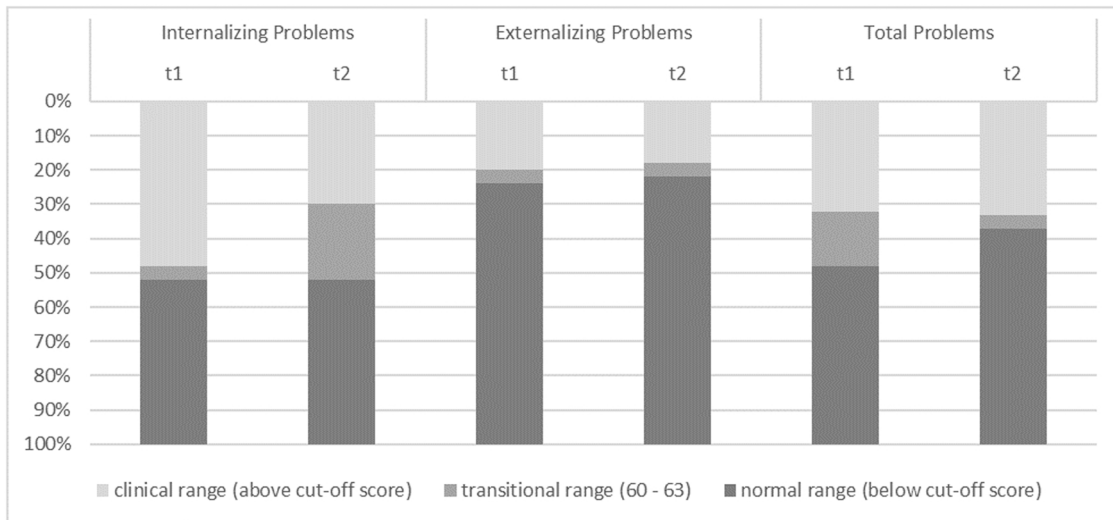


Fig. 1. Internalizing, Externalizing and Total Problems: clinical, transitional and normal range and at t1 (n = 25) and t2 (n = 27).

Table 2

Results of pre–test–post–test comparison (Wilcoxon-test) on social-emotional skills (IDS-2 SEK) in children.

	PMT Intervention group (IG) (n = 15)					Wait-listed control group (WG) (n = 13)				
	Pre t1	Post t2	Z-value	p	r	Pre t1	Post t2	Z-value	p	r
IDS-2 EI	Md (IQR) 43.00 (10)	Md (IQR) 50.00 (7)	-1.364	0.087		Md (IQR) 48.50 (14)	Md (IQR) 48.50 (6)	-1.56	0.064	
IDS-2 ER	40.00 (18)	53.00 (14)	-1.016	0.165		43.00 (17)	53.00 (20)	-0.534	0.314	
IDS-2 SCB	50 (14)	57.00 (9)	-2.217	<b>0.013 *</b>	.57	48.50 (11)	48.50 (14)	-1.621	0.057	
IDS-2 SEC	44.45 (13.06)	55.56 (13.06)	-2.867	<b>&lt; .001 *</b>	.74	42.78 (16.81)	48.89 (16.53)	-2.364	<b>0.008 *</b>	.66

Note. EI = Identifying Emotions, ER = Regulating Emotions, SCB = Socially Competent Behaviour, SEC = Social-Emotional Skills (Total); \* p < 0.05.; r = effect size (0.1 = small, 0.3 = medium 0.5 = large according to Cohen, 1988).

Table 3

Results of pre-post comparison (Wilcoxon-test) on behavioural problems in children (assessed by parents).

	PMT Intervention group (IG) (n = 15)					Wait-listed control group (WG) (n = 13)				
	Pre t1	Post t2	Z-value	p	r	Pre t1	Post t2	Z-value	p	r
CBCL INT	Md (IQR) 63.00 (20)	Md (IQR) 60.00 (17)	-1.335	0.097		Md (IQR) 68.00 (23)	Md (IQR) 63.50 (21)	-2.214	<b>0.016 *</b>	.61
CBCL EXT	50.00 (19)	52.00 (15)	-.196	0.431		55.50 (12)	53.50 (17)	-.218	0.406	
CBCL TOTAL	58 (19)	58.00 (17)	-1.157	0.134		64.50 (21)	61.00 (21)	-2.316	<b>0.012 *</b>	.64

Note. INT = Internalizing Problems, EXT = Externalizing Problems, TOTAL = Total Problems; \* p < 0.05.; r = effect size (0.1 = small, 0.3 = medium, 0.5 = large, according to Cohen, 1988).

Discussion

The most important finding of this RCT is the positive result in the IG group regarding the improvement of SEC from t1 to t2. This finding can be interpreted as a significant improvement in children’s knowledge of socially competent behaviour because of a four-month PMT group intervention. This intervention has thus proven to be effective.

Social-emotional skills

In line with the first hypothesis, the results revealed that children from the IG improved their capacity to identify socially competent behaviour. Thus, PMT seems to be effective in improving SEC and social competent behaviour and supporting children’s “... availability and application of cognitive, emotional and motor behaviours that can lead to a long-term favourable relationship between positive and negative consequences in interpersonal situations ...” (Hogrefe., 2023). These findings are in accordance with the efficacy of PMT regarding SEC in primary school children (Amft et al., 2013; Moschos & Pollatou, 2022;

Ruploh et al., 2013), as well as those exposed to risk factors (Catalano et al., 2002), or diagnosed with ADHD (Banaschewsky et al., 2001) where sensorimotor training significantly improved aggressive symptoms, in preschool children with ASD (Frazão et al., 2021) and in children attending a psychomotor class prevention programme (BESK) (Widmer et al., 2022). The results of this RCT consolidate these previous findings. PMT seems to play a valuable role in empowering children to recognize social situations and act in a socially competent manner. In the long run this might prevent negative consequences in interpersonal situations and reduce the risk of delinquency, substance abuse, and psychopathologies in the future (Hogrefe., 2023).

Behavioural problems

Other than expected, the WG parents rated their children’s improvements from t1 to t2 in internalizing and total problems significantly more highly than the IG parents. The IG also showed improvements in internalizing problems, but these values were not significant. These findings contradict the positive results of the PMT RCT

in children with selective mutism, who improved in several CBCL scales at t2 compared to children who did not receive PMT (Esposito et al., 2017). However, a comparison between the two RCTs can only be made with caution because the designs differ significantly in terms of indication (our RCT: non-diagnosed primary school children versus children diagnosed with selective mutism), duration and frequency of treatment (our RCT: once a week over four months versus 3x a week over six months), and treatment setting (our RCT: group versus individual setting). The significant improvement in the WG could also be due to a regression to the mean from t1 to t2, since some children in the WG started with very high values (clinical range) for internalizing problems at t1.

On the one hand, this RCT found that IG children improved their knowledge regarding SEC and socially competent behaviour, as noted by the test leaders. On the other, there was no effect of PMT on behavioural problems as reported by the parents. One explanation could be that parents believed that treatment would only take place if problems were described as serious. An obvious explanation may be that reports by test leaders are more objective, as test leaders perform many ratings and thus have a basis for comparison, while parents only rate their own children. A possible reason for this phenomenon could thus be that the children at t2 learned SEC more easily and quickly, but that knowledge concerning SEC was not reflected in parents' assessment of their children's behaviour at t2. The transfer of knowledge relating to SEC might take longer to become obvious in behavioural changes at home or may not necessarily correlate with behaviour. Future studies could either focus on teachers' or parents' assessments. Furthermore, a participatory approach could be used that includes the children's reflection on PMT, and their valuation of their personal changes in social-emotional and behavioural competencies.

The qualitative part (Bräuninger, et al., 2023) revealed which PMT interventions therapists used during the 13–15 sessions: most often therapists checked rule games, movement tasks, body perception, concentration exercises, self-awareness interventions, promoting familiarity/openness/group cohesion, reflective and situationally adaptive therapeutic attitude, and structuring leadership style in the *intervention checklist PMT (ICL-PMT)*. These interventions might correlate with children's improved knowledge at t2 regarding SEC and socially competent behaviour. Least often therapists mentioned movement stories, creative and artistic interventions, psychodrama, relaxation techniques and an explorative leadership style which might correlate with the result that the treatment group didn't show significant improvement in behavioural problems at t2. Future studies could evaluate, if a more explorative, emotion and artistic focused PMT approach could impact behavioural, and especially internal problems more positively. The inclusion criteria for participating in this RCT included children who exhibited social-emotional or behavioural problems according to their teachers' perceptions. A moderating finding of this study is that approximately 50% of all children at t1 could be considered (sub-)clinically conspicuous, according to the CBCL internalizing problems scores and approximately 20% in terms of externalizing problems. This figure seems alarming, although scores in the WG improved at t2. This shows a deviation in the parent-teacher assessment of social-emotional problems and behavioural problems.

Five out of 10 children in this RCT with social-emotional and behavioural problems were already in the sub-clinical area. The question arises as to whether that ratio could be an indication that children who are signed up for PMT are often in sub-clinical or clinical areas. It is recommended that this question be systematically examined in the future. The following considerations are proposed for discussion:

1. Before enrolling children for PMT, a preceding triage/assessment could evaluate whether children already show problems in (sub-)clinical areas. Such a process could protect psychomotor therapists and teachers from becoming overburdened and could detect children in (sub-)clinical areas who need more specific treatment.
2. The perspective of parents should be included to counteract possible parental misunderstandings.
3. As a result, a triage process could strengthen the role of PMT in the school setting as it would clarify its indication for therapy, different settings, and PMT-specific interventions. The best evidence-based practices for children with SEC needs and behavioural problems could be provided as a result.
4. The treatment duration might be indicative of different treatment objectives. As shown in this study, a short-term group treatment over four months seems to be effective for the improvement of SEC. To improve behavioural problems in sub-clinical range, a different intensity and duration seems to be necessary to provoke changes.

PMT in Switzerland is included in the school setting, which represents a great chance for reaching all children in need of PMT. The results of this study show that children improved their SEC through PMT offered in school. The Swiss example might serve as a model to other European countries to offer movement-based therapies such as PMT in school. Future studies are needed to expand knowledge of what duration, which frequency, and what PMT interventions are most effective for children with behavioural problems.

### Limitations

This study faced some limitations. The Covid pandemic caused a wave of cancellations from therapists who originally had agreed to take part in this study, but whose treatment procedures had changed due to the pandemic so that they had to withdraw at short notice. This resulted in an extended recruitment process, which had to be closed in 03/2022 with the small sample of N=28 participating children and four PMT groups that were sometimes only attended by two children. The results therefore only allow for making limited statements on the efficacy of PMT, as the interaction effects could not be calculated directly between the IG and WG from t1 to t2. The PMT interventions were recorded after each session by all the participating five therapists (Bräuninger, et al., 2023), but due to the small sample size no correlations to quantitative results were possible, i.e., no tendencies for more or less successful interventions can be derived. Other limiting factors were the absence of a second control intervention (placebo treatment) and that parents were not blinded to the grouping of their children. Future investigations could address these limitations.

### Conclusion

The findings suggest that a four-month PMT intervention in school will lead to an improvement of children's knowledge of socially competent behaviour. Approximately half of the children already showed a sub-clinical range at the pre-test t1, while the short-term treatment could be too limited to cause behavioural changes in such a brief treatment period. The question arises whether that ratio (50%) could be an indication that children who are signed up for PMT are often in sub-clinical or clinical areas. It is recommended that this question be systematically examined in the future.

### Informed consent

Informed consent was obtained from children and their parents/legal guardians.

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## Declaration of Competing Interest

The authors have no competing interests to declare.

## Data Availability

The data that has been used is confidential.

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