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Integrating Movement, Emotion and Cognition: A Meta-Analysis of the Effectiveness of Movement-Based Interventions for Motor Skills, Social-Emotional Learning, and Mental Health

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ABSTRACT

Objective **This meta-analysis investigated the effectiveness of movement- and body-oriented interventions as applied by psychomotor therapy and identified practice-relevant implications.**

Methods **A systematic literature search adhering to PRISMA guidelines was conducted across EBSCOhost databases. Studies involving movement-based interventions for participants aged 2–18 years were included, yielding 68 studies with 6,396 participants from 22 countries. Effect sizes were calculated using Wilson's bias-corrected d values and weighted for sample size. Heterogeneity was assessed via Q-statistics and I^2, with a random-effects model applied where appropriate.**

Results **The overall weighted mean effect size was $d_w = 0.59$ (95% CI [0.51, 0.67], $p < .001$), indicating a moderate, statistically significant impact. Substantial heterogeneity ($Q = 5294.84$, $p < .001$; $I^2 = 97.23\%$) supported the use of a random-effects model. Moderator analyses showed differential effects across outcome domains, with strong effects for motor skills ($d_w = 0.757$), self-management ($d_w = 0.662$), relationship skills ($d_w = 0.604$), and mental problem reduction ($d_w = 0.441$).**

Conclusion **Movement- and body-oriented interventions as applied by psychomotor therapy demonstrate moderate, practically significant effects, particularly for motor skills, social-emotional learning, and mental health. Tailoring interventions to participants' needs, integrating cognitive components, and ensuring professional expertise enhance effectiveness, providing a robust evidence base for psychomotor therapy and educational practice.**

Introduction

The direct impact of physical activity on physical and mental health, as well as on learning behaviour, has been extensively studied. In a comprehensive meta-analysis including 57 studies Spruit et al. (2016) reported small to moderate overall effects of physical activity on the reduction of internalising and externalising problems such as anxiety and depression or aggressive behaviour, as well as improvements in self-concept and academic performance among adolescents. Similarly, Haverkamp et

al. (2020) demonstrated in their meta-analysis that physical activity can enhance cognitive outcomes – particularly executive functions – and academic achievement in adolescents. These findings are consistent with more recent evidence suggesting that physical activity positively contributes to children's emotional regulation, attention, and social interaction, particularly when embedded in structured educational settings (Donnelly, et al., 2016; Singh, et al., 2019). Kemel, Porter, and Coombs (2022) examined the effects of movement-based interventions on physical and mental health, as well as social well-being, and consistently reported positive outcomes. In addition, qualitative findings revealed substantial evidence for the beneficial effects of group movement activities on individuals perceived social connectedness. These positive effects of physical activity on mental health are evident not only in adolescents but also in children. In a review of 23 studies, Hale et al. (2023) found clear evidence supporting the improvement of psychological well-being, including quality of life, body image, and self-esteem, through physical activity in children.

Previous reviews on the influence of movement-based interventions on psychosocial outcomes have focused almost exclusively on *movement* in the sense of *physical activity* (Spruit, et al., 2016; Kemel et al., 2022; Hale et al., 2023). However, this perspective captures only a limited aspect of what movement can entail. Psychomotor approaches expand this perspective by conceptualising movement not merely as physical exertion but as an integrated form of experience that engages sensorimotor, affective, and social-cognitive systems simultaneously (Payne & Crane-Godreau, 2015). Emerging from two main directions – movement-oriented approaches rooted in physical education and body-oriented approaches also referred to as body-oriented psychotherapy – psychomotor therapy adopts a broader understanding of movement, which encompasses not only physical activity but also body-oriented interventions centred on the immediateness of bodily, emotional and perceptive experiences (Röhricht, 2009; Emck & Scheffers, 2019). Psychomotor interventions are designed with an awareness of the dynamic interplay between cognitive processes (including perception, thinking and knowledge acquisition), affect, and behaviour. As such, these psychomotor interventions aim to promote not only motor development, but also aspects of socio-emotional development such as self-awareness, emotional regulation, and social competence through embodied experiences. By framing movement as a medium for self-experience, expression, interaction, and therapeutic change, psychomotor therapy offers a holistic approach to understanding and supporting psychosocial development.

To date, Moschos and Pollatou's (2022) work represents the only review specifically examining psychomotor interventions. In their study, they identified twelve research projects that implemented psychomotor intervention programmes aimed at supporting various areas of child development within a universal preventive framework. Psychomotor intervention was defined as a "treatment that uses body awareness and physical activity to solve problems" (Moschos & Pollatou, 2022). Overall, the authors report positive effects of these programmes on motor skills, as well as on emotional and academic development. However, the limited number of studies and the considerable methodological heterogeneity among them constrain the ability to draw nuanced or generalisable conclusions regarding their effectiveness. The authors thus demonstrate a well-known challenge in research on psychomotor therapy: despite the good theoretical foundation, psychomotor therapy as an educational-therapeutic approach and special educational discipline lacks evidence of effectiveness, which is increasingly required for its legitimisation and professionalisation (Gasser-Haas & Steiner, 2022).

This meta-analysis contributes to closing this research gap by including both studies explicitly labelled *psychomotor* or *psychomotor therapy* and movement- and body-oriented interventions that could be applied in the context of psychomotor therapy.

Interventions were considered for inclusion only if they met specific criteria, which are grounded in the definition of psychomotor therapy as applied in the German-speaking part of Switzerland. As a special educational discipline in the Swiss education system, psychomotor therapy offers a low-threshold support for children with developmental delays, difficulties or impairments in the

social, emotional, motor, cognitive, and/or sensory areas and their interactions (EDK, 2023). These are typically combinations of affective, social and/or motor difficulties (Widmer & Bräuninger, 2020; Amft & Amft, 2003).

In psychomotor therapy, self-activity and the individual meaningfulness of actions are central, always emphasising the inclusion of physical dimensions (Fischer, 2019, S. 48 f.). Movement is viewed both as a reflection of inner experience that can be seen as a self-expression or as a symbolic representation that can be leveraged as a tool for psychomotor intervention. Movement also includes playful and creative activities. This functional-aesthetic perspective on movement is particularly relevant in school settings, where emotional, behavioural, and cognitive learning processes are interwoven with embodied interaction (Lobo & Winsler, 2006). This creates possibilities for experience that enable or stimulate learning and change processes in various areas of development and education.

To categorise and differentiate the various effects achieved in and through movement, the theoretical model proposed by Thimme, Deimel, and Hölter (2021) for movement therapy in child and adolescent psychiatry provides a valuable framework. This model distinguishes three types of effects: functional-instrumental effects, buffer effects, and mediator effects. Functional-instrumental effects describe the physical impact of movement, such as increased physical resilience or improvements in motor skills. Buffer effects refer to the ability of physical activities to create “islands of normality” within otherwise challenging everyday lives. Such experiences can serve as entry points for engaging with difficult issues in the first place. Mediator effects, in turn, denote changes and developments that extend beyond the physical level, particularly in the emotional and social domains. These include not only symptom-specific improvements but also broader aspects of personal stability, such as enhancements in self-concept.

This conceptualisation aligns particularly well with pedagogical and therapeutic interventions such as psychomotor therapy that likewise aims to achieve effects across all three levels, with a particular focus on the mediator dimension. To operationalise these mediator effects in a comparable manner, the present study draws upon the model of Social and Emotional Learning (SEL). This framework, developed by the Collaborative for Academic, Social, and Emotional Learning (CASEL, 2023), defines five interrelated domains: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. Each domain encompasses competencies that reflect the interaction of cognitive (including perception, thinking and knowledge acquisition), affect, and behavioural processes (Durlak, et al., 2011). For interventions to be effective at the behavioural level, all three components must be addressed (Durlak et al., 2011). This integrative understanding is characteristic of psychomotor therapy, which seeks to harness the embodied interplay between movement, cognition, and emotion.

Building on these foundations, interventions within psychomotor therapy may be characterised as follows:

- movement activities combined with cognitive or behavioural elements, meaning that physical activity (e.g., movement games, exercise, mindfulness in movement) is complemented by reflective tasks and/or direct instruction, feedback or consequences;
- movement in a broader sense, combined with cognitive or behavioural elements. This encompasses the expanded understanding of movement and body orientation and includes playful and creative activities (e.g., role play, expressive arts) also integrated with reflective tasks and/or direct instruction, feedback or consequences.

The aim of the present meta-analysis is to examine the effectiveness of movement-based and body-oriented pedagogical and therapeutic interventions – as applied by psychomotor therapy – in enhancing motor skills, physical and mental health, academic achievement, and social-emotional competencies in children and adolescents, with a particular focus on the school context. Psychomotor therapy has previously been characterised as a combination of movement- and body-oriented approaches (Emck & Scheffers, 2019); the present study expands this conceptualisation by integrating cognitive and behavioural methods as core features of psychomotor therapy.

Method

Literature Search

The principles of the PRISMA guidelines were applied in conducting this systematic review. Relevant studies were identified through a search conducted via EBSCOhost across the databases ERIC, PsycInfo, Psyndex, Medline, and Education Source. Search terms in German, English, and French were used to increase the yield of relevant results. The terms *Wirksamkeit* (efficacy), *Entwicklung* (development), *Körper* (body), and *Zuwendung* (intervention), combined using AND were used in the search strategy. This operationalisation enables the inclusion of relevant studies on movement-based interventions from the broader field of educational and therapeutic approaches, given that only limited research specifically focused on *Psychomotoriktherapie* can be expected. The specified search terms were operationalised as follows:

Wirksamkeit (efficacy): Einzelfallstudie OR case study OR étude de cas OR Single-Case OR experiment* OR expériment* OR RCT OR Metaanalyse OR Meta-analysis OR Méta-analyse OR controlled OR kontrolliert* OR contrôlé
AND Befund OR Finding OR Ergebnis* OR result* OR résultat OR Effekt OR effect* OR effet OR Wirksamkeit OR effectiveness OR efficacité OR Evidenz OR evidence OR évidence OR preuve

Entwicklung (AV) (development, DV): emotional* OR émotionnel*OR social* OR sozial* OR attention* OR Aufmerksamkeit* OR executive functions OR Exekutive Funktionen OR fonctions executives OR sensorics* OR sensorial* OR Sensorik

Körper (body): motor* OR motricité OR motor development OR motorische Entwicklung OR développement moteur OR body OR Körper OR Leib OR corps OR clumsiness OR motorische Ungeschicklichkeit OR maladresse OR impulsive OR impulsiv OR impulsif OR hyperactive OR hyperaktiv OR hyperactif OR sluggish OR träge OR léthargique OR movement OR mouvement OR Bewegung

Zuwendung (UV) (intervention, IV): intervention OR prevention OR Prävention* OR prévention OR program* OR manual OR manuel*OR therapy OR thérapie OR Therapie

Inclusion and Exclusion Criteria

Studies were included if they were intervention studies that examined developmental outcomes in relation to the factor of *intervention*. Both the terms *body* and *development*, as previously operationalised, had to be addressed through the intervention, and the sample population had to fall within the age range of two to eighteen years. Only studies published in German, English, or French were considered.

Studies were excluded if, based on the consensus of the author team, they were deemed not relevant to the research question. This applied, for example, to animal-assisted interventions, parent-only training programmes, behavioural or psychotherapeutic interventions without a movement component, as well as music therapy interventions lacking active client participation. These approaches typically employ specific settings and methods that are not characteristic of pedagogical-therapeutic practices.

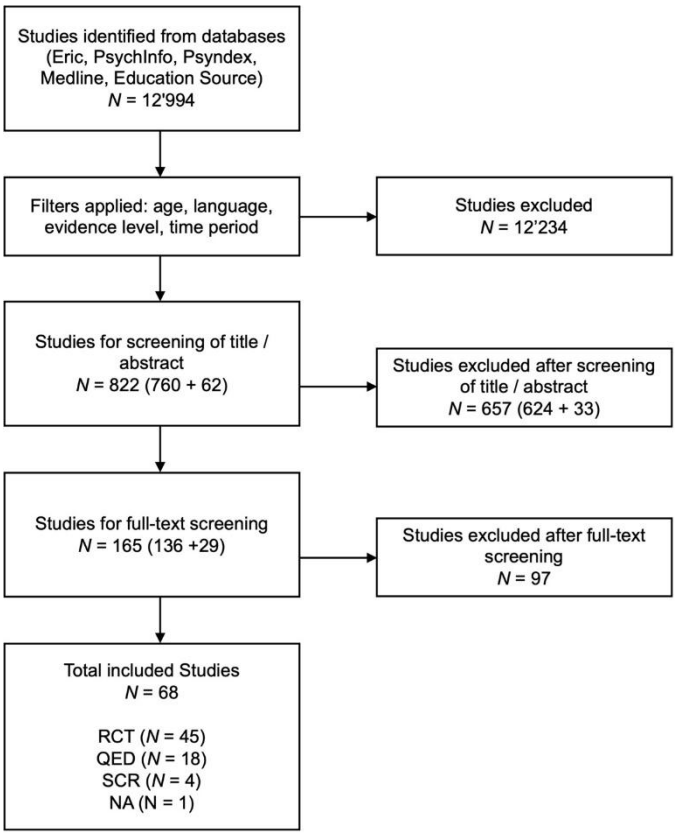

Figure 1 *Flow Diagram of Study Selection*

The initial search conducted on 13 January 2022 without filters yielded 12,994 results. Subsequently, the following

filters were applied: *age* (2–18 years), resulting in *N* = 2,717; *language* (German, English, French), *N* = 2,644; *evidence level* (peer-reviewed; evidence level II: quantitative data), *N* = 844; and *publication period* (2002–2022), *N* = 760. These 760 studies were randomly distributed among the author team for title and abstract screening. For 25% of the studies, screening was conducted independently by two members of the author team. This process resulted in 136 studies being selected for full-text screening, which followed the same procedure. Studies were excluded if they did not meet the inclusion criteria and had not yet been eliminated by the filters or if they were not relevant to the research question according to the consensus of the author team.

An additional literature search was conducted on 31.01.2024 to include more recent publications. Furthermore, the search was expanded to cover discipline-specific journals that are not indexed in the databases searched. The following journals were additionally examined: *The Arts in Psychotherapy, Prävention und Gesundheitsförderung, Children, Motorik*. The supplementary literature search identified an additional 29 studies for full-text screening.

Data Registration

All group comparisons identified within the included studies were recorded in accordance with PRISMA guidelines, using a coding scheme based on both content-related and methodological characteristics. The following information was documented: publication details (authors, year of publication), the research question of each study, sample characteristics (age, gender distribution, diagnoses, level of prevention, country, socio-economic status), aspects of methodological quality (design, dropout rates, blinding, pre-test differences, measurement instruments), intervention characteristics (name, number of sessions, duration, mode of delivery, setting, facilitator), as well as the dependent variables assessed. In addition, the interventions were categorised according to the previously established operationalisation of psychomotor interventions. The coding scheme, coding reliability, and a detailed list of all studies including all group comparisons are available upon request from the first author.

Outcomes were categorised based on the theoretical framework proposed by Thimme et al. (2021). The domain of functional-instrumental effects was represented by the categories *motor skills* and *physical problem reduction*. The domain of mediator effects—which was of particular interest—was categorised using the CASEL framework (2023), including the following domains: *self-awareness*, *self-management*, *social awareness*, *relationship skills*, *problem-solving skills*, *academic skills and mental problem reduction*. For each of the nine outcome categories, the effect measure, effect size, and p-value of the group comparison were also recorded.

Data Analysis

In a first step, all non-significant group comparisons were set to zero and all referenced effect measures, if not already specified in Cohen's *d* (1988), were transformed into *d* using the reported effect measures (η^2, *r*, φ) or the published primary statistics (mean, standard deviation) or using test statistics (*t*-, *F*-values). According to established conventions (Bortz & Döring, 2006), an effect size of $d < 0.2$ is considered to have no practical relevance, values between 0.2 and 0.49 indicate a small effect, between 0.5 and 0.79 a medium effect, and from 0.8 upwards a large effect.

Following the procedure for meta-analyses proposed by Wilson (2011) , all *d* values were adjusted using a bias correction for small sample sizes when calculating standardised mean differences. A weighting factor (*w*) was also calculated for each individual effect. The average effect sizes were then computed by taking the sum product of *d* and *w*, divided by the sum of *w*, and it was assessed whether these weighted average effects significantly differed from zero.

To examine the homogeneity or heterogeneity of the distribution of effect sizes, the *Q*-statistic was applied. This test determines whether the variance among effect sizes can be explained solely by sampling error (i.e., random variation), or whether substantial heterogeneity exists, indicating systematic differences between studies.

In cases where effect sizes were homogeneously distributed (non-significant *Q*-value), a fixed-effects model was used. This model assumes that all studies estimate the same true effect and that any observed

differences are due solely to random error. Effect sizes in this model are typically weighted by their precision, defined as the inverse of their variance.

Conversely, if significant heterogeneity was observed (significant *Q*-value), a random-effects model was applied. This model assumes that the true effect may vary across studies due to differences in populations, settings, or methodologies. It incorporates both within-study and between-study variance components in the weighting process, leading to more conservative estimates and wider confidence intervals.

Additionally, the analysis of heterogeneity served as a basis for moderator analyses aimed at identifying systematic sources of variation in effect sizes. These analyses examined whether specific study characteristics (e.g., study design, mode of implementation, theoretical framework of the intervention) moderated the effect sizes. Meta-regression techniques (*QM*-statistic) were used to identify potential explanatory variables for the observed heterogeneity, enabling more nuanced conclusions regarding the conditions under which interventions are effective.

Results

Description of Included Studies

A total of 68 studies (see supplement for the complete list) were included in the meta-analysis. These studies originated from 22 countries and together comprised a sample of 6,396 children and adolescents, ranging in age from 1;10 to 19;10 years (M = 101.13 months, SD = 43.64, Md = 95.5). The median sample size was 49 participants per study. Across the total sample, 36.76% were female (SD = 21.18), although the gender distribution varied considerably across studies. The number of intervention sessions ranged from 1 to 150 (M = 24.22, SD = 25.34, Md = 16), with a programme duration spanning from 0 to 44 weeks (M = 12.40, SD = 8.56, Md = 10).

The 68 studies included in the meta-analysis were conducted across a broad international spectrum, spanning six continents and 22 countries. Table 3 provides an overview of the number of studies per country. The highest number of studies originated from the United States (k = 16), followed by Switzerland (k = 6), Iran and Italy (each k = 5), and Australia and Canada (each k = 4). European countries collectively accounted for the largest share of studies (k = 22), with contributions from Germany (k = 3), France (k = 2), the Netherlands (k = 2), and several others. Studies from Asia represented a similarly substantial portion (k = 17), including Iran (k = 5), Taiwan (k = 3), and China (k = 2). African countries were represented by three studies, while two studies each originated from Brazil (South America) and Tunisia (Africa). One study, by Smith et al. (2020), included samples from both China and the United States, and is thus listed under both regions.

Eight studies (n = 1,227) explicitly targeted populations from low socio-economic backgrounds. Across all included studies, socio-economic status (SES) was classified as heterogeneous in 75% of cases (n = 51), middle in 11.8% (n = 8), and low in 13.2% (n = 9). These distributions reflect a broad range of socio-economic contexts and suggest that many studies included participants from diverse backgrounds.

With regard to the sample selection criteria, 30 studies focused on participants with diagnosed conditions (indicated), 12 addressed selective groups at risk, and 27 studies employed universal approaches without predefined inclusion criteria. The most frequently studied diagnoses were attention-deficit/hyperactivity disorder (ADHD; k = 10) and autism spectrum disorder (ASD; k = 8). Additional diagnoses included developmental coordination disorder (DCD; k = 2), emotional and behavioural difficulties (EBD; k = 4), intellectual disabilities (ID; k = 4), learning disabilities (LD; k = 3), and post-traumatic stress disorder (PTSD; k = 1). Two studies focused on children with somatic conditions. In 34 cases (50%), no specific diagnosis was reported.

A total of 45 studies used randomised controlled trial (RCT) designs, 18 followed quasi-experimental designs (QED), and 4 implemented single-case research (SCR) designs. One study did not report its methodological design. Fourteen studies included blinded data collection procedures, whereas in 53 studies no blinding was reported. In one case, the blinding status was unclear.

The interventions were delivered by various professionals. Educational-therapeutic staff were involved in 21 studies,

while teachers and trainers each implemented 12 interventions. Physical education specialists delivered the programme in 7 studies. Additional educational professionals were responsible in 4 studies, and in 6 cases, the developers of the programme themselves conducted the intervention. In 5 cases, the intervention personnel were not specified.

Most interventions (k = 37; 54.4%) were conducted in school settings. Therapeutic settings were used in 15 cases (22.1%), and 10 interventions took place in leisure or childcare contexts. In 6 studies (8.8%), the implementation setting was not reported.

The most frequently used assessment instruments included the BOT-2 (k = 14), the Strengths and Difficulties Questionnaire (SDQ; k = 12), DOF Scales for classroom observations (k = 11), the Social Skills Questionnaire (k = 10), Le Roux's Group Test for School Readiness (k = 8), and the Youth Self-Report (YSR; k = 6). Several studies also used versions of the Brunel Mood Scale (BRUMS; k = 6) and the SCBE.

Overall Effect and Participant Characteristics Influencing Effectiveness

The mean weighted overall effect size across all group comparisons (k = 318) was d_w = 0.59, indicating a moderate and statistically significant effect (95% CI [0.51, 0.67], p < .001). The test for heterogeneity yielded a highly significant result ($Q(df$ = 317) = 5294.84, p < .001), and the inconsistency index confirmed substantial between-study variation (I^2 = 97.23%). Accordingly, a random-effects model was applied.

The high degree of heterogeneity suggests that the intervention effects vary systematically across studies rather than being solely attributable to sampling error. This necessitated moderator analyses to examine contextual and conceptual factors that may account for this variability. These analyses are reported in the following sections. Table 1 provides an overview of average effect sizes disaggregated by outcome category.

Table 1

Summary of Overall Effects by Outcome Domain

Outcome Domain	*k*	*dw*	95% CI
Overall Effect	318	0.587	[0.507, 0.667]
Mental Problem Reduction	118	0.440	[0.107, 0.181]
Academic Skills	8	0.541	[0.057, 1.024]
Self-Awareness	6	1.277	[0.703, 1.852]
Self-Management	81	0.665	[0.510, 0.820]
Social-Awareness	5	0.240	[−0.383, 0.862]
Relationship Skills	32	0.612	[0.362, 0.863]
Problem-Solving Skills	1	0.834*	[−0.523, 2.192]
Motor Skills	59	0.750	[0.565, 0.934]
Physical Problem Reduction	8	0.366*	[−0.120, 0.852]

Notes. k = number of comparisons; d_w = weighted mean effect size.

* Not statistically significantly different from zero.

Age had no statistically significant effect on intervention outcomes ($QM(df = 1) = 1.49$, $p = .223$), indicating that the effectiveness of interventions was comparable across different age groups.

In contrast, significant differences emerged when comparing studies according to the presence of diagnosed conditions ($QM(df = 9) = 229.46$, $p < .001$). Interventions targeting children and adolescents with specific diagnoses such as developmental coordination disorder ($d_w = 1.17$, 95% CI [0.74, 1.61]), intellectual disabilities ($d_w = 0.86$, 95% CI [0.55, 1.16]), or emotional and behavioural difficulties ($d_w = 0.81$, 95% CI [0.42, 1.19]) yielded notably higher effects than those conducted with non-diagnosed populations ($d_w = 0.49$, 95% CI [0.39, 0.60]). Table 2 provides an overview of effect sizes by diagnostic category.

Table 2

Mean Weighted Overall Effect Sizes by Diagnosis

Indication	***k***	***d_w***	***95%* CI**
ADHD	54	0.587	[0.390, 0.784]
ASS	30	0.542	[0.269, 0.816]
DCD	11	1.175	[0.744, 1.610]
ID	24	0.857	[0.553, 1.160]
EBD	14	0.808	[0.424, 1.192]
LD	13	0.792	[0.415, 1.169]
PTBS	4	0.7648	[0.084, 1.446]
SOMATIC	7	0.329*	[−0.184, 0.843]
No Indication	161	0.495	[0.387, 0.603]
Indication	***k***	***d_w***	***95%* CI**

Notes. k = number of comparisons; d_w = weighted mean effect size. * Effect sizes not significantly different from zero. ADHD = Attention Deficit Hyperactivity Disorder, ASS = Autism Spectrum Disorder, DCD = Developmental Coordination Disorder, ID = Intellectual Disability, EBD = Emotional and Behavioural Difficulties, LD = Learning Difficulties, PTBS = Post-Traumatic Stress Disorder, Somatic = Somatic illnesses

In addition, the socioeconomic background of the study population significantly moderated effect sizes ($QM(df = 3) = 244.52$, $p < .001$). Interventions conducted with socioeconomically heterogeneous groups showed the largest effects ($d_w = 0.71$, 95% CI [0.61, 0.80]), followed by those with participants from middle-income ($d_w = 0.50$, 95% CI [0.29, 0.72]) and low-income backgrounds ($d_w = 0.23$, 95% CI [0.05, 0.40]). These findings highlight the relevance of social context for intervention outcomes and suggest that programmes implemented in mixed or more resourceful environments may offer more favourable conditions for behavioural and developmental change.

A mixed-effects model examined whether average effect sizes varied as a function of the continent in which the study was conducted. The overall test for moderation was statistically significant ($QM(df = 6) = 318.86$, $p < .001$), indicating that the effectiveness of movement-based interventions differed substantially across geographical regions. The analysis was based on 318 group comparisons and revealed significant between-study heterogeneity ($QE(df = 312) = 4090.44$, $p < .001$, $I^2 = 96.55\%$). As shown in Table 3, the highest mean effect sizes were observed for studies conducted in Africa ($d_w = 0.96$, 95% CI [0.65, 1.27]) and Asia ($d_w = 0.93$, 95% CI [0.80, 1.06]), both of which were statistically

significant and notably higher than effects observed in other regions. Studies conducted in Europe also showed significant and moderately strong effects (d_w = 0.64, 95% CI [0.50, 0.79]). In contrast, studies from North America yielded smaller but statistically significant effects (d_w = 0.24, 95% CI [0.11, 0.37]). For Australia (d_w = 0.18, 95% CI [−0.12, 0.48]) and South America (d_w = 0.20, 95% CI [−0.17, 0.57]), effects were not significantly different from zero. These findings suggest that contextual or systemic factors—such as educational infrastructure, implementation fidelity, cultural expectations, or access to support services—may influence the effectiveness of movement-based interventions across regions.

Table 3

Countries With Continent Effects

Continent Country	***k***	***d_w***	**95% CI**
Australia	**4**	**0.18***	**[-0.12, 0.48]**
Africa	**3**	**0.96**	**[0.65, 1.27]**
South Africa	1		
Tunisia	2		
Asia	**17.5**	**0.93**	**[0.80, 1.06]**
China	2.5		
Hong Kong	1		
Iran	5		
Israel	3		
Japan	1		
Pakistan	1		
Taiwan	3		
Turkey	1		
Europe	**22**	**0.64**	**[0.50, 0.79]**
Denmark	1		
Germany	3		
France	2		
Italy	5		
Kosovo	1		
Netherlands	2		
Norway	1		
Switzerland	6		
Serbia	1		
North America	**20.5**	**0.24**	**[0.11, 0.37]**
Canada	4		
USA	16.5		
South America	**2**	**0.20***	**[-0.17, 0.57]**
Brazil	2		

Notes. *k* = number of studies, d_w = weighted mean effect size. The study by Smith et al. (2020) included a sample from both China and the USA. * Effect sizes not significantly different from zero.

Influence of Methodological Quality on Effect Sizes

Several indicators of methodological quality were examined as potential moderators of effect sizes. Sample size was found to have a statistically significant influence on the magnitude of effects ($QM(df = 1) = 26.28$, $p < .001$), explaining approximately 8.72% of the between-study heterogeneity. Larger samples were associated with smaller effect sizes, as indicated by a negative slope in the meta-regression model (estimate = −0.0015, 95% CI [−0.0020, −0.0009]). This pattern is consistent with the tendency for smaller samples to overestimate effects due to sampling error or publication bias.

Study design also moderated the outcomes significantly ($QM(df = 3) = 211.07$, $p < .001$). Randomised controlled trials (RCTs) yielded a mean effect size of $d_w = 0.571$ (95% CI [0.475, 0.667]), while quasi-experimental designs (QEDs) produced higher estimates ($d_w = 0.679$, 95% CI [0.525, 0.834]). In contrast, single-case research designs (SCRs) resulted in a non-significant mean effect of $d_w = 0.239$ (95% CI [−0.157, 0.635]).

The type of measurement instrument also exerted a statistically significant influence on effect size estimates ($QM(df = 4) = 249.07$, $p < .001$). The strongest effects were observed in studies using external ratings ($d_w = 0.821$, 95% CI [0.656, 0.986]) and standardised tests ($d_w = 0.662$, 95% CI [0.551, 0.773]). Self-report measures yielded smaller effects ($d_w = 0.293$, 95% CI [0.141, 0.446]), while observation-based assessments, although suggestive of positive effects ($d_w = 0.290$, 95% CI [−0.038, 0.617]), did not reach statistical significance.

In contrast, blinding procedures did not significantly influence outcomes. The comparison between blinded and non-blinded studies yielded a non-significant moderation effect ($QM(df = 1) = 0.02$, $p = .898$), suggesting that the presence or absence of blinded assessments did not systematically bias the effect size estimates in the included studies.

These findings underline the importance of methodological design choices and measurement tools in interpreting intervention effectiveness. A summary of effect sizes by type of measurement instrument is provided in Table 4.

Table 4

Mean Weighted Overall Effect Sizes by Type of Measurement Instrument

Measurement Instrument	*k*	d_w	95% CI
Standardised Test	148	0.662	[0.551, 0.773]
External Rating	68	0.821	[0.656, 0.986]
Self-Report	77	0.293	[0.141, 0.446]
Observation	23	0.290*	[−0.038, 0.617]

Notes. *k* = number of comparisons; d_w = weighted mean effect size. * Effect size not significantly different from zero.

Influence of Implementation Modalities on Effectiveness

The professional background of the individuals responsible for delivering the interventions significantly moderated the overall effectiveness ($QM(df = 7) = 340.59$, $p < .001$). As shown in Table 5, the most substantial effects were achieved when interventions were conducted by programme developers themselves ($d_w = 1.470$, 95% CI [1.215, 1.726]) or by physical education teachers ($d_w = 1.000$, 95% CI [0.760, 1.240]). These findings suggest that specialised domain knowledge and a deep familiarity with the intervention model can substantially enhance implementation fidelity and effect magnitude. Trainers, many of whom likely had extensive experience with the respective programmes, also yielded robust effects ($d_w = 0.604$, 95% CI [0.474, 0.735]). Educational-

therapeutic professionals (d_w = 0.411, 95% CI [0.266, 0.556]) and classroom teachers (d_w = 0.343, 95% CI [0.186, 0.500]) achieved moderate and statistically significant effects, indicating their potential effectiveness when adequately supported. In contrast, studies involving other pedagogical personnel not otherwise specified yielded smaller and non-significant effects (d_w = 0.038, 95% CI [−0.287, 0.364]). Interestingly, interventions for which the facilitator role was not specified still showed a positive and significant mean effect (d_w = 0.651, 95% CI [0.319, 0.984]), although the lack of detailed reporting limits interpretability and calls for improved documentation in future research. These findings collectively underscore the importance of implementation expertise. When interventions are delivered by professionals with subject-specific training and experience, particularly those closely involved in programme development or sports pedagogy, outcomes tend to be considerably more effective.

Table 5

Mean Weighted Overall Effect Sizes by Type of Facilitator

Facilitator	*k*	d_w	95% CI
Classroom Teacher	61	0.343	[0.186, 0.500]
Physical Education Teacher	27	1.000	[0.760, 1.240]
Other Educational Staff	19	0.038*	[−0.287, 0.364]
Educational-Therapeutic Staff	76	0.411	[0.266, 0.556]

Notes. *k* = number of comparisons, d_w = weighted mean effect size. * Effect size not significantly different from zero.

A significant influence was also observed with regard to the setting of implementation (QM(df = 4) = 184.34, p < .001). Interventions conducted in extracurricular leisure contexts showed the strongest effects (d_w = 0.804, 95% CI [0.568, 1.041]), followed by those delivered in school (d_w = 0.577, 95% CI [0.474, 0.679]) and therapeutic settings (d_w = 0.405, 95% CI [0.216, 0.593]). Interventions in care-based settings, such as after-school childcare or residential care, yielded non-significant effects (d_w = 0.079, 95% CI [−0.438, 0.596]).

The mode of delivery was also a statistically significant moderator (QM(df = 2) = 214.18, p < .001). Group-based interventions produced larger average effects (d_w = 0.621, 95% CI [0.536, 0.706]) compared to individual formats (d_w = 0.367, 95% CI [0.151, 0.584]). This suggests that group-based delivery may not only be more resource-efficient but also more impactful, potentially due to additional peer-related social dynamics or motivation.

Regarding dosage, no statistically significant influence was found for the number of sessions (QM(df = 1) = 1.79, p = .181), although programme duration did significantly moderate effect sizes (QM(df = 1) = 6.02, p = .014). Longer interventions were associated with stronger effects, while shorter programmes tended to yield weaker outcomes (slope estimate = −0.0138, 95% CI [−0.0248, −0.0028]).

Finally, the level of prevention also moderated effectiveness (QM(df = 3) = 213.62, p < .001). Selective interventions targeting at-risk groups yielded the highest effects (d_w = 0.715, 95% CI [0.550, 0.881]), followed by indicated interventions (d_w = 0.604, 95% CI [0.473, 0.734]) and universal programmes (d_w = 0.497, 95% CI [0.371, 0.623]).

Differential Effectiveness by Outcome Domain

To account for the variability in intervention effects across different areas of impact, we conducted moderator analyses for those outcome domains that were sufficiently

represented in the data. Among the nine outcome categories identified, only four domains—motor skills, mental problem reduction, relationship skills, and self-management—included a sufficient number of effect sizes ($k \geq 30$) to allow for robust moderator testing. The remaining domains (academic skills, physical problem reduction, self- awareness, social-awareness, problem-solving skills) were excluded from moderator analyses due to limited data availability (see Table 1).

The overall moderator test across outcome domains was statistically significant ($QM(df = 9) = 228.89$, $p < .001$), indicating that the type of outcome variable itself functioned as a moderator of intervention effectiveness. This underscores the necessity of differentiating intervention effects according to the specific objectives and psychological constructs targeted by each programme.

In the following sections, the four outcome domains with sufficient empirical basis are examined in greater detail. For each domain, we present the mean weighted effect size, heterogeneity indicators, and results of moderator analyses relating to key implementation variables: level of prevention, delivery mode, intervention setting, and theoretical foundation.

Motor Skills

For the outcome domain motor skills, a total of 59 effect sizes were included in the meta-analysis. The mean weighted effect size was $d_w = 0.757$, reflecting a large and practically meaningful effect (95% CI [0.552, 0.962], $p < .001$). The test for heterogeneity indicated substantial between-study variability ($Q(df = 58) = 857.20$, $p < .001$), with an inconsistency index of $I^2 = 96.89\%$. Consequently, a random-effects model was applied.

To examine potential sources of heterogeneity, moderator analyses were conducted for four study characteristics. The level of prevention significantly moderated intervention effects ($QM(df = 3) = 73.20$, $p < .001$). The strongest effects were found for selective interventions ($d_w = 1.47$, 95% CI [1.02, 1.92]), followed by universal ($d_w = 0.70$, 95% CI [0.36, 1.05]) and indicated interventions ($d_w = 0.53$, 95% CI [0.27, 0.80]).

The mode of implementation also showed a significant moderating effect ($QM(df = 2) = 60.19$, $p < .001$). Group-based formats produced substantially larger effects ($d_w = 0.85$, 95% CI [0.63, 1.06]) than individual interventions, which yielded smaller and non-significant results ($d_w = 0.24$, 95% CI [−0.26, 0.75]).

With regard to setting, intervention effects differed significantly depending on the context ($QM(df = 4) = 48.11$, $p < .001$). Interventions delivered in school settings achieved the highest effects ($d_w = 1.07$, 95% CI [0.73, 1.41]), followed by those implemented in leisure environments ($d_w = 0.75$, 95% CI [0.18, 1.31]). Interventions conducted in therapeutic and care settings did not result in statistically significant outcomes.

Finally, the underlying intervention model significantly influenced the effectiveness of interventions ($QM(df = 5) = 61.67$, $p < .001$). The highest effects were observed when explicitly structured movement activities were combined with behavioural principles ($d_w = 1.03$, 95% CI [0.74, 1.33]). Moderate, statistically significant effects were also found for interventions using explicit movement in conjunction with cognitive-behavioural approaches ($d_w = 0.48$, 95% CI [0.14, 0.82]), and for those employing implicit movement in combination with cognitive-behavioural frameworks ($d_w = 0.65$, 95% CI [0.10, 1.20]).

These findings highlight the importance of structured and theory-informed psychomotor interventions for promoting motor skill development, particularly when delivered in school-based, group-oriented formats that incorporate clear behavioural or learning-theoretical components.

Mental Problem Reduction

The outcome domain mental problem reduction, comprising internalising and externalising symptoms, included 118 effect sizes. The mean weighted effect size was $d_w = 0.441$, reflecting a small to moderate and statistically significant effect (95% CI [0.307, 0.575], $p < .001$). Heterogeneity was substantial, as indicated by a significant Q-test ($Q(df = 117) = 1591.42$, $p < .001$) and a high inconsistency index ($I^2 = 97.80\%$). A random-effects model was therefore applied.

Four moderator analyses were conducted to explain this variability. First, the level of prevention significantly moderated the effects ($QM(df = 3) = 41.82$, $p < .001$). The largest effects were found for indicated interventions

(d_w = 0.52, 95% CI [0.29, 0.75]), followed by universal (d_w = 0.43, 95% CI [0.21, 0.65]) and selective interventions (d_w = 0.36, 95% CI [0.11, 0.62]).

Second, the implementation mode also showed a significant moderating influence ($QM(df = 2) = 41.83$, $p < .001$). Group-based interventions yielded higher and statistically significant effects (d_w = 0.46, 95% CI [0.32, 0.61]), while individual formats only approached significance (d_w = 0.33, 95% CI [−0.00, 0.66]).

Third, the setting significantly influenced the effectiveness of interventions ($QM(df = 4) = 35.90$, $p < .001$). Interventions delivered in school settings produced the largest and statistically significant effects (d_w = 0.48, 95% CI [0.32, 0.64]). Effects in leisure or therapeutic settings were not significant, and interventions in care settings yielded null effects.

Finally, the intervention model emerged as a highly significant moderator ($QM(df = 6) = 161.59$, $p < .001$). The strongest effects were observed in interventions using implicit movement combined with cognitive frameworks (d_w = 3.13, 95% CI [2.57, 3.69]). Significant, though smaller, effects were also evident for explicit movement paired with behavioural principles (d_w = 0.36, 95% CI [0.20, 0.51]) and explicit movement combined with cognitive-behavioural principles (d_w = 0.29, 95% CI [0.12, 0.46]). Interventions based solely on cognitive models or using implicit movement with behavioural principles did not result in statistically significant effects.

These findings indicate that movement-based interventions aiming to reduce mental health difficulties are most effective when implemented in schools, in group formats, and particularly when embedded in theory-informed models that integrate cognitive and embodied approaches. The notably strong effects of interventions combining implicit movement with cognitive frameworks suggest promising potential for targeted approaches in educational and therapeutic contexts.

Relationship Skills

The outcome domain relationship skills comprised 32 effect sizes. The mean weighted effect size was d_w = 0.604, indicating a moderate and statistically significant effect (95% CI [0.384, 0.823], $p < .001$). The heterogeneity test yielded a highly significant result ($Q(df = 31) = 309.33$, $p < .001$), and the inconsistency index was I^2 = 94.49%, suggesting pronounced variability across studies. A random-effects model was therefore employed.

Also four moderator analyses were conducted to account for this heterogeneity. The level of prevention was a significant moderator ($QM(df = 3) = 46.13$, $p < .001$). The largest effects were found in selective interventions (d_w = 0.97, 95% CI [0.58, 1.36]) and indicated interventions (d_w = 0.67, 95% CI [0.39, 0.95]). Universal interventions, by contrast, did not produce statistically significant effects (d_w = 0.12, 95% CI [−0.25, 0.50]).

A significant moderating effect also emerged for the implementation mode ($QM(df = 2) = 28.72$, $p < .001$). Group-based interventions showed the strongest effects (d_w = 0.65, 95% CI [0.38, 0.92]), while individual interventions yielded lower, yet still significant, effects (d_w = 0.50, 95% CI [0.11, 0.89]).

The setting likewise influenced intervention outcomes ($QM(df = 4) = 38.16$, $p < .001$). The largest effects were found for interventions delivered in leisure contexts (d_w = 1.38, 95% CI [0.46, 2.30]), followed by therapy settings (d_w = 0.68, 95% CI [0.32, 1.03]) and schools (d_w = 0.65, 95% CI [0.33, 0.97]). No significant effects were observed in care settings.

Finally, the intervention model emerged as a significant moderator ($QM(df = 4) = 42.66$, $p < .001$). The most robust effects were associated with implicit movement combined with cognitive-behavioural models (d_w = 1.22, 95% CI [0.70, 1.74]) and with implicit movement combined with behavioural principles (d_w = 0.50, 95% CI [0.21, 0.79]). Statistically significant effects also emerged for explicit movement paired with behavioural frameworks (d_w = 0.52, 95% CI [0.17, 0.87]), whereas effects from explicit movement with cognitive-behavioural models were non-significant.

These findings suggest that interventions aiming to enhance relationship skills are particularly effective when implemented in selective or indicated settings, when delivered in groups, and when grounded in implicit, experience-based movement approaches aligned with cognitive-behavioural theory. Leisure and therapeutic

environments may provide especially conducive contexts for such interventions.

Self-Management

The outcome domain self-management comprised 81 effect sizes. The mean weighted effect size was d_w = 0.662, indicating a moderate to large and statistically significant effect (95% CI [0.518, 0.806], p < .001). A test for heterogeneity revealed considerable between-study variability ($Q(df = 80) = 1827.03$, $p < .001$), with a high inconsistency index ($I^2 = 96.72\%$). A random-effects model was therefore applied.

Moderator analyses were conducted to explore the observed heterogeneity. First, the level of prevention was identified as a significant moderator ($QM(df = 3) = 84.52$, $p < .001$). Indicated interventions showed the highest effects (d_w = 0.84, 95% CI [0.58, 1.10]), followed by selective (d_w = 0.59, 95% CI [0.28, 0.90]) and universal interventions (d_w = 0.58, 95% CI [0.37, 0.79]).

The mode of implementation also significantly moderated outcomes ($QM(df = 2) = 81.14$, $p < .001$). Interventions delivered in group formats showed robust effects (d_w = 0.67, 95% CI [0.52, 0.81]), while those in individual formats yielded a null result (d_w = 0.00, 95% CI [−1.68, 1.68]).

A further moderating effect was found for the setting ($QM(df = 4) = 96.07$, $p < .001$). The highest effects were observed in therapeutic settings (d_w = .19, 95% CI [0.10, 2.27]) and in leisure contexts (d_w = 1.10, 95% CI [0.81, 1.39]). Interventions in school settings also yielded statistically significant effects (d_w = 0.50, 95% CI [0.34, 0.66]), while those in care settings showed no significant results.

Finally, the intervention model significantly moderated the effects ($QM(df = 4) = 101.56$, $p < .001$). The largest effects were associated with interventions combining implicit movement and cognitive-behavioural principles (d_w = 1.07, 95% CI [0.62, 1.52]), followed by implicit movement with behavioural frameworks (d_w = 0.93, 95% CI [0.35, 1.50]). Explicit movement combined with behavioural principles also resulted in significant effects (d_w = 0.69, 95% CI [0.53, 0.86]), whereas explicit movement with cognitive-behavioural models showed non-significant results.

In summary, interventions targeting self-management appear most effective when implemented in group formats, in leisure or therapeutic settings, and when they draw on implicit movement patterns embedded within behavioural or cognitive-behavioural frameworks.

Discussion

The aim of this meta-analysis was to investigate the effectiveness of movement- and body-oriented interventions as applied by psychomotor therapy and to derive practice-relevant implications. Across all outcomes, a moderate, practically significant overall effect of d_w = 0.59 was found for movement-based educational-therapeutic interventions. This finding is consistent with other studies, both in the area of mediator effects (psychosocial/mental outcomes) and in the area of functional-instrumental effects (Hale et al., 2023; Kemel et al., 2022; Spruit et al., 2016).

The effects of this meta-analysis are influenced by methodological aspects and implementation modalities. As expected, studies with higher quality (RCTs, larger samples) showed smaller effects than studies with quasi-experimental designs or smaller samples. This bias has also been observed in other reviews of effectiveness research (Beelmann, Pfost & Schmitt, 2014; Spruit et al., 2016) and is not viewed solely as negative. For instance, Beelmann et al. (2014) argue that the higher implementation quality in smaller studies might contribute to the more positive results observed.

The measurement instrument also influences effect size. Notably, self-reports show overall smaller effects than external ratings and standardised tests. This contradicts findings from other studies (e.g., Wilson & Lipsey, 2007), where self-reports yielded larger effects than other assessment methods. One possible explanation is that many of the included studies implemented interventions with behavioural elements. The primary aim of these interventions is behaviour change rather than cognition and affect. Affective changes are particularly suitable for assessment by self-assessment.

Longer interventions (over 10 weeks) show stronger effects than shorter ones (e.g., Sklad, et al., 2012). While functional-instrumental outcomes can improve relatively quickly with higher intensity, socio-emotional changes

usually require more time to develop and thus become evident mainly in longer interventions. This pattern is also consistent with the findings of Moschos and Polatou (2022).

The influence of the person conducting the intervention is well-documented in several meta-analyses and is also evident in the present analysis. While Spruit et al. (2016) and Sklad et al. (2012) reported no significant differences between facilitators with or without a pedagogical background, Beelmann et al. (2014) demonstrated that facilitators directly associated with the intervention programme achieved more pronounced effects. In the present analysis, it was found that not only programme developers and physical education teachers but also trainers were more successful than educational-therapeutic professionals and teachers. This finding could be interpreted to suggest that facilitators with high, specific expertise are able to achieve greater effects. This interpretation aligns with Wilson and Lipsey (2007), whose data show that a high level of implementation quality leads to higher effects in prevention programmes aimed at reducing aggressive and disruptive behaviour. Specific expertise related to the intervention appears to be advantageous for the success of movement-based, educational-therapeutic interventions. It is likely that such expertise is also associated with a more accurate alignment between the needs of the clients and the intervention. This further underscores the consistency of the findings of the present analysis, which indicate that interventions targeting children and adolescents with specific diagnoses demonstrated significantly higher effects compared to those targeting populations without specific diagnoses. We assume that in interventions targeting populations with a diagnosis, the need for support has been clearly defined, which may explain why the previously mentioned alignment between the needs of the clients and the intervention was better achieved.

The very high effect associated with physical education teachers can be explained by the fact that studies with physical education teachers as facilitators focused heavily on the outcome of self-management. This category included exclusively measures of executive functions. There is substantial evidence that executive functions can be effectively promoted through movement-based interventions (e.g., Liang et al., 2021; Sung et al., 2021; Welsh et al., 2021), which likely contributes to the large effect observed. It is also assumed that trainers are likely to implement existing programmes. It can be assumed that these programmes are theoretically well-founded, methodologically structured, and have clearly defined goals.

For four of the registered outcomes, it was possible to determine which type of intervention demonstrated the greatest effectiveness. The combination of *physical activity* and learning theory-based methods proved to be most successful for the outcome *motor skills* (d_w = *0.76, 95% CI [0.55, 0.96]*). This represents a functional-instrumental effect, which appears plausible given that the *physical activity* component directly targets *motor skills*. Motor learning theories also emphasise the importance of immediate feedback to reinforce reafferent information for adjusting motor patterns (Schnabel & Krug, 2021). Furthermore, repetition is a key aspect of motor learning (ibid.), and its implementation is particularly likely when behavioural structuring principles – such as modelling and reinforcement – are integrated into *physical activity* settings. Additional evidence, such as from the Neuromotor Task Training (Schoemaker & Smits-Engelsman, 2005; Smits-Engelsman, 2013), also highlights the relevance of feedback and suggests that children with motor difficulties benefit more from an external focus of attention than from internally directed bodily awareness. These findings are well reflected in the present meta-analysis, where interventions combining explicit physical movement with behavioural principles produced the strongest effects.

Body- and movement-oriented activities showed the highest effectiveness for outcomes classified under mediator effects, particularly for mental problem reduction (d_w = 0.44, 95% CI [0.31, 0.57]). These activities were most effective when combined with cognitive methods—typically in the form of structured reflection or reappraisal strategies. In such cases, the movement component serves as a somatic anchor or access point for addressing implicit emotional or cognitive schemas, which are subsequently made explicit and processed via verbal or metacognitive means. This logic aligns with theories of embodied cognition, which assume that bodily action and

perception provide essential scaffolding for mental state access and modulation (e.g. Shapiro & Stolz, 2019). *Interventions integrating implicit movement and cognitive components in particular demonstrated the strongest effects in this domain (d_w = 3.13, 95% CI [2.57, 3.69]), indicating the potential of experiential and indirect methods for addressing internalising and externalising symptoms.*

For the outcomes self-management (d_w = 0.66, 95% CI [0.52, 0.81]) and relationship skills (d_w = 0.60, 95% CI [0.38, 0.82]), both of which are situated within the framework of Social and Emotional Learning (SEL), the additional integration of cognitive and learning theory-based elements proved particularly effective. This is consistent with the hierarchical organisation of SEL, in which self-management is considered a precursor to relationship skills. This sequence was mirrored in the present analysis, where the effect for self-management slightly exceeded that for relationship skills, and both outcomes benefited most from interventions that incorporated cognitive-behavioural modelling and explicit instruction. The combination of cognitive and learning-theoretical components aligns well with the integrated model of emotion and cognition in social information processing as proposed by Lemerise and Arsenio (2000), which emphasises the role of emotion regulation, perspective taking and attributional reasoning in social behaviour.

Moreover, moderator analyses revealed that group-based formats and school-based settings yielded particularly robust effects across these SEL-related outcomes, underscoring the importance of socially embedded and ecologically valid implementation contexts.

Limitations

Although this meta-analysis provides a substantial contribution to the field, as with all meta-analyses, the quality of the included studies remains a limiting factor. The present dataset also exhibits a high degree of methodological heterogeneity. The interventions used in the included studies are highly diverse in content and are based on a wide range of, at times, divergent theoretical assumptions. A more detailed analysis of the content of these interventions would therefore provide an important complement to the observed effects and pattern of findings. Another limitation is the uneven distribution of outcome categories. Only the outcomes *motor skills, mental problem reduction, self-management*, and *relationship skills* could be analysed in more detail. The outcome category of *self-management* is well represented with *k = 55*. However, it is almost exclusively reflected by measurements of executive functions, particularly inhibition. As a result, the large effects observed in this category are somewhat relativised.

Practical implications

The findings of the present meta-analysis reveal essential implications for psychomotor therapy, particularly in the domains of motor skills, social and emotional learning (SEL), and mental health. The practical implications comprise:

- **The integration of movement with cognitive and learning-theoretical components is effective and should be adapted to the target domain** (motor skills, SEL, or mental health).
- **The selection of intervention methods should be tailored to the specific focus area** (e.g., immediate feedback and repetition for motor skills; reflective and cognitive components for SEL and mental health).
- **Interventions show higher effectiveness when aligned with the clearly defined support needs of participants**, underscoring the importance of comprehensive diagnostic assessment and individualisation.
- **The expertise of the facilitator is a crucial factor** in intervention success, supporting the prioritisation of trained professionals with specific knowledge in both movement and **learning-theoretical** approaches.

Conclusion

The present study contributes to the body of effectiveness research on movement- and body-oriented interventions as applied by psychomotor therapy. By systematically synthesising evidence from diverse studies, this meta-analysis reveals a moderate and practically significant overall effect size, highlighting the efficacy of interventions that combine physical activity with cognitive and learning-theoretical components. The findings underscore the importance of methodological considerations, such as the duration and quality of interventions, and they emphasise the influence of

facilitators' expertise and the alignment of intervention content with the specific support needs of the participants.

The comprehensive nature of this meta-analysis strengthens the evidence base for psychomotor therapy and provides a nuanced understanding of how movement-based interventions can be optimally designed and implemented. Specifically, the integration of movement and cognitive elements appears to enhance both functional-instrumental outcomes, such as motor skill development, and mediator effects, such as improvements in mental health and social-emotional competencies. The findings also highlight the critical role of tailored interventions that respond to clearly defined individual needs, as well as the necessity of high-quality implementation by well-trained professionals.

Nevertheless, this meta-analysis is subject to certain limitations. The quality and methodological heterogeneity of the included studies, as well as the diversity of intervention content and theoretical assumptions, limit the generalisability of the findings.

In summary, this study not only affirms the effectiveness of movement-based educational-therapeutic interventions but also offers practical guidance for their application. These findings can inform future programme development, professional training, and research in the fields of psychomotor therapy and educational interventions.

Statements and Declarations

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Furthermore, during the preparation of this work, the authors used ChatGPT (version GPT-4-turbo, May 2025) to improve the readability and language of the manuscript under human oversight and control. After using this service, the authors thoroughly reviewed and edited the content and accept full responsibility for the final version of the published article. Ethical approval was not required for this study, as it is a meta-analysis of previously published research.

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References

Amft, H., & Amft, S. (2003). Welche Kinder kommen in die Psychomotoriktherapie? Ergebnisse einer Studie zur Klientel der Psychomototirktherapie. *Schweizerische Zeitschrift für Heilpädagogik, 9*(12), 35-43.

Beelmann, A., Pfost, M., & Schmitt, C. (2014). Prävention und Gesundheitsförderung bei Kindern und Jugendlichen. Eine Meta-Analyse der deutschsprachigen Wirksamkeitsforschung. *Zeitschrift für Gesundheitspsychologie, 22*, 1-14. https://doi.org/10.1026/0943-8149

CASEL (2025). *What is the CASEL Framework?* https://casel.org/fundamentals-of-sel/what-is-the-casel-framework/

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2. Ausg.). Hillsdale: Lawrence Erlbaum Associates.

Donnelly, J. E., Hillman, C. H., Castelli, D., Etnier, J. L., Lee, S., Tomporowski, P., . . . Szabo-Reed, A. N. (2016). Physical Activity, Fitness, Cognitive Function, and Academic Achievement in Children: A Systematic Review. *Medicine & Science in Sports & Exercise, 48*(6), 1197-1222. . https://doi.org/1249/MSS.0000000000000901

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child Development, 82*, 405-432. https://doi.org/1111/j.1467-8624.2010.01564.x

EDK (Konferenz der kantonalen Erziehungsdirektorinnen und -direktoren) (2023). *Reglement über die Anerkennung von Hochschuldiplomen in Psychomotoriktherapie.* https://edudoc.ch/record/233721?ln=de

Emck, C., & Scheffers, M. (2019). Psychomotor interventions for mental health: an introduction. In J. De Lange, O. Glas, J. van Busschbach, C. Emck, & T. Scheewe, *Psychomotor interventions for mental health - Adults* (S. 17-51). Boom.

Fischer, K. (2019). *Einführung in die Psychomotorik* (4., überarbeitete und erweiterte Auflage Ausg.). Ernst Reinhardt.

Gasser-Haas, O., & Steiner, J. (2022). Evidenzbasierte Praxis (EbP) in der Psychomotoriktherapie ist möglich – auch wenn Studien weitgehend fehlen. *Motorik, 45*(4), 164-169. https://doi.org/2378/mot2022.art31d

Gasser-Haas, O., Sticca, F., & Wustmann Seiler, C. (2020). Poor Motor Performance – Do Peers Matter? Examining the Role of Peer Relations in the Context of the Environmental Stress Hypothesis. Front. Psychol., 11: 498. https://doi.org/10.3389/fpsyg.2020.00498

Hale, G. E., Colquhoun, L., Lancastle, D., Lewis, N., & Tyson, P. J. (2023). Physical activity interventions for the mental health of children: A systematic review. *Child Care Health Dev., 49*, 211-229. https://doi.org/1111/cch.13048

Haverkamp, B. F., Wiersma, R., Vertessen, K., van Ewijk, H., Oosterlaan, J., & Hartman, E. (2020). Effects of physical activity interventions on cognitive outcomes and academic performance in adolescents and young adults: A meta-analysis. *Journal of Sports Sciences, 38*(23), 2637-2660. https://doi.org/1080/02640414.2020.1794763

Kemel, P. N., Porter, J. E., & Coombs, N. (2022). Improving youth physical, mental and social health through physical activity: A Systematic literature review. *Health Promotion Journal of Australia, 33*, 590-601. https://doi.org/10.1002/hpja.553

Lemerise, E., & Arsenio, W. (2000). n integrated model of emotion processes and cognition in social information processing. *Child Development, 71*(1), 107–118. https://doi.org/10.1111/1467-8624.00124

Liang, X., Li, R., Wong, S., Sum, R., & Sit, C. (2021). The impact of exercise interventions concerning executive functions of children and adolescents with attention-deficit/ hyperactive disorder: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity, 18*(86), 2-17. https://doi.org/10.1186/s12966-021-01135-6

Lobo, Y. B., & Winsler, A. (2006). The Effects of a Creative Dance and Movement Program on the Social Competence of Head Start Preschoolers. *Social Developmen, 15*(3), 501–519. https://doi.org/10.1111/j.1467-9507.2006.00353.x

Moschos, G., & Pollatou, E. (2022). The effect of a psychomotor intervention program in children 3–10 years of age: a systematic review. *Body, Movement and Dance in Psychotherapy, 17*(4), 294-309. https://doi.org/10.1080/17432979.2022.2078406

Payne, P., & Crane-Godreau, M. A. (2015). Meditative Movement for Depression and Anxiety. *Frontiers in Psychiatry, 4*. https://doi.org/10.3389/fpsyt.2013.00071

Röhricht, F. (2009). Body oriented psychotherapy. The state of the art in empirical research and evidence-based practice: A clinical perspective. *Body, Movement and Dance in Psychotherapy, 4*(2), 135-156. https://doi.org/10.1080/17432970902857263.

Schnabel, G., & Krug, J. (2021). *Bewegungslehre Sportmotorik : Abriss einer Theorie der sportlichen Motorik unter pädagogischem Aspekt (12th ed.)*. Meyer & Meyer.

Schoemaker, M., & Smits-Engelsman, B. (2005). Neuromotor task training: a new approach to treat children with DCD. In D. Sudgen, & M. Chambers, *Children with developmental coordination disorder* (212-227). Wiley.

Shapiro, L., & Stolz, S. A. (2019). Embodied cognition and its significance for education. *Theory and Research in Education, 17*(1), 19-39. https://doi.org/10.1177/1477878518822149

Singh, A. S., Saliasi, E., Berg, V. v., Uijtdewilligen, L., Groot, R. H., Jolles, J., . . . Chinapaw, M. J. (2019). Effects of physical activity interventions on cognitive and academic performance in children and adolescents: a novel combination of a systematic review and recommendations from an expert panel. *British Journal of Sports Medicine, 53*(10), https://doi.org/640-647. 10.1136/bjsports-2017-098136

Sklad, M., Diekstra, R., Ritter, M., & Ben, J. (2012). Effectiveness of school-based universal social, emotional, and behavioral programs: do they enhance students' development in the area of skill, behavior, and adjustment? *Psychology in the Schools, 49*, 892-909. https://doi.org/10.1002/pits.21641

Smits-Engelsman, B. (2013). Neuromotor Task Training. Zum motorischen Lernen befähigen. *Ergopraxis, 13*(9), 24-31.

Spruit, A., Assink, M., van Vugt, E., van der Put, C., & Stams, G. J. (2016). The effects of physical activity interventions on psychosocial outcomes in adolescents: A meta-analytic review. *Clinical Psychology Review, 45*, 0272-7358. https://doi.org/10.1016/j.cpr.2016.03.006.

Thimme, T., Deimel, H., & Hölter, G. (2021). *Bewegung und psychische Gesundheit von Kindern und Jugendlichen. Grundlagen - Störungsbilder - Therapie*. Schattauer.

Welsh, L., Alliott, O., Kelly, P., Fawkner, S., Booth, J., & Niven, A. (2021). The effect of physical activity interventions on executive functions in children with ADHD: A systematic review and meta-analysis. *Mental Health and Physical Activity, 20*, 1-12. https://doi.org/10.1016/j.mhpa.2020.100379

Widmer, I., & Bräuninger, I. (2020). Bestandsaufnahme der Psychomotoriktherapie zur Förderung sozialer und emotionaler Kompetenzen von Schulkindern. Ergebnisse einer schweizweiten Online-Umfrage. *Motorik, 43*(3), 134-143. https://doi.org/10.2378/mot2020.art24d

Wilson, D. B. (August 2011). *Effect Size Calculation and Elementary meta-Analysis.* Retrieved 19. August 2013, from www.campbellcollaboration.org: http://www.campbellcollaboration.org

Wilson, S., & Lipsey, M. (2007). School-based interventions for aggressive and disruptive behavior: Update of a meta-analysis. *American Journal of Preventive Medicine, 33*, https://doi.org/130-143. 10.1016/j.amepre.2007.04.011

Supplementary material

List of included studies