



Overview

There is a strong evidence base to show that teaching children the skills needed for movement and handling has a positive impact on their physical development. Our searches identified four systematic reviews for this approach.¹ However, this body of evidence should be interpreted with caution because all authors comment on the high risk of bias in many of the primary studies included. For example, authors drew out problems with study design and reporting, among other things. In addition to the four systematic reviews, our searches identified 36 primary studies evaluating interventions in which the educator's primary aim was to teach children the skills needed for movement and handling. There is only limited overlap between the reviews and the primary studies but the latter broadly align with the findings from the systematic reviews. This means that the evidence base is relatively cohesive and large.

Main findings

In reviews, interventions were typically grouped by the specific motor skill(s) they target. By far the most common were those that target fundamental movement skills (Eddy et al., 2019).² Three systematic reviews have summarised evidence on a range of interventions targeting a variety of such skills (Eddy et al., 2019; Wick et al., 2017; Veldman et al., 2016).³ Collectively, the reviews found that this kind of intervention can have a positive effect on various outcomes, including overall motor proficiency, object control,⁴ locomotor skills,⁵ and gross motor skills.⁶ More research is needed to understand the effect on visual motor integration,⁷ but there is some indication that interventions can have a positive effect on this outcome (Eddy et al., 2019). Wick et al.'s review included a meta-analysis giving the average effect of fundamental movement skills interventions (these could include whole-body movements

like kicking or smaller movements such as finger dexterity).⁸ The authors found a positive average effect on overall motor proficiency (Wick et al., 2017). Within this positive picture, there is some variation: not every study evidenced a positive effect and there was variation in how effective the successful interventions were (ibid.). The same is reflected in the primary studies: most interventions had a positive effect on at least one outcome, but often not on all outcomes measured (Bedard et al., 2020; Bellows et al., 2017; Jones et al., 2011).

Two systematic reviews summarised the evidence on interventions that aimed to improve fine motor skills.⁹ Strooband et al. (2020) carried out a meta-analysis and found, on average, a positive effect for this type of intervention on fine motor outcomes, visual motor outcomes, and manual dexterity. Eddy et al. (2019) identified two studies targeting fine motor skills that looked at outcomes including visual motor integration, manual dexterity,¹⁰ and motor-coordination; both had positive results on some outcomes but not others. This body of evidence suggests that fine motor skill interventions are promising but more research is needed into exactly how and when they work.

Some interventions that focus on teaching the skills needed for movement and handling are not captured by these reviews because they either target balance or multiple motor skills in a multicomponent intervention. In the set of primary studies identified by our searches, interventions that targeted a combination of gross and fine motor skills generally had a positive effect on at least some physical development outcomes (Africa and van Deventer, 2017; Hamilton and Liu, 2018; Mecias-Calvo et al., 2021; Navarro-Paton et al., 2021). Interventions that targeted balance also had positive results (Abuin-Porras et al., 2020; Yöntem et al., 2021).

¹ In systematic reviews, researchers summarise all of the research on a particular topic that meets predefined eligibility criteria in order to answer a specific research question. This gives an objective overview of the evidence for a particular topic or research question. The methods used must be reproducible and transparent.

² A range of motor skills that use different body parts and are the building blocks of more complex movement.

³ Veldman et al.'s (2016) review focused specifically on a subset of fundamental movement skills: gross motor skills. All studies included in Veldman et al.'s review are also included in Wick et al.'s review.

⁴ For example, throwing, catching, or kicking.

⁵ For example, running, hopping, and jumping.

⁶ Skills developed using the whole body.

⁷ Effective, efficient communication between the eyes and the hands.

⁸ In a meta-analysis, researchers combine the results of multiple studies to calculate an overall effect. This involves more than just pooling data from studies together: the process uses established statistical methods to account for differences in sample size, variability, and findings.

⁹ Fine motor skills involve small muscles working with the brain and nervous system to control movements in areas such as the hands, fingers, lips, tongue, and eyes.

¹⁰ The ability to use the hands to perform a difficult action skilfully and quickly so that it looks easy.



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Interventions delivered by the children's usual educator and externally trained professionals or researchers can be effective. Wick et al.'s (2017) analysis suggests that the latter tend to be more effective, perhaps because they bring expertise which can motivate staff and children. However, Veldman et al. (2016) emphasised that focusing on professional development of usual setting staff is likely to be important for long-term effectiveness; having setting staff deliver an intervention may make effects more sustainable and minimise costs. Other reviews identified a lack of follow-up data testing the long-term effects and sustainability of interventions (Eddy et al., 2019; Strooband et al., 2020). In two studies where follow-up tests took place, the impact of the interventions was not sustained (Strooband et al., 2020). These authors suggested that this is due to the cost of implementing interventions after external support is removed. The primary studies that we identified through our searches give a mixed picture regarding skills retention. Some found evidence of good skills retention (Chung et al., 2023; Bellows et al., 2017; Altunsoz and Goodway, 2016) while others found that gains in the intervention groups were not maintained on all measures after six months or more (Roth et al., 2015; Hestbaek et al., 2021; Hurmeric, 2010). In light of this mixed picture, settings may want to consider how to sustain change through professional development of internal staff. Future research could consider carrying out follow-up tests to build a better understanding of if, when, and why impact is sustained.

Despite the overall positive picture, and the findings relating to implementation detailed above, there are still large gaps in the evidence. Little is known about the specific aspects of interventions that influence effectiveness. Authors note that studies do not always clearly describe the content and components of interventions that would facilitate comparisons (Strooband et al., 2020; Veldman et al., 2016). In the set of primary studies we identified, authors often do not include detailed accounts of the educators' actions and practices. In addition, the interventions are diverse and use a wide range of outcomes and measures making it difficult to summarise and compare across the evidence base (Strooband et al., 2020; Eddy et al., 2019).

While some studies included in the reviews had children from lower-income families in their sample, this was not the focus of the reviews and no conclusions are drawn. Two primary studies looked specifically at whether the interventions tested are differentially effective for disadvantaged children and found

no evidence that this was the case (Cunningham et al., 2023; Hestbaek et al., 2021). Another study tested the effectiveness of the SKIP programme—which was previously shown to be successful with preschoolers—specifically with disadvantaged children: the study finds that the intervention was successful with this sample too (Altunsoz and Goodway, 2016). From this evidence, no firm conclusions can be drawn regarding the effect of teaching the skills needed for movement and handling on disadvantaged children specifically.

Intervention types

While review authors have noted insufficient detail in intervention descriptions to facilitate systematic comparisons, there is enough detail to recognise that this approach can work across a range of intervention types. This suggests that teaching the skills needed for movement and handling can be done effectively in a range of ways.

All studies included in this approach involved some explicit instruction in skills.¹¹ In some studies, this was framed by educators as a typical PE lesson. For example, one intervention consisted of a cross-skill training programme that took specific skills as the focus of each session (Fu et al., 2022; Hamilton et al., 2018).

Often, educators introduced motivating stimuli, for example, Brian et al. (2017) used music during the warm-up task. Zhang et al. (2022) evaluated an intervention in which skills were taught through games, such as copying the teacher executing a movement or passing a watermelon over and under to the back of a line. Some interventions took a more imaginative approach, teaching skills within a playful context. By doing this, they aimed to engage the children in their learning. This very often involved creative stimuli. There are examples of educators teaching a dance (Zach et al., 2015; Lindsay et al., 2020; Kapodistria et al., 2020), introducing imaginative games that were designed to target specific skills (Chung et al., 2023), teaching balance through martial arts (Li et al., 2022), and teaching skills through characters in a narrative (Cunningham et al., 2023; Bellows et al., 2017). One study evaluated the effectiveness of teaching through analogy in comparison to explicit teaching (Chatzopoulos et al., 2023).¹² The study finds that, on average, children's locomotor skills improved in both conditions, but only the analogy learning group improved in balance.

¹¹ Formal educator-directed approaches in which educators explicitly support children to develop specific ideas and skills.

¹² Analogy learning involved instructing the children through metaphors, for example, 'Imagine as if you are playing drums with your elbows on a drum hanging at a wall.'



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Whether or not the educator introduced a context for the learning, all interventions included in this approach involved at least some structured teaching time. Educators introduced activities and tasks to develop children's skills. The nature of the activities depended on the skill(s) being taught. For example, in an intervention targeting visual motor integration, children practised hitting a target by throwing, kicking, or rolling objects as well as motor coordination activities like threading beads onto a lace (Africa and van Deventer, 2017). Interventions that targeted fine motor skills included activities such as buttoning, picking up cubes in a pincer grasp, or using tweezers (Hamilton and Liu, 2017; Navarro-Paton et al., 2021). Interventions that targeted gross motor skills included activities such as obstacle courses or purposefully exploring movements (such as running fast and slow; Jones et al., 2011; Veldman et al., 2015).

Often, educators varied the difficulty of the task during the structured teaching time (Abuin-Porras et al., 2020; Bellows et al., 2017; Mecias-Calvo et al., 2021; Navarro-Patton et al., 2021; Popovic et al., 2020; Veldman et al., 2015). This worked both to support children who were struggling and to challenge those who had achieved the expected level to further consolidate and refine the taught skills. Educators varied the difficulty of tasks in a variety of ways. For example, they may have offered different equipment (for example, progressing from beanbags to balls; Cunningham et al., 2023), offered verbal prompts to support the child (such as suggesting that the child catch the ball with two hands; Brian et al., 2017), manipulated elements of the environment (for example, changing the distance from the target; Altunsoz and Goodway, 2016), or introduced skill progression (for example, kicking first with eyes on the object then focusing on one foot; Jones et al., 2011).

In many interventions, including those in which the adult had introduced an imaginative context for the learning, there are examples of adults using both verbal and physical direction to support children. Verbal direction took the form of feedback (Chung et al., 2023; Mulvey et al., 2018), verbal cues (Hamilton and Liu, 2018; Robinson et al., 2016), oral explanations of movements, including dances (Zach et al., 2015), and extending

through verbal suggestions (Jones et al., 2016). Sometimes interventions included lesson scripts for the educators (Ohl et al., 2013). Physical direction often took the form of modelling or demonstrating a skill (Cunningham et al., 2023; Mulvey et al., 2018; Ohl et al., 2013; Robinson et al., 2016; Robinson et al., 2017; Zhang et al., 2022). In two studies, an avatar in a digital game provided visual modelling of a movement: the authors suggested that this supported children's learning (Hsiao and Chen, 2016; Hsiao et al., 2018). One study evaluated the effectiveness of visual and verbal cues to teach a horizontal jump (Weimar et al., 2011). The authors found that both verbal and physical cues could be effective, and that using both together could further support children. Sometimes explicit teaching was combined with unstructured time (Veldman et al., 2016; Wick et al., 2017). Some authors reported that this unstructured time supported children to consolidate the taught skills (Bedard et al., 2020; Jones et al., 2011; Jones et al., 2016). Unstructured time often involved free choice and play for the children, which was supervised by educators. Educators had a role to play in setting up equipment so that children could practise taught skills through play (for example, hula-hoops and puzzles; Bedard et al., 2020). Sometimes, adult-directed play was also offered, with educators facilitating games specifically chosen to consolidate the day's taught skill (Jones et al., 2011).

Behind the summary

The reviews and studies underpinning this summary draw evidence from many countries, although the U.S.A. is particularly prominent in the evidence base. Interventions took place in early years settings, including halls and outdoor spaces. Most studies and reviews focused on children aged three to six. Studies were only included if the majority of children were aged six or under. One study focused on children aged two and found distinct challenges delivering to this younger age group, such as pitching learning at the right stage of development and taking account of shorter attention spans. Despite these challenges, there was some indication that the intervention was successful (Veldman et al., 2015). Educators may want to consider how teaching might be adapted for younger children.



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