

## Teaching Mark-making and Letter formation

### Technical Summary

#### Overview

In this approach, educators adopt various strategies to support the mechanics of mark-making before moving to focus on the formal curation of letter shapes and numbers. We found 8 systematic reviews<sup>1</sup> and 15 primary studies of relevance. For pre-school children, there is evidence that fine motor skill<sup>2</sup> interventions can support mark-making. There are a range of interventions targeting handwriting outcomes and the evidence for letter formation is an outcome within this. The reviews suggest that educator feedback and instruction can help to improve children's handwriting fluency;<sup>3</sup> this is particularly true for primary school aged children (Hall, 2023; Ray, 2022; Santangelo, 2016; Engel 2018).

The evidence broadly fits within three categories: studies focused on fine motor skill interventions; studies that look more closely at interventions related to early handwriting; and finally, multi-component studies which often also consider whether improving handwriting skills leads to improved literacy outcomes.

#### Main findings

The outcomes for this approach are closely related to the approach of 'Teaching the skills needed for movement'; fine motor skills interventions can impact children's manual dexterity<sup>4</sup>, visual perception, and visual integration<sup>5</sup>, which in turn support children's mark-making, early letter formation and later handwriting skills. We found two reviews that look specifically at the relationship between fine motor skill interventions and these physical development outcomes (Strooband et al, 2020; Eddy, 2019). They report improvements to visual motor outcomes and manual dexterity. The authors note the heterogeneity of intervention types and outcome measures and thus advise caution, pointing additionally to a high risk of bias. Our searches also identified several primary studies that report positive effects on visual motor skills and manual dexterity (Mecias-Calvo, 2021; Navarro-Paton, 2021; Battaglia, 2019). In the evidence, a range of activities are described. These include: the use of hand tools such as scissors; toys that required assembling; blocks; clay; threading and stringing toys; and jigsaws. Some studies encouraged fine motor skill development through everyday acts; for example, fastening buttons and zips. The use of dance and song were also components of interventions that reported positive effects.

Whilst the above studies report improvements to manual dexterity and visual motor outcomes, no effect was found on letter formation and broader handwriting outcomes such as legibility and fluency. The evidence suggests that to improve these outcomes, a multi-component approach incorporating educator feedback is needed (Santangelo, 2016; Ray, 2022; Strooband, 2020).

Four reviews (Engel, 2018; Fancher, 2018; Lopez-Escribano 2022; Santangelo, 2016) looked more widely at interventions focused on improving outcomes such as legibility, fluency and speed. It is

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<sup>1</sup> Researchers summarise all of the research on a particular topic, which meets pre-defined 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.

<sup>2</sup> 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.

<sup>3</sup> Children's ability to form letters and words quickly with accuracy.

<sup>4</sup> The ability to use the hands to perform a difficult action skilfully and quickly so that it looks easy

<sup>5</sup> Effective, efficient communication between the eyes and the hands,

worth noting that children in these studies are at the upper age range considered in the Evidence Store as the studies include children aged six. Activities in the reviews included: varying pencil size and grips, changing paper types, matching letters, tracing letters, use of music, therapy balls and digital technology applications (Santangelo, 2016). The evidence suggests that interventions focused on a single aspect of letter formation and handwriting skills, such as only tracing letters, were ineffective (Engel, 2018; Fancher, 2018; Lopez-Escribano 2022; Santangelo, 2016). More positively, strategies involving highly structured and explicit multi-component handwriting programmes were seen to bolster children's progress. In particular, multi-component interventions with a performance feedback element, such as educator or peer feedback, and encouragement through goal setting, led to gains in children's handwriting fluency (Lopez-Escribano, 2022; Engel, 2018).

The final group of reviews (Hall, 2023; Ray, 2022; Santangelo, 2016) looked at mark-making and its development, considering early literacy and writing composition. The importance of educator demonstration and performance feedback in early writing was reinforced with positive effects reported in interventions of this type (Hall, 2023). However, in studies that solely focused on targeting handwriting skills, rather than multi-component programmes also targeting literacy outcomes such as sentence construction and spelling, improvements were less pronounced (Hall, 2023). This suggests that educators might consider teaching handwriting skills and literacy skills together. However, the number of studies was very small and therefore more research is needed. Overall, there is little evidence in this area that moves beyond a correlational relationship between handwriting and early literacy (Ray, 2022). However, explicit letter formation interventions were found to lead to improvements in writing skills such as spelling and sentence composition (Ray, 2022). Direct instruction and feedback were deemed beneficial for the development of children's letter formation skills (Ray, 2022). The use of digital technology as part of multicomponent programmes requires further investigation after some initial positive results (Ray, 2022; Santangelo, 2020). It is important to note that these reviews draw their conclusions based on studies which include both children within early years and in older age groups..

#### Intervention types

We found 9 primary studies not included in the systematic reviews. The primary studies in this evidence base demonstrate the huge variation of intervention types and outcome measures but do suggest that multi-component interventions with guidance and feedback may be effective strategies. The studies broadly align with the categorisation of the reviews; some look closely at fine motor skills, some at more explicit handwriting instruction, and some are examples of multi-component programmes that also target literacy outcomes. In Amani (2019), children were introduced to three-dimensional shapes and encouraged to draw and manipulate them. The author reported improvements to children's visual motor integration. Lavoie (2020) used a multi-component alphabet training programme to improve children's handwriting and wider literacy skills. This included a multi-sensory approach to understanding letters; children were encouraged to touch and feel different letter shapes and then provided with regular educator feedback to improve their letter formation. Positive effects on legibility and spelling were reported; interestingly, educator demonstration and feedback were again key elements of this intervention. Finally, McGarringle (2006) focused on fine and gross motor skills, alongside explicit instruction on letter formation using dots and arrows to support children's understanding of letter shapes. Stories and rhymes with corresponding actions were used to support paper and pencil manipulation skills. The intervention group's letter formation skills improved.

To conclude, it is difficult to determine the effectiveness of this approach. However, the evidence does suggest at least two points of interest. Firstly, fine motor skills interventions can improve

manual dexterity and visual motor skills; these skills may be important precursors for later writing. Secondly, interventions focused on a single aspect of handwriting skills may be less effective than multi-component programmes with an explicit focus on educator guidance, feedback and performance goal setting.

### Behind the evidence

Whilst most of the evidence for the approach came from the USA, evidence from other countries such as Denmark, Spain and Australia was also included. We have considered outcome data for children aged 2-6, some reviews had a broader age range and considered children below aged 2 and older than 7. Almost all the reviews reported a medium to high risk of bias, indicating the need for additional high-quality research. In some cases, the reviews look at a similar pool of primary studies but offer different reflections on the evidence. Therefore, it is important to exercise caution when drawing conclusions and considering implications for practice.

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