

Effect of Fine Motor Skills Training on Arithmetical Ability in Children

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The aim of the present study was to examine the effect of motor skills training on arithmetical abilities among 80 Grade 1 students. One result indicated that the intervention group (who received training in fine motor skills for 10 min) exhibited greater improvements in performance on an arithmetic task and a pegboard compared to the active control group (who read their favourite book for 10 min).

Authors: Atsushi Asakawa, Taro Murakami, & Shinichiro Sugimura

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The aim of the present study was to examine the effect of motor skills training on arithmetical abilities among 80 Grade 1 students. One result demonstrated that the intervention group (who received training in fine motor skills for 10 min) achieved improved performance on an arithmetic task and a pegboard compared to the active control group (who read their favourite book for 10 min). These findings suggest that the training presented in this study is an appropriate programme for improving fine motor skills and that fine motor skills

have a significant influence on arithmetical abilities in children (with a medium effect size).

- When learning arithmetic at an early stage, children tend to use their fingers to represent and count numbers.
- Based on the embodiment theory, claims have been made that finger movements are related to arithmetic development.

Possible explanations for the link between arithmetical abilities and fine motor skills:

- Brain areas governing these two abilities are close to each other; hence, they might exhibit similar developmental patterns.
- The executive function might mediate the relationships.
- Numerical operation is not merely abstract thinking—it is also based on physical, embodied experiences.

What is finger gnosis?

- Finger gnosis is the ability to identify the form of the hand and position of fingers without visual feedback.
- Finger gnosis is a different aspect of finger processing from fine motor skills.



The study

The purpose of this study was to clarify the effect of fine motor skills training on arithmetical ability in children in the first grade of primary school.

Hypothesis:

- The training programme in this study is only expected to influence fine motor skills and arithmetical abilities, not finger gnosis.

Participants

The study involved 80 Grade 1 students, who were randomly assigned to either a fine motor training group or a control group. In the intervention group, fine motor skills training was conducted instead of a reading activity (which was continued in the control group) for 3 weeks after pre-test.

Fine motor skills training

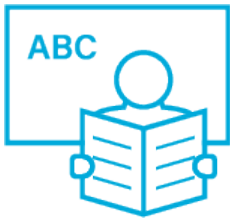
- **Bead stringing:** children were required to string as many beads as possible with one hand at a time for one minute.
- **Finger opposition:** children performed finger opposition movements (thumb to index, medium, ring, and little fingers) with each hand five times.
- **Pulling each finger:** children placed their hands in front of their chest with the right palm facing them and left palm facing away. They clasped the fingers of both hands together and pulled their left hand towards their right side while pulling their right hand to the left.



Findings

- The training was effective in improving fine motor skills.
- The fine motor skills training was effective in improving children's arithmetical abilities.
- The fine motor skills training in this study was not

effective in improving finger gnosis.



Summary

- The arithmetic scores of the fine motor training group showed improvement after the 3 week intervention period, whereas those in the reading group showed no improvement.
- It appears that fine motor skills have a significant influence on arithmetical abilities (given the medium effect size).
- For the first time, the present study has provided evidence suggesting there may be a causal relationship between fine motor skills and arithmetical abilities.
- Fine motor skills training does not improve finger gnosis.
- According to the 'brain' view, the brain areas underlying both finger movement and arithmetical ability are close to each other.
- According to the 'mediation' view (which proposes that executive function mediates the relationship between fine motor skills and arithmetical ability), it is possible that arithmetic abilities develop because of improvements in executive function through fine motor skills training.
- According to the 'embodiment' view, numerical operations are not merely abstract thinking—they are also based on physical, embodied experiences.
- The results cannot confirm whether the mediation or embodiment view best fits the results.