

Math learned best when children move

February 8 2017



The project have investigated whether different types of math math learning strategies changes the way children solves math problems. On the picture mounting of the hood which is used for recording brain activity during solving of math problems. Credit: University of Copenhagen

Children improve at math when instruction engages their own bodies. This is one of the findings from a recent study coming from the University of Copenhagen's Department of Nutrition, Exercise and Sports. The results also document that children require individualized learning strategies.

Well-being and learning among school age [children](#) has a significant impact on how children fare later on in life. Therefore, frameworks for elementary school teaching and learning must be optimized. The 2014 Danish School Reform emphasized physical activity during the primary and lower secondary education years - as apart of academic instruction as well. Researchers from the Department of Nutrition, Exercise and Sports have investigated the effect of different types of primary school mathematics instruction.

It helps to use the whole body

Results from the study underscore that many children improve at math when their bodies are engaged during instruction, and that math instruction should be individualized.

"The children learn more if they move and use the whole body to learn", according to head researcher and Associate Professor Jacob Wienecke of the University of Copenhagen's Department of Nutrition, Exercise and Sports. "Compared to previous studies which demonstrated that intense physical activity could improve learning outcomes, we have been able to show that lower intensity activities are just as effective, or even more effective, as long as movement is integrated into the topic at hand."

After just six weeks of the study, all of the children improved their scores in a standardized fifty question national test. Children whose instruction included whole body activity performed best. Their performance improved by 7.6%, with nearly four more correct responses than the baseline, and twice as much improvement as the sedentary [fine motor skills](#) group.

Differentiated instruction is crucial

When children were grouped according to pre study math performance, the results demonstrated that children with average and above average performance benefitted most from using the entire body in learning. Children who weren't very good at math prior to the study received no particular benefit from the alternative instructional forms.

"We need to keep this in mind when developing new forms of instruction," according to Associate Professor Wienecke, who continues: "The new [school reform](#) focuses on, among other things, the incorporation of [physical activity](#) during the school day, with the aim of improving the motivation, well-being and learning of ALL children. However, individual understanding must be taken into account. Otherwise, we risk an unfortunate combined outcome in which those who are already proficient advance, and those who have not yet mastered concepts cannot keep up."

The researchers are now investigating which areas of the brain are involved in these various learning strategies. At the same time, researchers will be testing the School Reform's positive effects on other academic skills, such as reading.

Results of the study have just been released in the article, Motor-enriched Learning Activities can Improve Mathematical Performance in Preadolescent Children, published in the internationally renown scientific journal, *Frontiers of Human Neuroscience*.

About the study

The University of Copenhagen's Department of Nutrition, Exercise and Sports studied the effect of various instructional types related to mathematics instruction for Danish primary school students. 165 Danish first grade students, divided among 3 schools in the Copenhagen area participated in a 6-week study.

The children were divided into three groups:

- One group used the whole body during mathematics education. Teaching took place on the classroom floor, with tables and chairs set to the side. Students were included in problem solving by, for example, making a triangle or shaping numerals with their bodies, or using one another when being asked to add or subtract.
- Another group of students was sedentary and worked on math using fine motor skills. These children worked independently or in small groups using LEGO-bricks in a classroom setting. For example, they used bricks for arithmetic or to build models for solving geometry tasks.
- A control group engaged in regular mathematics instruction, using pencils, paper, rulers and the like.

More information: Mikkel M. Beck et al. Motor-Enriched Learning Activities Can Improve Mathematical Performance in Preadolescent Children, *Frontiers in Human Neuroscience* (2016). [DOI: 10.3389/fnhum.2016.00645](https://doi.org/10.3389/fnhum.2016.00645)

Provided by University of Copenhagen

Citation: Math learned best when children move (2017, February 8) retrieved 23 April 2024 from <https://medicalxpress.com/news/2017-02-math-children.html>

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