

Pre-school program shown to improve key cognitive functions, self-control

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An innovative curriculum for pre-schoolers may improve academic performance, reduce diagnoses of attention deficient hyperactivity disorder (ADHD), and close the achievement gap between children from poor families and those from wealthier homes, according to research led by a Vancouver neuroscientist who is an expert in the development of cognitive function.

University of British Columbia Psychiatry Prof. Adele Diamond, who is Canada Research Chair in Developmental Cognitive Neuroscience, led the first evaluation of a curriculum called Tools of the Mind (Tools), that focuses on executive functions (EFs) that depend on the prefrontal cortex area of the brain. Functions include resisting distraction, considering responses before speaking, mentally holding and using information, and mental flexibility to “think outside the box.”

The program was developed over the last 12 years by U.S. educational psychologists Deborah Leong and Elena Bodrova and has been used in several U.S. states. Its value in improving EF has not been determined until now.

The study is published in this week’s issue of *Science*.

“EFs are critical for success in school and life. The skills are rarely taught, but can be, even to preschoolers. It could make a huge difference, especially for disadvantaged children,” says Diamond, who is a member of the Brain Research Centre at UBC Hospital; Vancouver

Coastal Health Research Institute (VCHRI); the Child and Adolescent Psychiatry Dept. at BC Children's Hospital; the Child & Family Research Institute (CFRI); and the Human Early Learning Partnership (HELP) in Vancouver.

“The recent explosion in diagnoses of ADHD may be partly due to some children never learning to exercise attentional control and self-discipline,” says Diamond. “Although some children are strongly biologically predisposed to hyperactivity and wouldn't benefit from training, others may be misdiagnosed because what they actually need are skills in self-regulation.”

Previous research has shown that EFs are stronger predictors of academic performance than IQ, she adds.

Children from lower-income families may enter school with disproportionately poor EF skills and fall progressively farther behind in school each year – facts which Diamond says are related and correctible.

“Helping at-risk children improve EF skills early might be critical to closing the achievement gap. We showed EFs can be improved in preschoolers without fancy equipment and by regular teachers in regular public school classrooms.”

Most interventions target consequences of poor self-control rather than seeking prevention at an early age, which is a hallmark of Tools. Previous attempts to improve children's EF have been costly and of limited success, say the researchers.

The research team, which includes investigators from the National Institute for Early Education Research at Rutgers University in New Jersey, evaluated 147 five-year-olds in a low-income, urban U.S. school district. Researchers compared Tools with a curriculum called balanced

literacy (dBL) that covered the same academic content as Tools but without a focus on EF.

Both programs were new, instituted at the same time and used identical resources. Children and teachers in Tools and dBL were randomly assigned and teachers had equivalent levels of education and teaching experience. Children received either Tools or dBL for one to two years.

Evaluation involved two computerized tests that measured EF.

In the first test, children were told to respond to shapes (a heart and a flower), appearing one at a time on the left or right side of a computer screen, by pressing a right- or left-hand button. A heart symbol meant press the button on the same side as the shape appeared; the flower meant press the button on the opposite side. The exercise tested ability to hold abstract rules in the mind. Most children in Tools completed the test successfully, compared to fewer than one-third of children in dBL.

The second test presented one shape inside a different shape (e.g. a triangle and a circle) with instruction to focus on either the inside or outside shape and press corresponding right- or left-hand buttons. The test measured ability to focus attention, ignore the distraction of the non-relevant shape, and switch focus from inside to outside shapes. When children had to switch focus, children in dBL were correct on 65 per cent of the trials – not significantly better than chance. Children in Tools were correct on 84 per cent of the trials.

Source: University of British Columbia

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