What's Next? Performance on the Next Number Task as a Predictor of Primary Children's Math Achievement

Marcie Penner-Wilger[1], Lisa Fast[1], Brenda L. Smith-Chant[2], Sherri-Lynn Skwarchuck[3], Jo-Anne LeFevre[1], Jessie S. Arnup[1], Jeff Bisanz[4], & Deepthi Kamawar[1]
[1]Carleton University, [2]Trent University, [3]University of Winnipeg, [4]University of Alberta

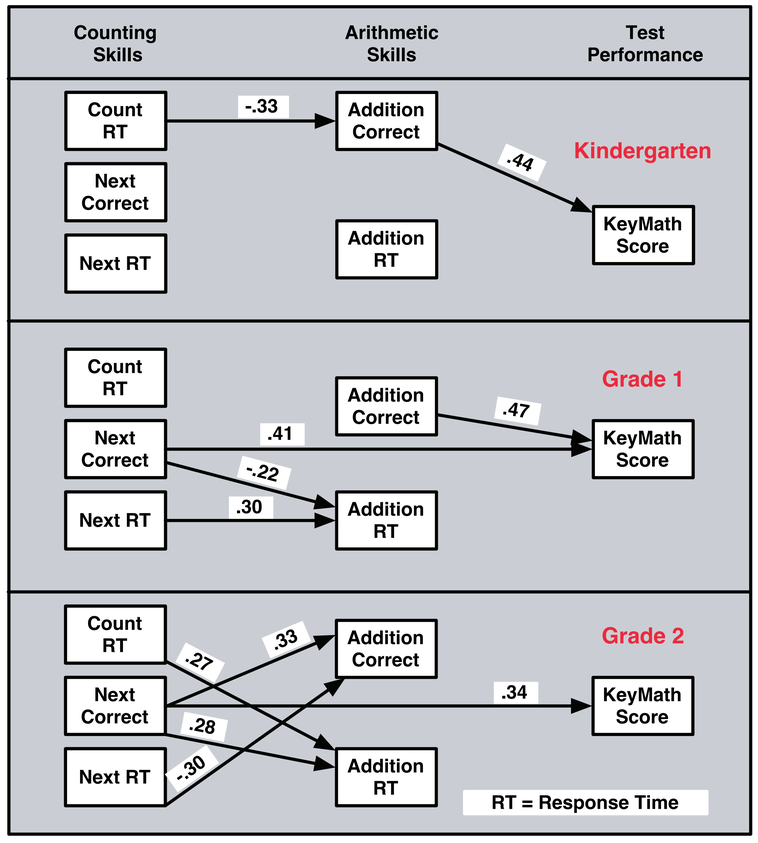
Is counting predictive of young children's math achievement?

Previous research (Geary, 1993) has suggested that children's grasp of counting procedures and principles is an important component skill for acquiring arithmetic knowledge. Children's knowledge of counting should predict their addition performance before they start to rely heavily on direct retrieval.

Relatively few researchers have explored more advanced counting knowledge, where the children could not rely on rote memory, but instead have to construct the answer. The Next Number task (shown below) requires this underlying knowledge of the number system. The stimuli included digits ranging from 2 to 407,276.

Beyond simple counting – the Next Number task

As part of the first point in a longitudinal study of the development of math skills in primary children, 232 Canadian children in Kindergarten (n = 62), Grade 1 (n = 89), and Grade 2 (n = 81) completed a battery of computerized tasks, including the Next Number task, counting objects, and an addition task. Children also completed subtests of a standardized test of math achievement (KeyMath). The Numeration subtest covers key concepts such as quantity, order and place value.



Progression from counting to Next Number as a predictor of math achievement

Based on a model by Geary (1993), performance on the counting task (response time and accuracy) and Next Number task (response time and number correct) were used to predict performance on the addition task (response time and number correct). Performance on all computerized tasks was then used to predict math achievement in the KeyMath Numeration subtest. Separate regressions were run for each grade, and variables were entered in a single step. Different patterns of relations were found among tasks across grade levels. Only paths with significant standardized coefficients are shown in the figure to the left.

In Kindergarten, children's math achievement was predicted by accuracy on the addition task. As hypothesized, counting speed predicted addition accuracy. In Grade 1, addition accuracy continued to predict math achievement but performance on the Next Number task became an important predictor of both addition response times and math achievement. In Grade 2, performance on the Next Number task had even more predictive power, accounting for variance in addition response times and addition accuracy, as well as math achievement.

A higher-level understanding of counting procedures, which is both abstract and creative, predicts children's math achievement. Our research shows how this pattern changes in the critical Kindergarten to Grade 2 range.

Carleton University · Trent University · The University of Winnipeg · Social Sciences and Humanities Research Council of Canada · Canada