

# Counting on Subitizing

## The Relations among Subitizing, Counting, and Fine Motor Coordination



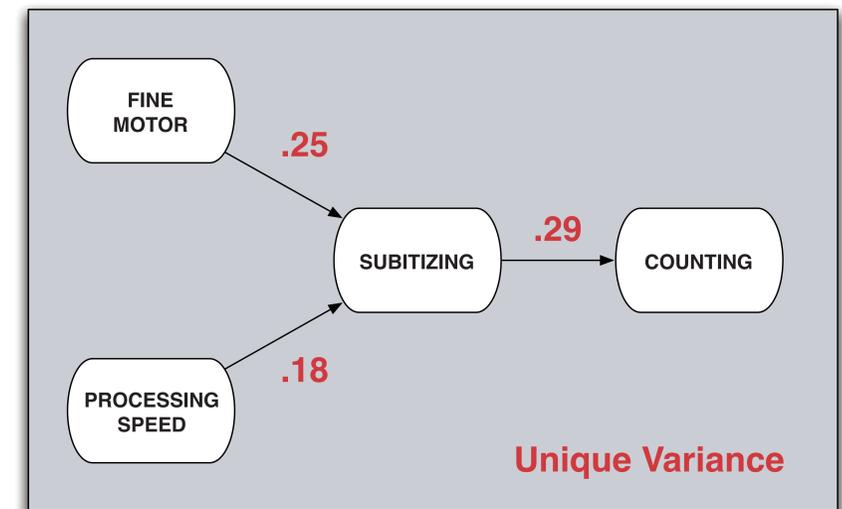
Marcie Penner-Wilger<sup>1</sup>, Lisa Fast<sup>1</sup>, Brenda L. Smith-Chant<sup>2,3</sup>, Tina Shanahan<sup>1</sup>, Jesse Arnup<sup>1</sup>, Jo-Anne LeFevre<sup>1</sup>, & Sheri-Lynn Skwarchuk<sup>4</sup>  
<sup>1</sup>Carleton University, <sup>2</sup>Trent University, <sup>3</sup>Ontario Ministry of Children and Youth Services, <sup>4</sup>University of Winnipeg

### How are subitizing and fine motor ability related to counting in young children?

The ability to subitize, quickly enumerate 1-3 items, is posited to be central to the development of numerical knowledge. Counting, and indeed all mathematical understanding, is argued to be built upon this foundation (Butterworth, 1999; Dehaene, 1997). Fine motor ability is also thought to play an important role in the development of counting and mathematics (Barnes, Smith-Chant, & Landry, 2005). In the current experiment, we examined the relations among subitizing, fine motor ability, and counting speed in primary children.

### Determining the cognitive precursors of subitizing and counting

In a pilot study for the Count Me In longitudinal study, Canadian children in grades 1-3 (n = 24) completed a battery of computerized tasks including: a **fine motor** task (finger tapping), a **subitizing** task (enumerating sets of 1-3 items), a **counting** task (enumerating sets of 4-6 items), and a **processing speed** task (pressing a key to correspond to a displayed X or O). Processing speed was included to partial out the general influence of fast responding.



### Relation between fine motor ability and counting is mediated by subitizing

Linear regression revealed that processing speed accounted for 18% of unique variance in subitizing speed. Finger tapping (maximum for non-dominant hand) accounted for an additional 25% of unique variance in subitizing speed. Subitizing speed accounted for 29% of unique variance in counting speed. In contrast, neither finger tapping nor processing speed contributed significantly to variance in counting speed, after the influence of subitizing was accounted for.

**Our findings suggest that fine motor ability does not affect counting performance directly, but rather the relation between fine motor ability and counting is mediated by subitizing. Findings are also consistent with the position that counting and subitizing are separate but overlapping processes and that counting builds on subitizing (Piazza, Mechelli, Butterworth, & Price, 2002).**

**Computer Tests**

**Fine Motor**

Go Valid

Use right hand - Press X or O

X

Go Q

**Processing Speed**

Go Valid

**Subitizing**

Go Valid

**Counting**

Go Valid