

# Count Me In!

## Long-term predictors of mathematical development in Canadian Children

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# Background

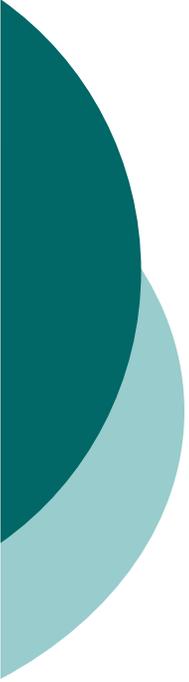
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- i Brenda Smith-Chant

- 1 PhD, MA (Carleton University)
- 1 BSc (Trent University)
- 1 Postdoctoral Fellow (Sick Kids)

- i Professor, Trent University

- 1 Department of Psychology
- 1 Research area: Development and Cognition
- 1 Mathematical cognition and social, educational, and cultural influences on how math is organized in memory



# Count Me In! and Count Me In, Too!

## Long-term predictors of children's math

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### Co-investigators:

- 1 Jo-Anne LeFevre (Carleton)
- 1 Deepthi Kamawar (Carleton)
- 1 Jeff Bisanz (Alberta)
- 1 Sheri-Lyn Skwarchuk (Winnipeg)

i [www.carleton.ca/cmi](http://www.carleton.ca/cmi)



# Count Me In! and Count Me In, Too!

## Long-term predictors of children's math

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### Long-term study

- 1 Following over 450 children across Canada
- 1 Grades JK to 5
  - 1 Over 5 years
- 1 Looking at early behaviours that support later math performance
- 1 Also, looked at literacy behaviours
  
- 1 Completed testing: Analysing results!



# Numeracy: what is it?

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## Numeracy:

- 1 Similar to the concept of *literacy*
- 1 Skills involving numerical concepts,
  - ; Number sense and counting
  - ; Measurement
  - ; Patterning and algebra
  - ; Geometry and spatial sense
  - ; Probability and estimation
- 1 Sometimes called “math literacy”
  - ; Problem: Don’t like this word, implies that it is just part of literacy
  - ; Not quite true...



# Agenda for this presentation

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- i Overview the factors known to impact children's early numeracy
- i Discuss the importance of early numeracy for later mathematical achievement
  - 1 Present early results from Count Me In!



# Numeracy: Who cares?

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Numeracy is essential for:

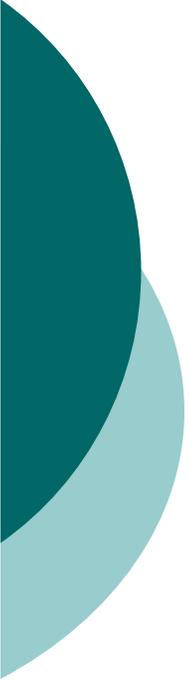
- 1 Formal math
- 1 Science
- 1 Technology
- 1 Music
- 1 Art
- 1 Carpentry/Trades
- 1 \$\$\$



## Numeracy skills associated with:

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- ; Socio-economic status
- ; Autonomy (independence)
- ; Academic outcomes
  
- ; More predictive of future career attainment than literacy!



# Numeracy: Who cares?

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- ⌋ Current cohort of university students
  - ⌋ Declining scores, avoidance
- ⌋ Math avoidance leads to:
  - ⌋ Apathy and fear
  - ⌋ Avoidance of math
    - ⌋ Games
  - ⌋ Gambling\*
  - ⌋ Problems assessing risk



## Why?

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- i Perception that math is an innate ability, not learned
  - 1 There are 'math people'



## Interesting....

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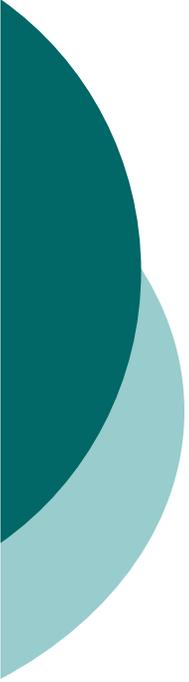
- i Only in North America/Western culture is math viewed as “something you are born good at”
  - 1 Huntsinger and colleagues
  - 1 Geary and colleagues
- i Parents in Asia, Middle East believe that math is a skill that must be learned
  - 1 Math performance is accordingly higher



## What we have learned:

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- ⌋ Numeracy skills in PRESCHOOL and early grades are powerful predictors of school-aged math performance
  - ⌋ Indicates that early numeracy skills are foundational
    - ⌋ Supported by research from across many countries, many different studies
  - ⌋ Provides child with basis for formal math education
- ⌋ What are some of these skills?



## We found 3 essential skills

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- i Counting and Subitizing (more on that later)
- i Spatial attention
- i Language

# “Paths” to numeracy (Mathville)





# What are these early numeracy skills?

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## Quantity awareness:

- i Subitizing

- 1 Ability to determine the quantity of a small group of items without apparent counting

- 1 Let me show you....



How many are there?

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J

J

J



# How many are there?

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J

J

J

J

J

J

J

J

J



How many are there?

---

J

J



# What are these early numeracy skills?

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## Quantity Awareness:

- i Counting

- 1 NOT just reciting number words!

- i Can hide that they can't count to determine quantity

- 1 Understand the CONCEPTS of counting

- i Special counting words

- i These words go in set order

- i Each item set gets a specific word

- i The last word represents 'the number'



## What are these early numeracy skills?

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- i Must be able to count sets more than 3 items
  - 1 Lots of practice needed
  - 1 Lots of different items
  - 1 Develop the awareness that anything can be counted
  - 1 Fast, efficient, accurate (counting fluency)



# Counting skills

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- i Highly predictive of early addition skills
  - 1 Addition predicts subtraction, multiplication, arithmetic
  - 1 Arithmetic core skill in ALL math domains (even geometry)
  
- 1 In much of the existing research arithmetic skills highly predictive of later math performance right to university!



# What are these early numeracy skills?

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- i Language
  - 1 Not just any language...
  - 1 Language of numeracy
    - i Counting words
    - i Patterns of counting words, rules of the number system
    - i What number comes after 99?
    - i More/less, larger/smaller



## What are these early numeracy skills?

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- i Spatial attention/working memory
  - 1 Ability to pay attention
  - 1 Remember information and its location (spatial memory)
  - 1 Manage complex mental tasks (directions)



# So, what do we do?

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## Issue at hand:

- 1 Most parents and ELCC workers UNDERESTIMATE children's abilities to do math
  
- 1 Parents:
  - ; "Too little"
  - ; "I don't know enough"
  - ; "That is something they teach in school"



## Sum Up: Early numeracy

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- i Understand the importance of fostering early numeracy skills
- i Develop the awareness that even in preschool, children can learn a great deal about numeracy



## Sum Up: Early numeracy

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- i Ensure all “3 paths to Mathville” are provided to children
  - i Quantitative awareness
  - i Language
  - i Spatial Attention/Working memory



# Quantity Awareness

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- i Skills like subitizing and counting
  - 1 Play games where quantities are used (Snakes and Ladders, Trouble, Cribbage)
  - 1 Have children count to determine quantity as part of real-world activities
  - 1 Teach children about money
  - 1 Use arithmetic in real-world settings
  - 1 Practice with speed—count from car windows and things that move



## Other things

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- i Understand that in the early years—  
fingers are good for math
- i Activities such as Art, Music, Sports,  
Crafts may assist in learning math
  - 1 Application of numeracy to real-world
  - 1 Working memory practice



## Likely the most important

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- i Attitude of the adult is key
  - 1 Use math yourself and include the child
  - 1 Get more comfortable!
- i Children experiencing math problems need MORE experience—not avoidance...
  - 1 Calculators AFTER the ability is there...not instead of



# Good thing about numeracy!

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- i Technology is not necessary
  - 1 Numeracy opportunities surround us
  - 1 Expensive programs and materials are not necessarily BETTER
- i Early numeracy isn't rocket science (it's just the foundation for it...)
- i Math is a SKILL and not an INNATE ABILITY



# Coming to help!

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- i The Canadian Language and Literacy Network (CLLRNET)
  - 1 Developing a “Math Kit” for parents, ELCC professionals, teachers
  - 1 From preschool to grade 6
    - i Will contain research summary, developmental pathways, recommended tasks and activities to promote numeracy
  - 1 Available late 2009/2010



# For more information...

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[bresmith@trentu.ca](mailto:bresmith@trentu.ca)

[www.carleton.ca/cmi](http://www.carleton.ca/cmi)

- 1 Research
- 1 Parent newsletters,
- 1 Links to other sites

[www.cllrnet.ca](http://www.cllrnet.ca)

- 1 Encyclopaedia of Child Development