

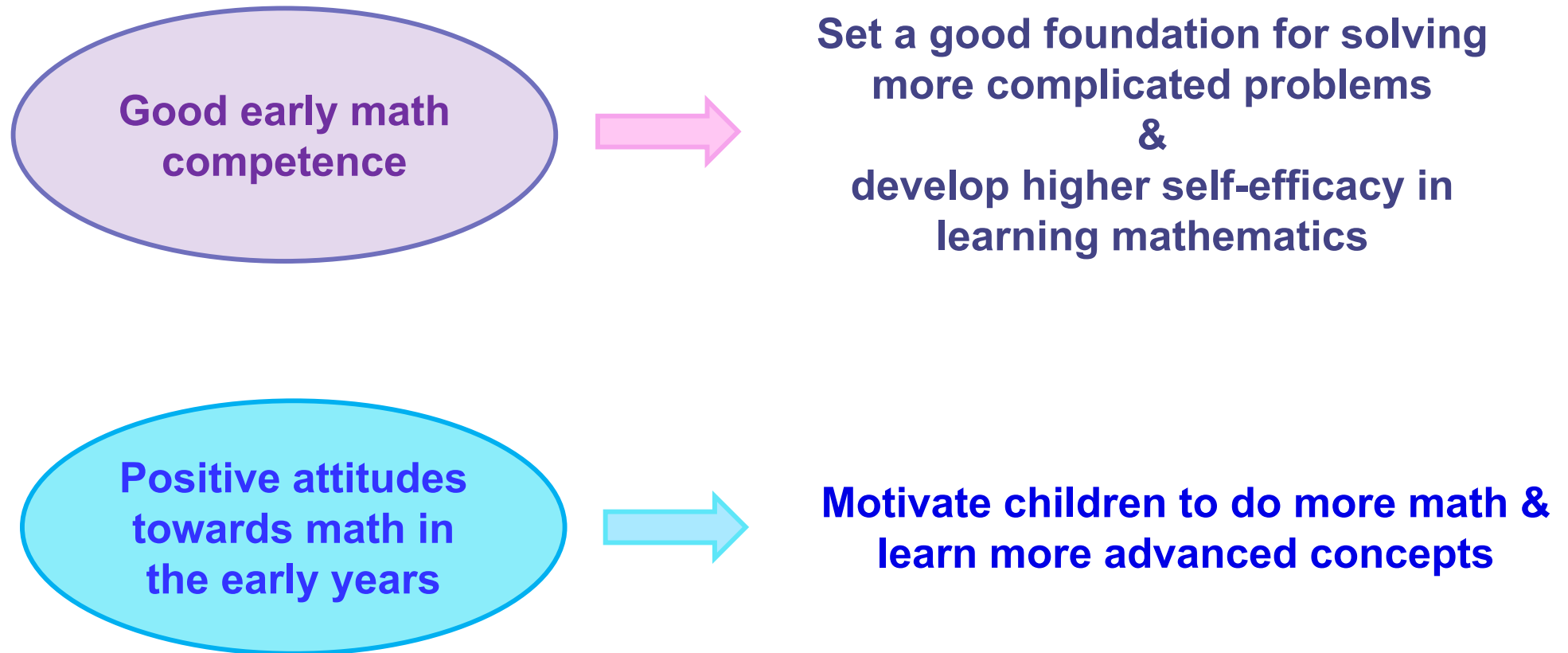


Hong Kong Young Children's Mathematical Competence & Attitudes: How Do Parents Matter?

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Early math development is very important!







- **Early math competence**

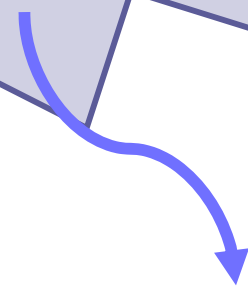
- **Rote counting, object counting, number naming, number comparison, number identification, simple addition and subtraction, applied problem solving, etc.**

- **Early math attitudes**

- **Math interest, math anxiety, etc.**



**Great variations in
children's math
abilities upon entry
to kindergarten**



**This may imply that parents play
an important role in early math
development!**

How do parents matter for early math development? *(Cheung et al., 2021)*

Home math practices

- Provision of home math resources
 - Math-related storybooks, board games, card games, computer games, etc.
- Frequency of home math activities
 - Completing math-related exercise books, playing number board games, etc.
- Amount of math talk during parent-child interactions
 - Number names, count sequence, etc.
- Strategies used to help children learn math
 - Indirect math teaching strategies, sustained shared thinking strategies, etc.

How do parents matter for early math development?

- Empirical evidence of the relation between home math practices & early math development:

Huang et al. (2017) found that ...

- Higher frequency of number skills activities with mothers & number application activities with fathers → Better math performance in children

Cheung and McBride (2017) found that ...

- Regular number board game playing between parents & children → Children's math skills & interest ↑

How do parents matter for early math development?

■ Parents' socioeconomic background

Cheung et al. (2018) found that ...

- Children from lower-SES families demonstrated poorer math competence

DeFlorio and Beliakoff (2015) found that ...

- Middle-SES parents are more likely to engage children in math games & talk about math during daily routines
- Low-SES parents are more likely to set aside some time to improve children's math skills

How do parents matter for early math development?

■ Parent-child relationship

Cheung et al. (2022) found that ...

- High parent-child closeness → Better language abilities in children → Better math abilities in children
- After controlling for parent-child closeness, parent-child conflict had no significant correlation with children's math abilities

How do parents matter for early math development?

■ Parents' own math abilities & attitudes

Cheung et al. (2020) found that ...

- Parents with better math abilities →
More home math activities & resources →
Better math competence in children

Maloney et al. (2015) found that ...

- Math anxious parents who frequently help children with math homework →
Higher math anxiety in children

How do parents matter for early math development?

- Currently, relatively little is known about the effects brought by:



Parents' beliefs &
and attitudes

How do parents matter for early math development?

- Empirical evidence of the role of parental beliefs & attitudes in early math development

Segers et al. (2015) found that ...

- Higher parental numeracy expectation → Better numeracy skills in children

Cheung and Kwan (2021) found that ...

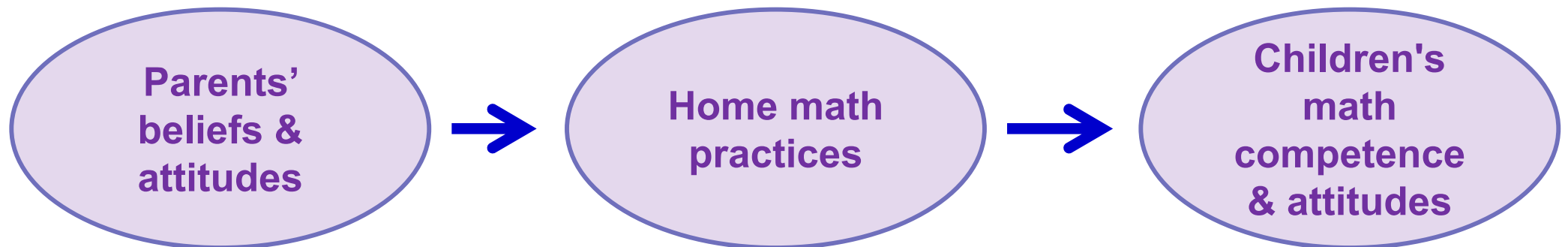
- Higher level of importance to the attitude goal & the reasoning goal → Higher level of approach motivation to learn math in children

Research Gaps

What other parental beliefs & attitudes are related to young children's math attitudes & competence?

What are the underlying mechanisms?

Proposed Conceptual Model



Study 1

Research aims

- To examine Hong Kong parents' perceived **nature of math (static belief vs dynamic belief)**
- To examine how parents' perceived nature of math, contributes to the home math experiences they create (i.e., home math activities & math teaching strategies), young children's numeracy interest and competence in Hong Kong

Study 1

Participants

- 327 K2 & K3 children and their parents
- Recruited from 10 kindergartens in Hong Kong
- Of the children ...
 - ~ 50.2% girls
 - ~ 53.8% K2
 - ~ Mean age = 4.95 years (SD = 0.65 years)
- Of the parents ...
 - ~ 81.7% mothers

Study 1

Measures & Procedure

Parent questionnaire

- Parents' perceived nature of math
(Tatto et al., 2008)
- Frequency of home numeracy activities
(Cheung et al., 2018)
- Parents' use of indirect numeracy teaching strategies
(Ricco et al., 2003)
- Children's early numeracy interest
(Cheung et al., 2018)

Sample item of static belief

Math involves the remembering and application of definitions, formulas, math facts and procedures.

Sample item of dynamic belief

In math many things can be discovered and tried out by oneself.

Study 1

Measures & Procedure

Parent questionnaire

- Parents' perceived nature of math
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- Children's early numeracy interest
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Sample item

Playing card games, board games, and/or computer games related to numbers

Sample item

Provide some hints or suggestions and see if my child can do the rest for himself/herself

Sample item

Talking about numbers

* *Good reliabilities of the measures were observed.*¹⁷

Study 1

Measures & Procedure

Child tests

- **Non-verbal intelligence** (*Raven et al., 1998*)
- **Language abilities** (*Cheung et al., 2022*)
- **Early numeracy abilities** (*Cheung et al., 2018*)

8 tasks:

Forward rote counting, backward rote counting, number comparison, number identification, number writing, identification of missing numbers, addition facts, addition story problems

* *Good reliabilities of the measures were observed.*¹⁸

Study 1

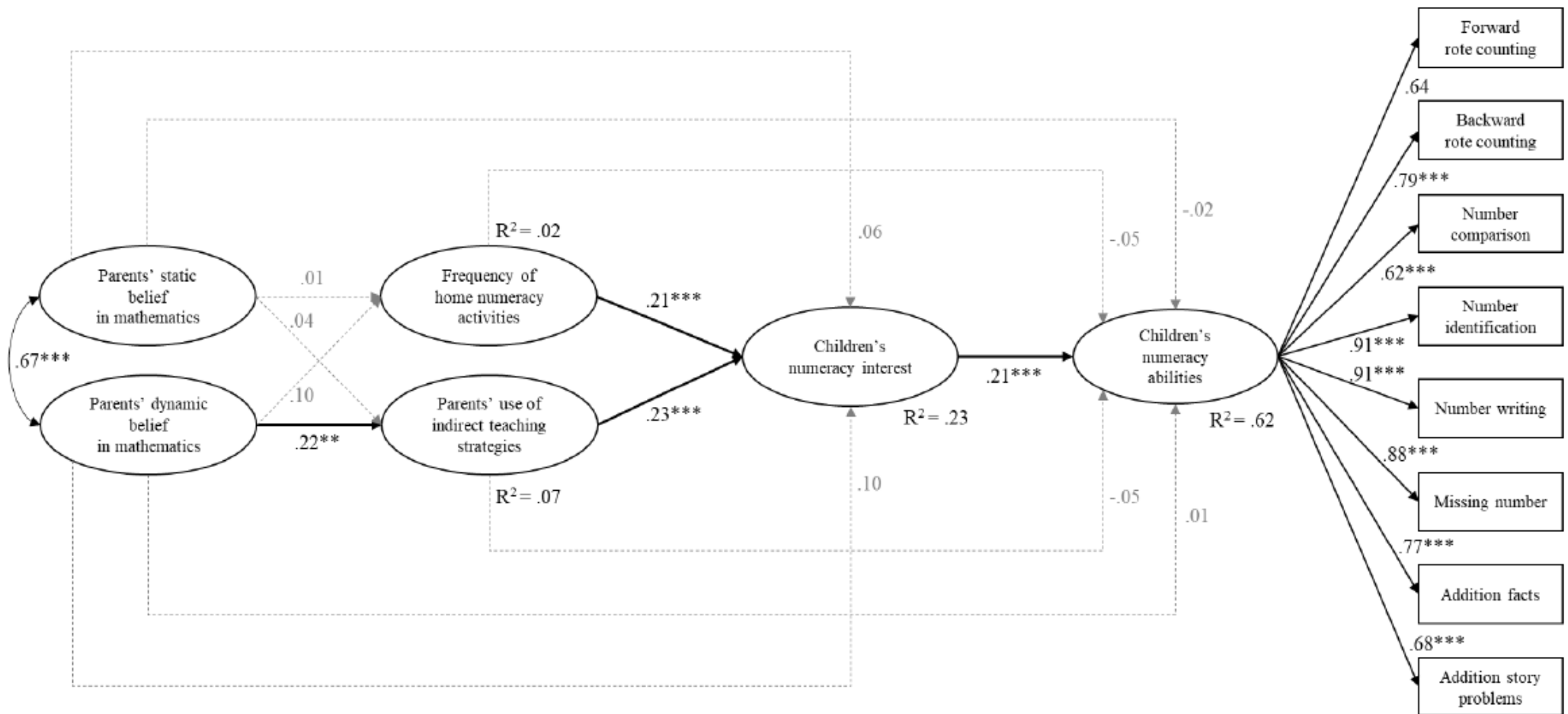
Results

Nature of mathematics	Mean	SD
Static	4.68	.58
Dynamic	4.80	.55

Paired samples *t*-tests showed that Hong Kong parents in our sample were inclined to regard mathematics as dynamic rather than static in nature ($t = -4.86, p < .001$).

Study 1

Results



$\chi^2 (83) = 195.59, p < .001; RMSEA = .06; CFI = .96; TLI = .93; SRMR = .03$

Study 2

Research aims

- To examine whether Hong Kong parents score higher in **perfectionistic strivings** or **perfectionistic concerns**
- To examine how parents' perfectionistic strivings and concerns about children's learning contributes to the home math experiences they create (i.e., home math activities), young children's motivation to learn math and math abilities

Study 2

Participants

- 212 K3 children and their parents
- Recruited from 10 kindergartens in Hong Kong
- Of the children ...
 - ~ 45.3% girls
 - ~ Mean age = 6.14 years (SD = 0.37 years)
- Of the parents ...
 - ~ 83.0% mothers

Study 2

Measures & Procedure

Parent questionnaire

- **Parents' perfectionistic tendencies**
(Wang, 2010)
- **Frequency of home math activities**
(Modified from LeFevre et al., 2009)
- **Children's motivation to learn math**
(Berhenke, 2013)

Sample item of perfectionistic strivings

I have high expectations for my child's learning

Sample item of perfectionistic concerns

I often feel disappointment after my child has completed a learning task because I know s/he could have done better

Child tests

- **Rapid automatic naming**
- **Early math abilities** *(Cheung et al., 2018)*

Study 2

Measures & Procedure

Parent questionnaire

- Parents' perfectionistic tendencies
(Wang, 2010)
- Frequency of home math activities
(Modified from LeFevre et al., 2009)
- Children's motivation to learn math
(Berhenke, 2013)

Sample items

- * Teach how to print numbers
- * Using clocks and calendars to talk about time

Child tests

- Rapid automatic naming
- Early math abilities *(Cheung et al., 2018)*

Study 2

Measures & Procedure

Parent questionnaire

- Parents' perfectionistic tendencies
(Wang, 2010)
- Frequency of home math activities
(Modified from LeFevre et al., 2009)
- Children's motivation to learn math
(Berhenke, 2013)

Sample item of approach motivation

Is eager to talk about his/her activities

Sample item of avoidance motivation

Tears when faced with difficulties

Child tests

- Rapid automatic naming
- Early math abilities *(Connolly, 2007)*

Naming of letters

2 tasks:

Mental computation,
applied problem solving

* Good reliabilities of the measures were observed.

Study 2

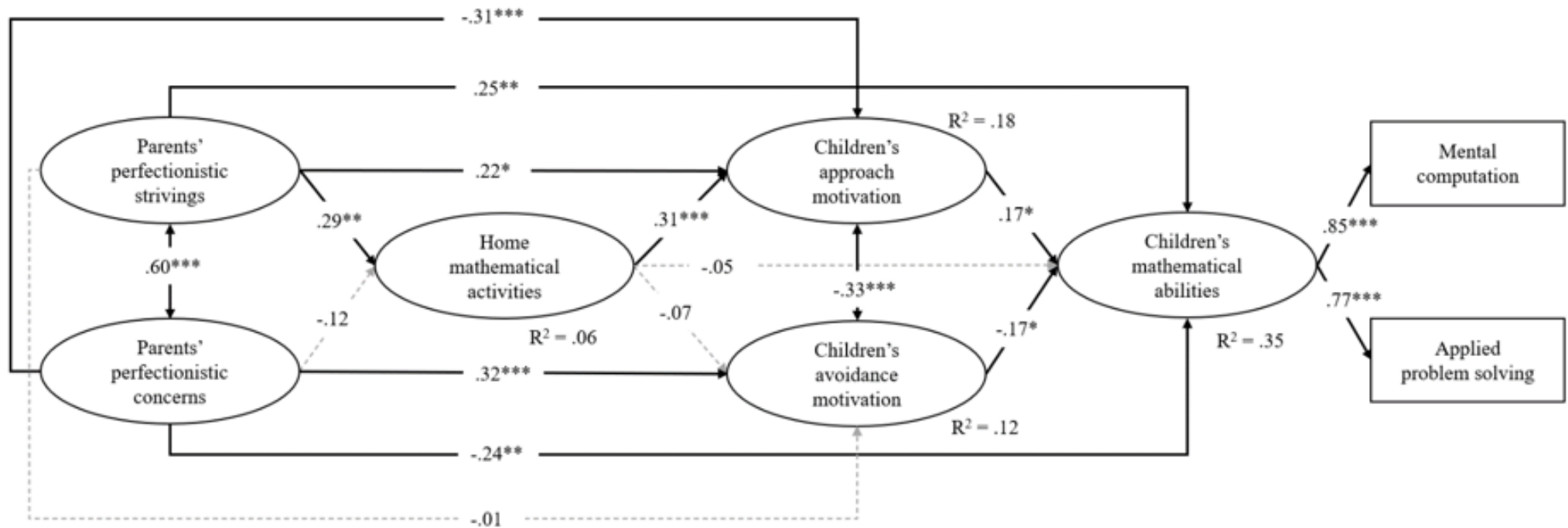
Results

Types of perfectionistic tendencies	Mean	SD
Perfectionistic strivings	4.06	1.08
Perfectionistic concerns	3.49	1.03

Paired samples *t*-tests showed that Hong Kong parents in our sample scored higher in perfectionistic strivings than perfectionistic concerns ($t = 8.61, p < .001$).

Study 2

Results



$\chi^2(16) = 28.42, p < .05; RMSEA = .06; CFI = .97; TLI = .91; SRMR = .04$

Discussion

Implications for practitioners

- It is important to promote young children's positive attitudes towards math & motivation to learn math
- Parent education programs should ...
 - ~ help parents appreciate the dynamic nature of math
 - ~ raise parents' awareness of how to express high expectations for children's learning in a constructive manner
 - ~ coach parents how to guide children's math learning effectively

Discussion

Issues that warrant the attention of researchers

- When examining the effects of the home math environment on children's early math competence, it is important to include the following variables:
 - ~ Parental beliefs & attitudes
 - ~ Children's math attitudes & motivation to learn math
- The studies presented have some limitations
 - E.g., use of cross-sectional data
- Some possible future research directions:
 - ~ Whether fathers and mothers play similar roles
 - ~ Whether the mechanisms identified are culturally specific or universal

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