LIÈGE université
Enfances

FINGER GAMES TO IMPROVE BASIC NUMERICAL SKILLS IN PRESCHOOLERS

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INTRODUCTION

Introduction

Currently :

The mathematical abilities take an important place in the school curriculum.

- Priority to the early mathematical skills **from preschool** (Vilani & Torossian, 2018)

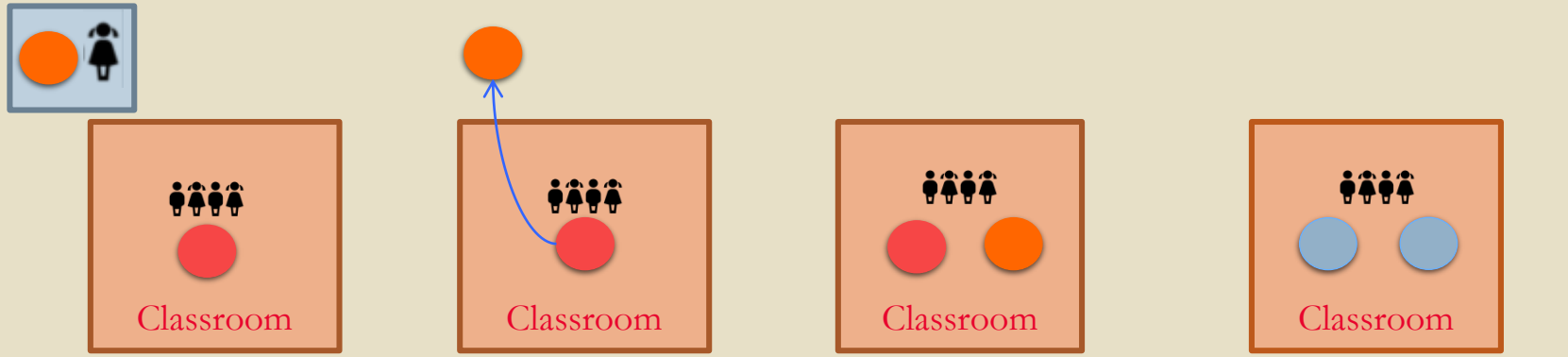
✓ Reduce the inequalities of the numerical abilities in preschoolers (Ramani & Siegler, 2008; Starkley, Klein & Wakeley, 2004)

✓ Strong relationship between preschooler's numerical abilities and later arithmetical performance (Jordan, Kaplan, Ramineni & Locuniak, 2009; Geary, Hoard, Nugent & Bailey, 2013; Watts, Duncan, Siegler & Davis-Kean, 2014)

Introduction

Early training

✓ Different methods exist depending on the suggested activities and the place of the intervention (Hall & Weaver, 2001; Hartas, 2004)



Multidisciplinary approach

Consultations

Interdisciplinary approach

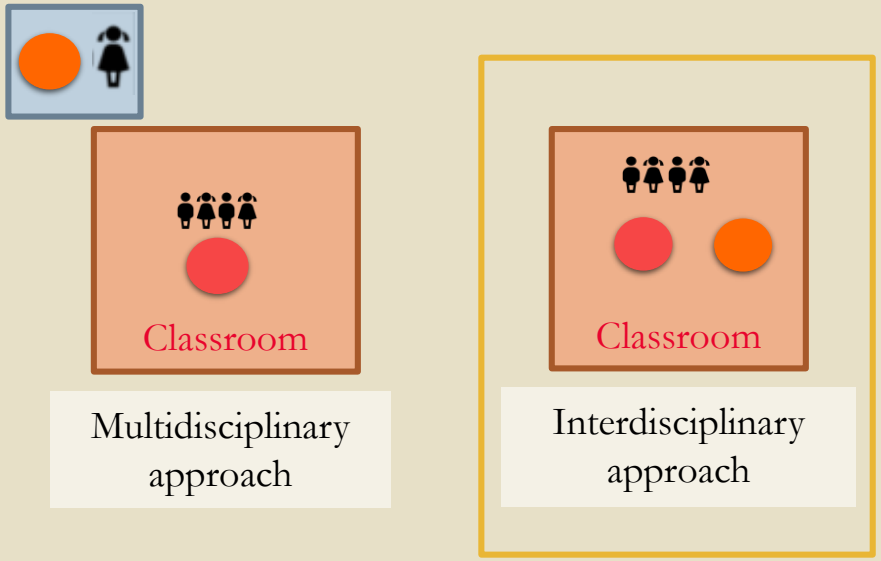
Transdisciplinary approach

✓ Improving children's mathematical skills **AND** prevent learning disabilities (Suleman, McFarlane, Pllock, Scheinder Leroy & Skoczylas, 2014)

Introduction

Numerical training: two main approaches (Wang, Firmender, Power, & Byrnes, 2016)

Specific rehabilitation adapted to the child's disabilities



Multidisciplinary approach

Interdisciplinary approach

Additional activities with specific goals to enrich traditional numerical activities

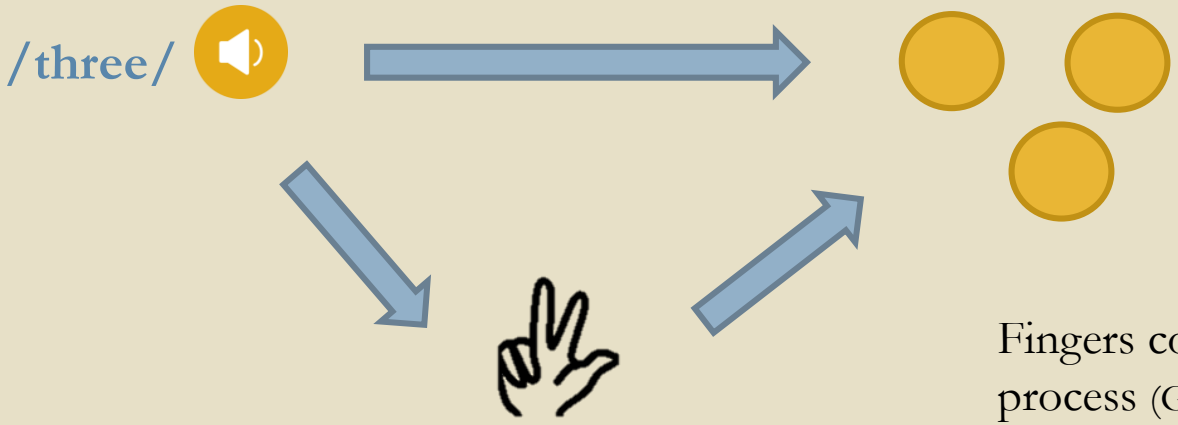
Introduction

The meaning of number-words :

A long-lasting process (Wynn, 1992)

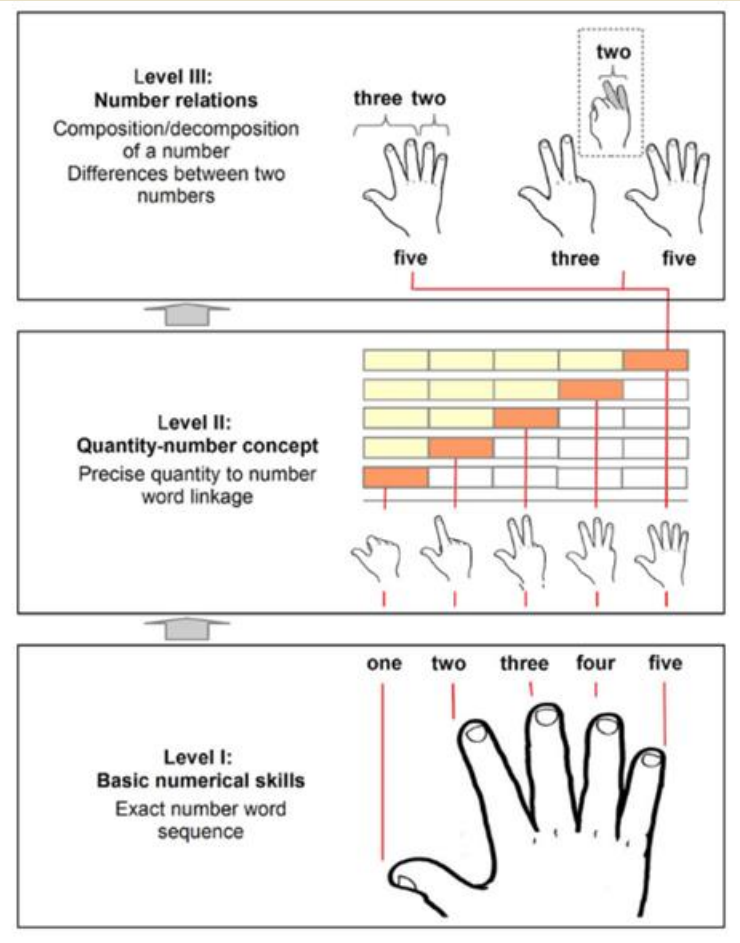
✓ Because the language **does not keep track** of the increase of quantities.

✓About one year and a half



Fingers could help children in this learning process (Gunderson et al. 2015)

Introduction



(Roesch & Moeller, 2015)

Level III : Basis of calculation
Decomposition, recomposition and comparison

Level II : Cardinal Principal
Fingers could support the association between quantities (finger numerical configurations) and number-words

Level I : Association 1 finger → 1 number-word
Fingers support the acquisition of the verbal number sequence and the counting procedure

QUESTION

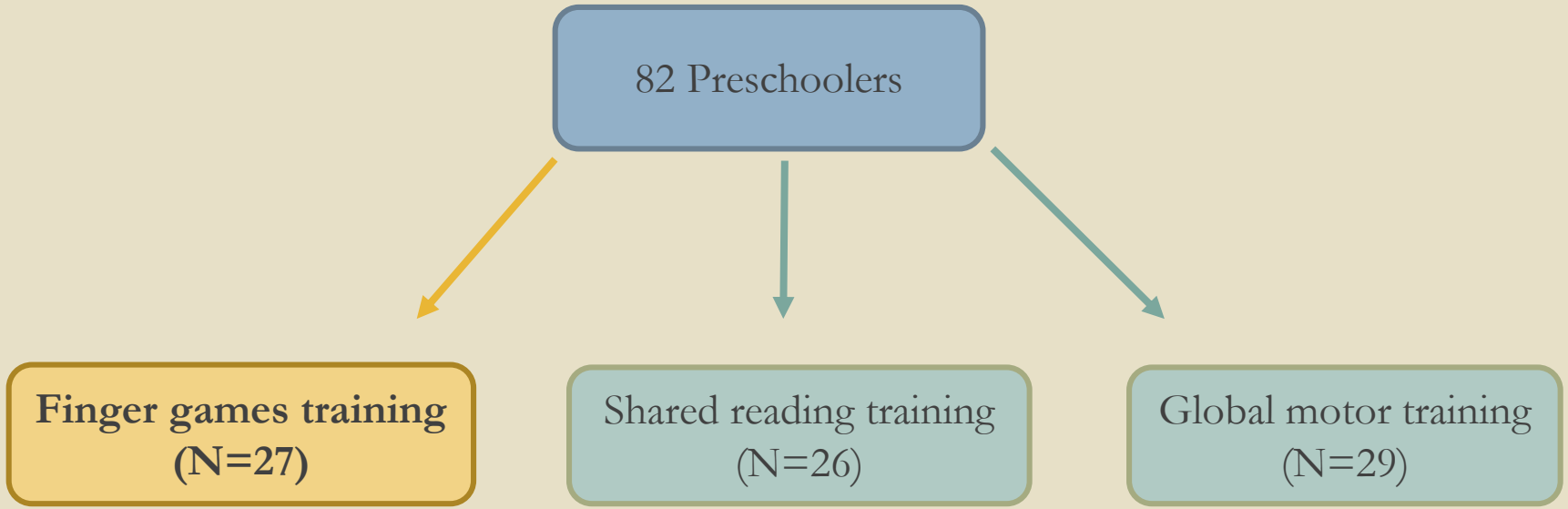
Question

How an **interdisciplinary training program**, using number-gestures to support the understanding of number-words, helps children in the development of **basic numerical skills ?**

METHODOLOGY

Methodology

Population



Methodology

Training

Finger games training program (10 weeks)

- ✓ Numerical activities using number words and number gestures
  - From 1 to 10 progressively
  - Comprehension and production tasks
- ✓ Fine motor skills training





Methodology

Training

Shared reading training program

Reading of a book

- Phonological skills
- Vocabulary

Global motor training program

Individual or team games

- Jump
- Balls throwing

Methodology

Pre-test → Training → Post-test

Pre- and post-tests

- ✓ Verbal number sequence : stable & conventional part
- ✓ Counting skills : « How many ice-creams in total ? »

- ✓ Cardinality understanding : « Give me three tokens » / « Give me  with tokens »

- ✓ First arithmetical skills with verbal problems supported by pictures

« In this cage, there is two birds. If one other bird comes into the cage, how many birds are there in total? »

2+1=

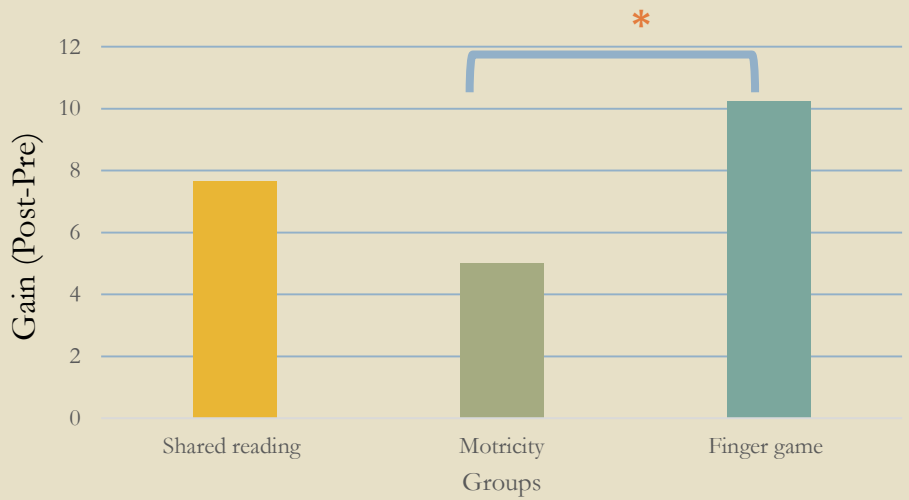
RESULTS

Results

Verbal number sequence

N= 43 (verbal sequence <10 in pretest) – Main Effect of Group

F(2,39)=3.60, p=.04



Counting skills

N = 82 – Main Effet of Group

F(2,82)=1.89, ns

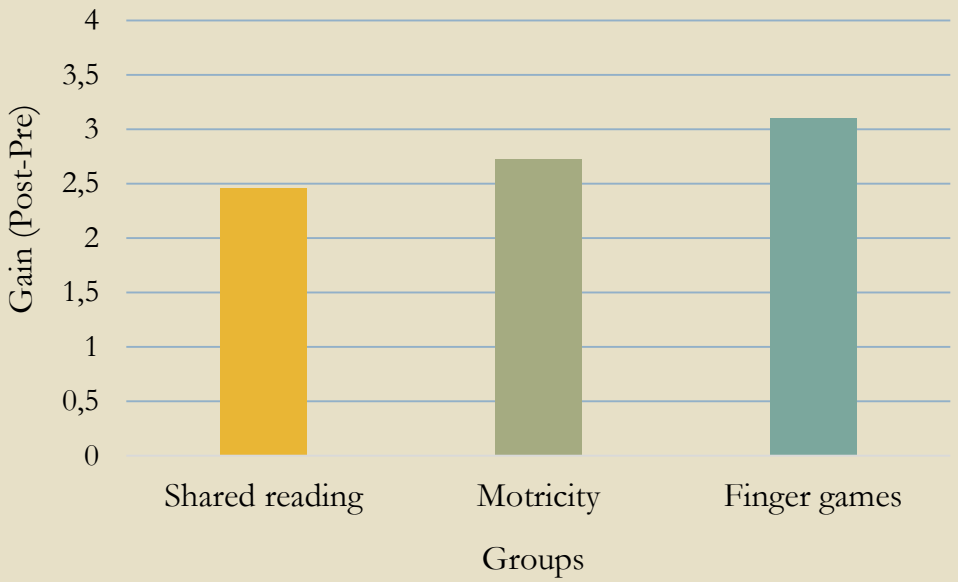
Results

Understanding of cardinality

Give-a-number ? (with number words)

N = 44 – Main effect of Group

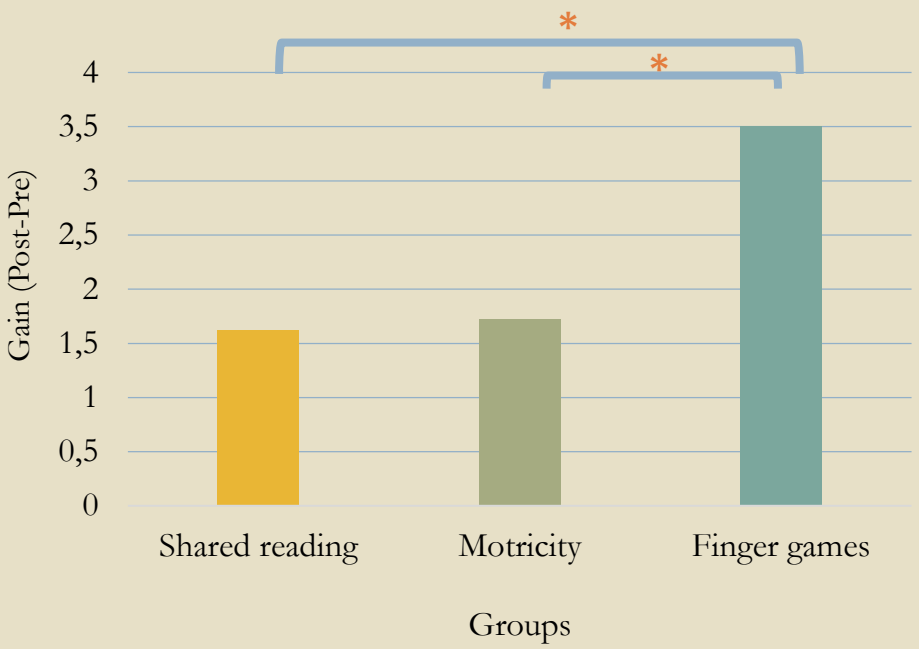
F(2,40)=.75, ns



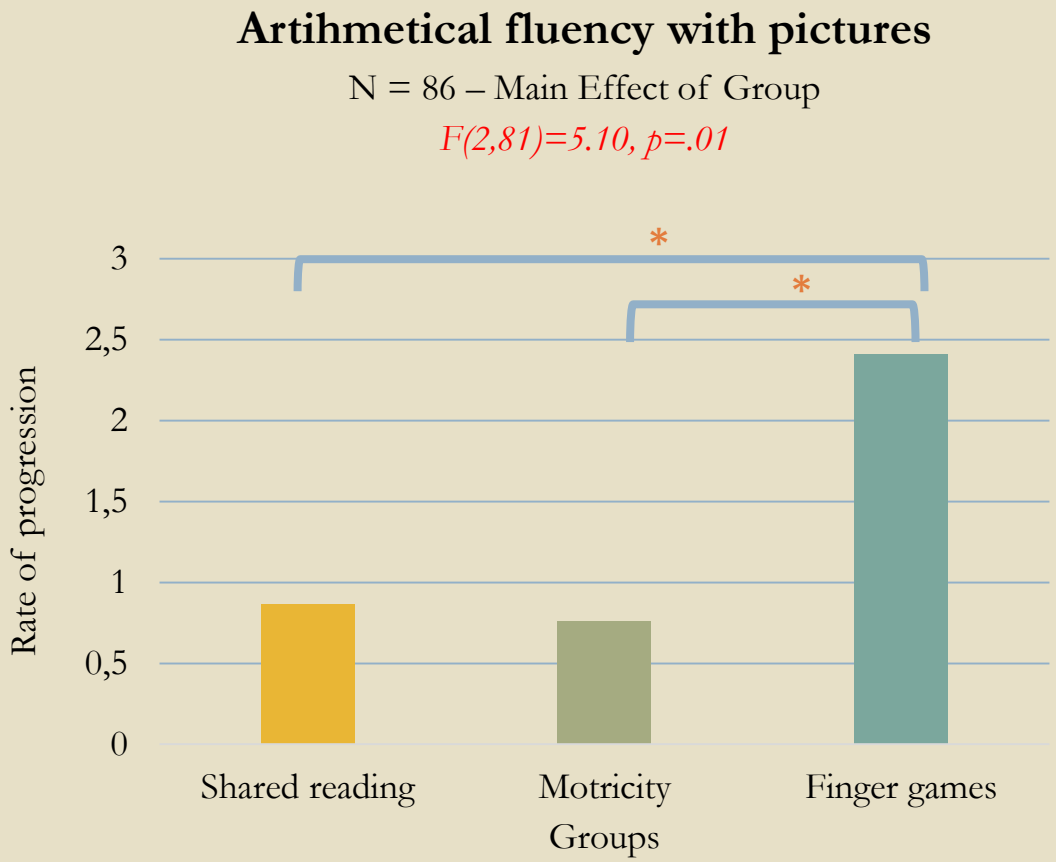
Give-a-number ? (with number gestures)

N= 44 - Main affect of Group

F(2,40)=7.56, p=.002



Results


Artihmetical fluency with pictures
N = 86 – Main Effect of Group
F(2,81)=5.10, p=.01
*
*
3
2,5
2
1,5
1
0,5
0
Rate of progression
Shared reading
Motricity
Finger games
Groups

Conclusion and future perspectives

- ✓ **Efficiency & specificity** : Children in finger game training progress more than children in other groups, especially in tasks demanding the processing of number gestures.

- ✓ **Transfer** : This training seems increase early arithmetic skills.

- ✓ **Longitudinal study** :
  - Assessment of numerical and basic arithmetical skills one year after
  - Assessment of arithmetical skills in 1st grade of primary school

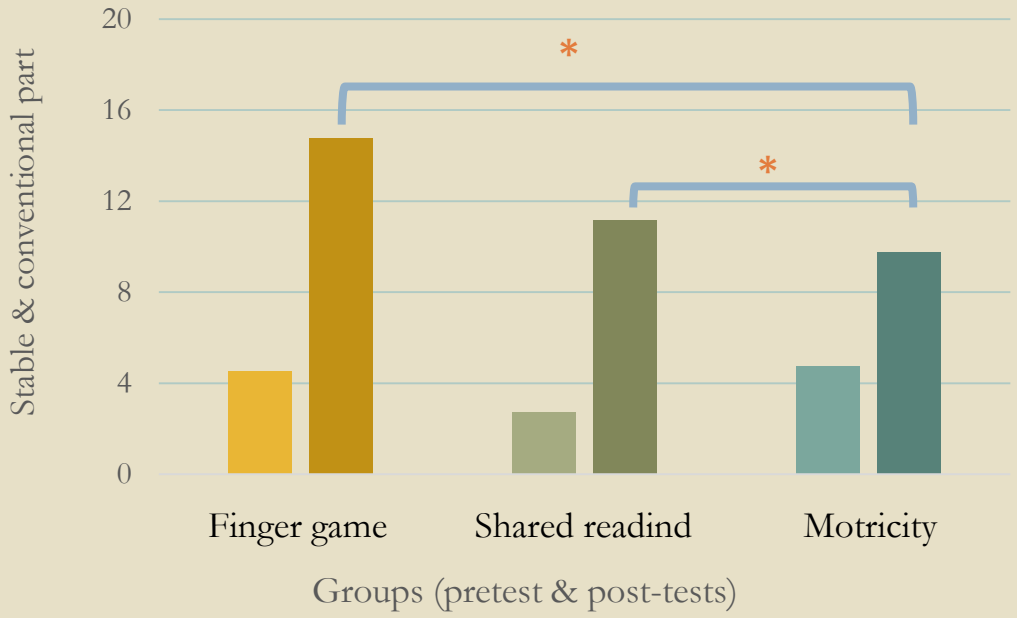
- ✓ **Future researchs** :
  - Assessment of the influence of this training in populations at risk to develop learning disabilities in mathmetics

Thank you for your attention

Results

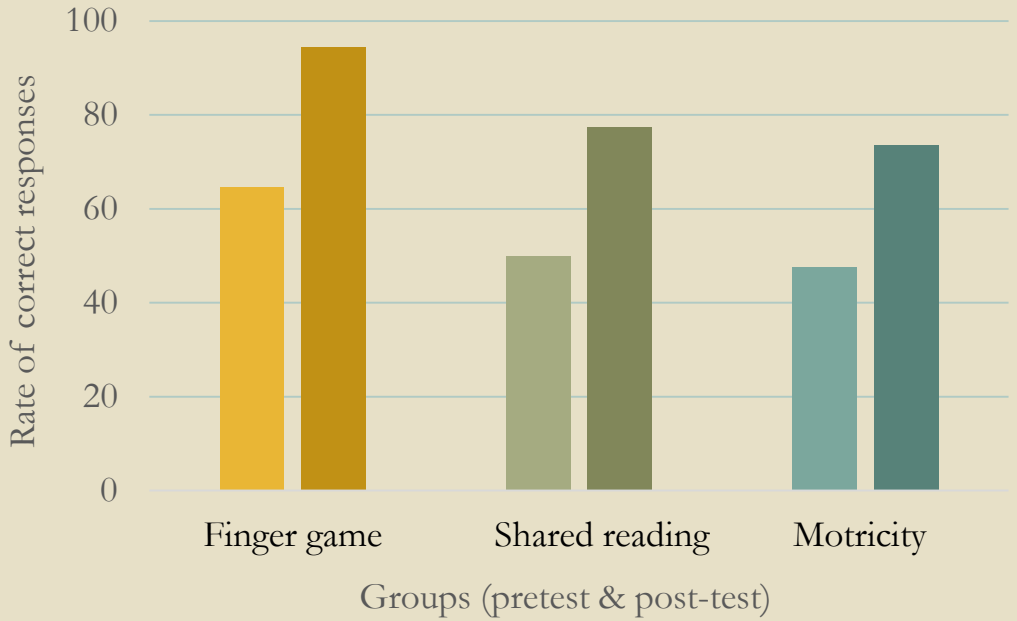
Number verbal sequence

N= 43 (<10 in pretest) – Interaction Groups*Times : *F(2,39) = 4.01, p = .03, η_p^2=.17*



Counting skills

N = 82 - Interaction Groups*Times : *F(2,81) = 2.40, p= .10, η_p^2 =.06*

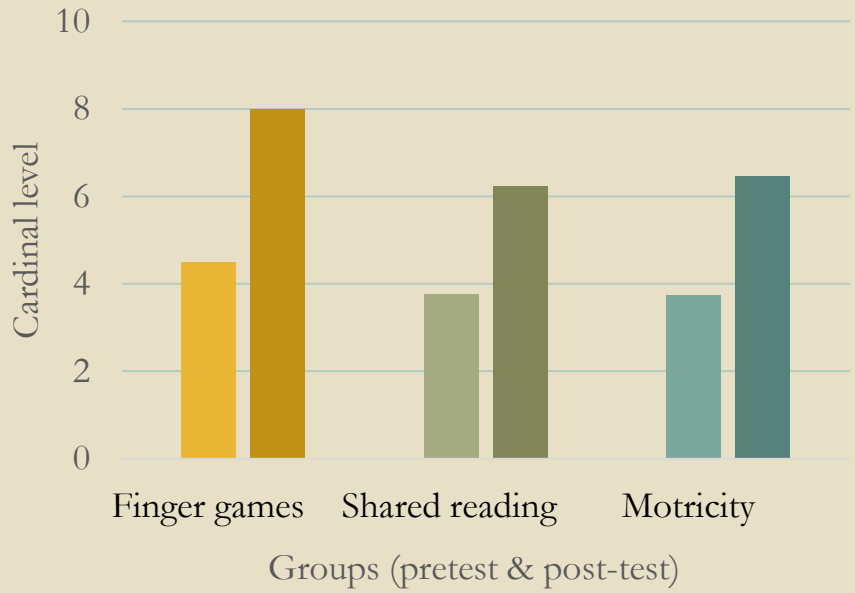


Results

Understanding of cardinality

Give-a-number ? (with number-words)

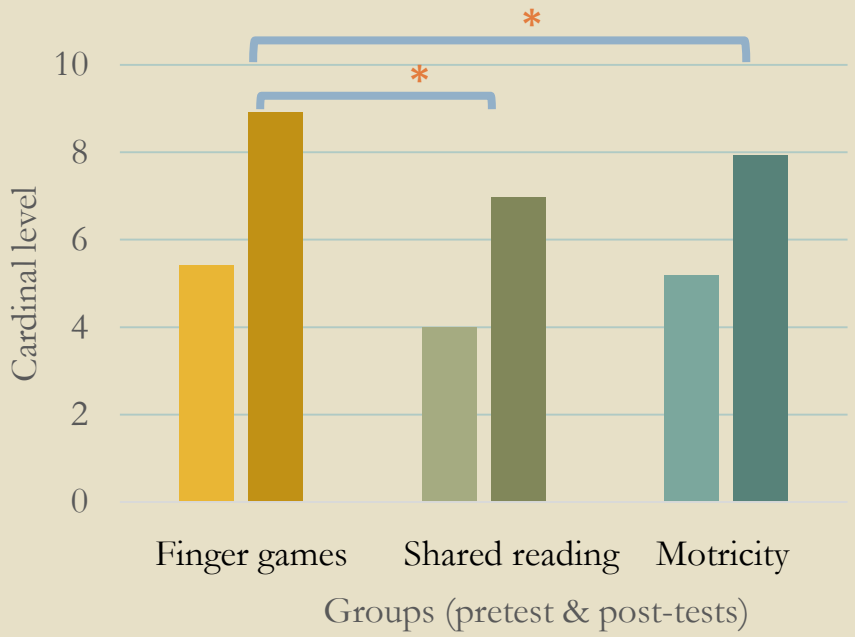
N = 44 - Interaction groups*times : *F(2,40) = .75, ns*



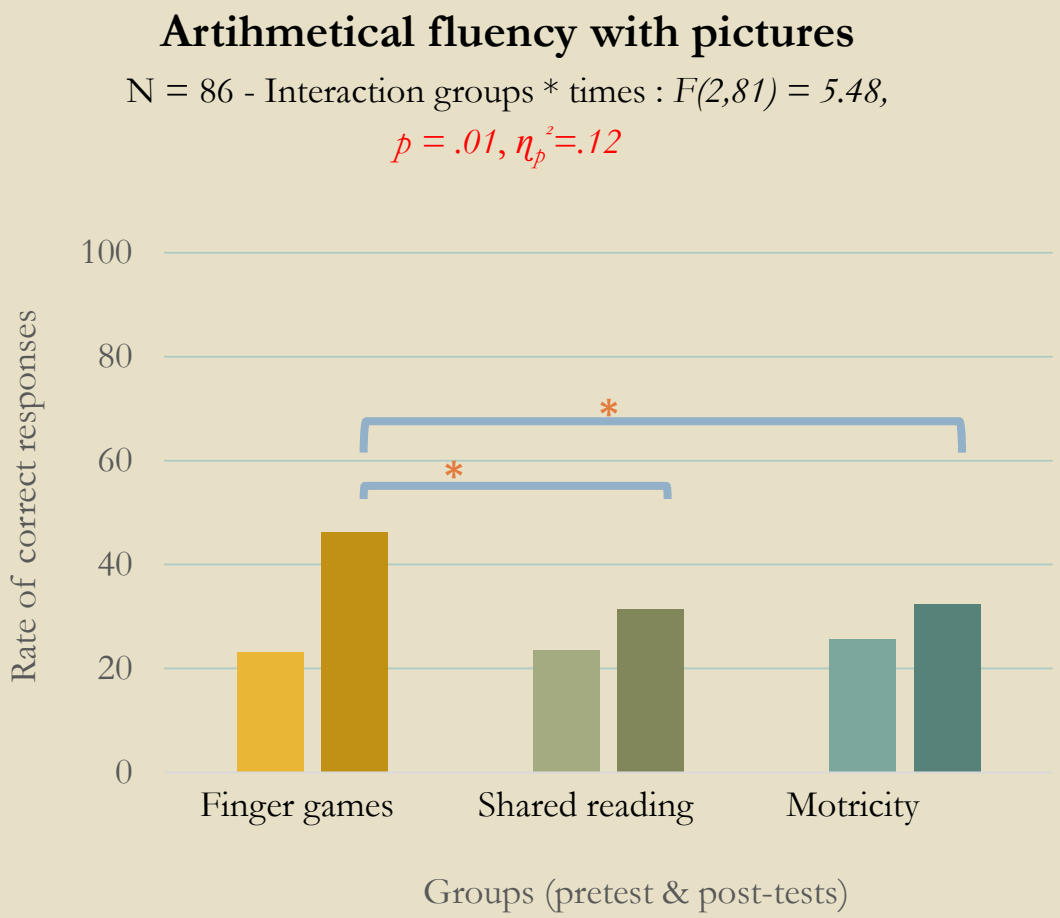
Give-a-number ? (with number-gestures)

N= 44 - Interaction groups*times : *F(2,40) = 7.56,*

p = .002, η_p^2*=.27*



Results


Artihmetical fluency with pictures
N = 86 - Interaction groups * times : F(2,81) = 5.48,
p = .01, η²p =.12
100
80
60
40
20
0
Rate of correct responses
*
*
Finger games
Shared reading
Motricity
Groups (pretest & post-tests)