"Early birds" vary quite a bit: Individual differences in metaphor comprehension in preschoolers

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INTRODUCTION & AIMS

Children deal with metaphors on a daily basis, yet the developmental trajectories of metaphorical understanding are still a matter of debate. Some authors claim that a full understanding of metaphors occurs no earlier than adolescence (Winner et al., 1976), while others argue that children can understand metaphors starting from the age of 3 when tested with age-appropriate tasks (Pouscoulous & Tomasello, 2020). Furthermore, metaphorical expressions may vary in terms of familiarity, structural complexity, as well as **mentalistic content**. Delving into the latter difference, Lecce and colleagues (2019) created the **Physical and Mental Metaphors task (PMM)**, a novel tool for assessing the understanding of physical and mental metaphors through verbal explanation. In this study we implemented the **multiple-choice** version of the PMM task to a) investigate **developmental differences** in metaphor understanding in preschoolers and b) disentangle the contribution of **Theory of Mind** along with the role of vocabulary in the understanding of physical and mental metaphors.

METHODS

- **Sample**: 246 children, aged between 4 and 6 years. 175 children (4 years=58; 5 years=78; 6 years=39) met the inclusion criteria: having both Italian native-speaker parents; no diagnosis of developmental disorder.
- **Assessment**:
  - ➤ Vocabulary skills (**Peabody**);
  - ➤ Theory of Mind (**1st Order False Belief Task; FB**);
  - ➤ Metaphor understanding (**Multiple-choice PMM**):

The multiple-choice sentence-picture matching version of PMM task includes **10 orally-presented items**, 5 physical and 5 mental metaphors. Three options are presented for each item: a) literal; b) metaphorical; and c) non-related, each accompanied by a picture (*Fig.1*). For physical metaphors, all options capitalized on physical features, while for mental metaphors, all options capitalized on mental ones. This solution allowed to investigate children's metaphor understanding distinguishing between a purely pragmatic inference and a pragmatic inference with an extra ToM load. **Accuracy** in the multiple-choice PMM was coded as **0-1** (DV), with 1 representing the metaphorical response and 0 the literal and the unrelated ones.
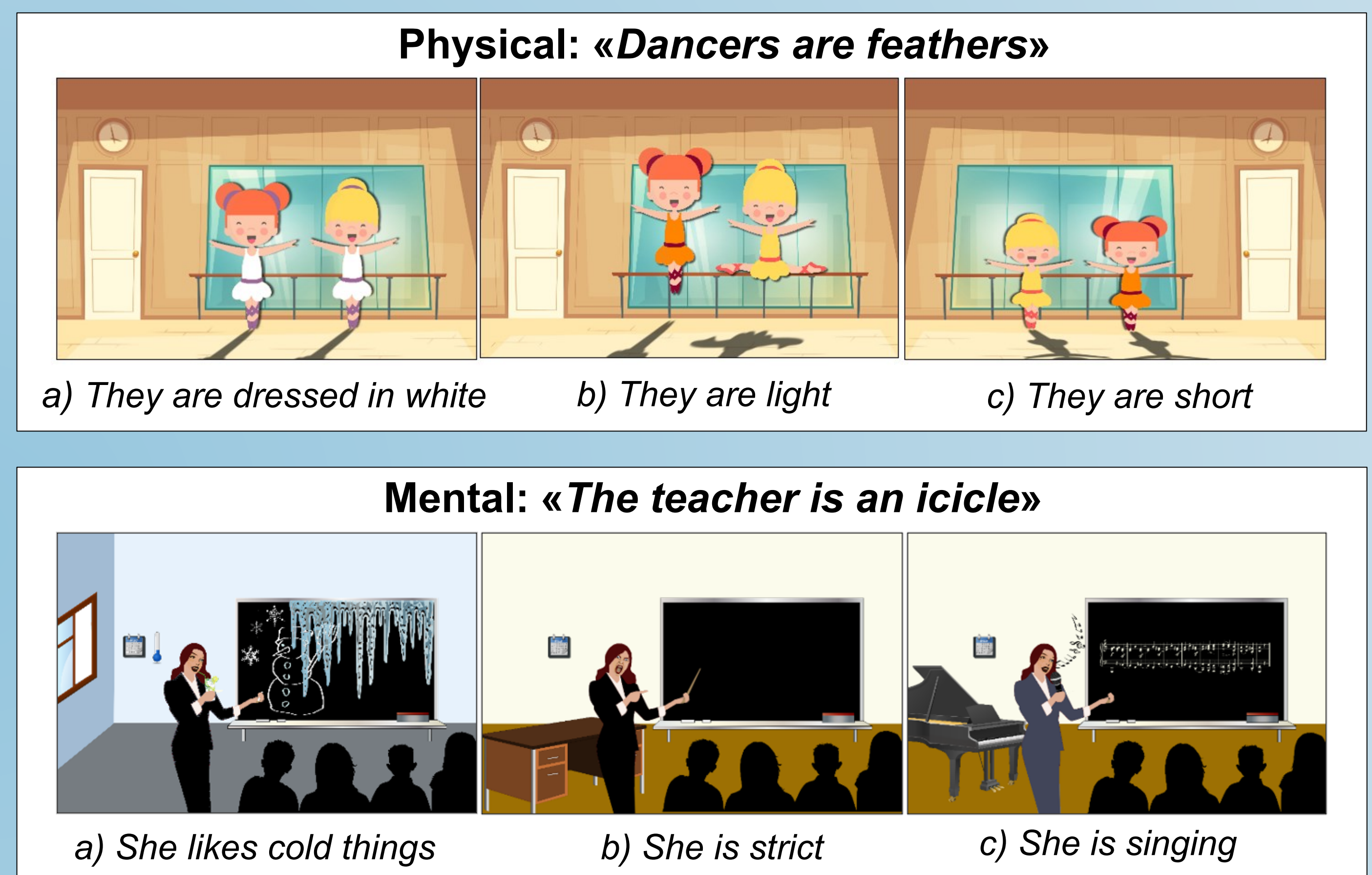
Physical: «Dancers are feathers»

a) They are dressed in white   b) They are light   c) They are short

Mental: «The teacher is an icicle»

a) She likes cold things   b) She is strict   c) She is singing

Figure 1
Example of item of the multiple-choice PMM

	β	SE	z	p	
(Intercept)	-0.24	0.20	-1.21	.225	
Metaphor Type (Mental vs Physical)	-0.87	0.39	-2.21	.027	*
Age Groups (5 vs 4)	-0.14	0.12	-1.21	.227	
Age Groups (6 vs 5)	0.51	0.13	3.78	.000	***
Vocabulary	0.09	0.05	1.66	.097	.
ToM	0.07	0.06	1.15	.251	
Metaphor Type (Mental vs Physical) : Age Groups (5 vs 4)	-0.24	0.23	-1.02	.308	
Metaphor Type (Mental vs Physical) : Age Groups (6 vs 5)	-0.26	0.27	-0.96	.335	
Metaphor Type (Mental vs Physical) : Peabody	-0.28	0.11	-2.54	.011	*
Metaphor Type (Mental vs Physical) : False Belief	0.23	0.12	1.98	.048	*

*Note: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Table 1
Summary of the fixed effects of the Generalized Linear Mixed Model on Accuracy of the multiple-choice PMM

Metaphor Type : Vocabulary	β	SE	z	p
Mental	-0.05	0.08	-0.61	.543
Physical	0.23	0.07	3.06	.002

Table 2
Simple effects of vocabulary skills (Peabody) on Accuracy of Physical and Mental metaphors included in the multiple-choice PMM

Metaphor Type : ToM	β	SE	z	p
Mental	0.18	0.09	2.14	.032
Physical	-0.05	0.08	-0.61	.543

Table 3
Simple effects of ToM skills (FB) on Accuracy of Physical and Mental metaphors included in the multiple-choice PMM

RESULTS

- Children showed lower accuracy in mental metaphors (*p*=.027).

- 6-year-old children performed significantly better than 5-year-olds (*p*<.001). (*Fig. 2*; *Tab. 1*).

- We observed two interactions involving **Metaphor Type**:

  - ➤ **Vocabulary** has a positive effect on **Physical** (but not Mental) metaphors (*Tab. 2*).

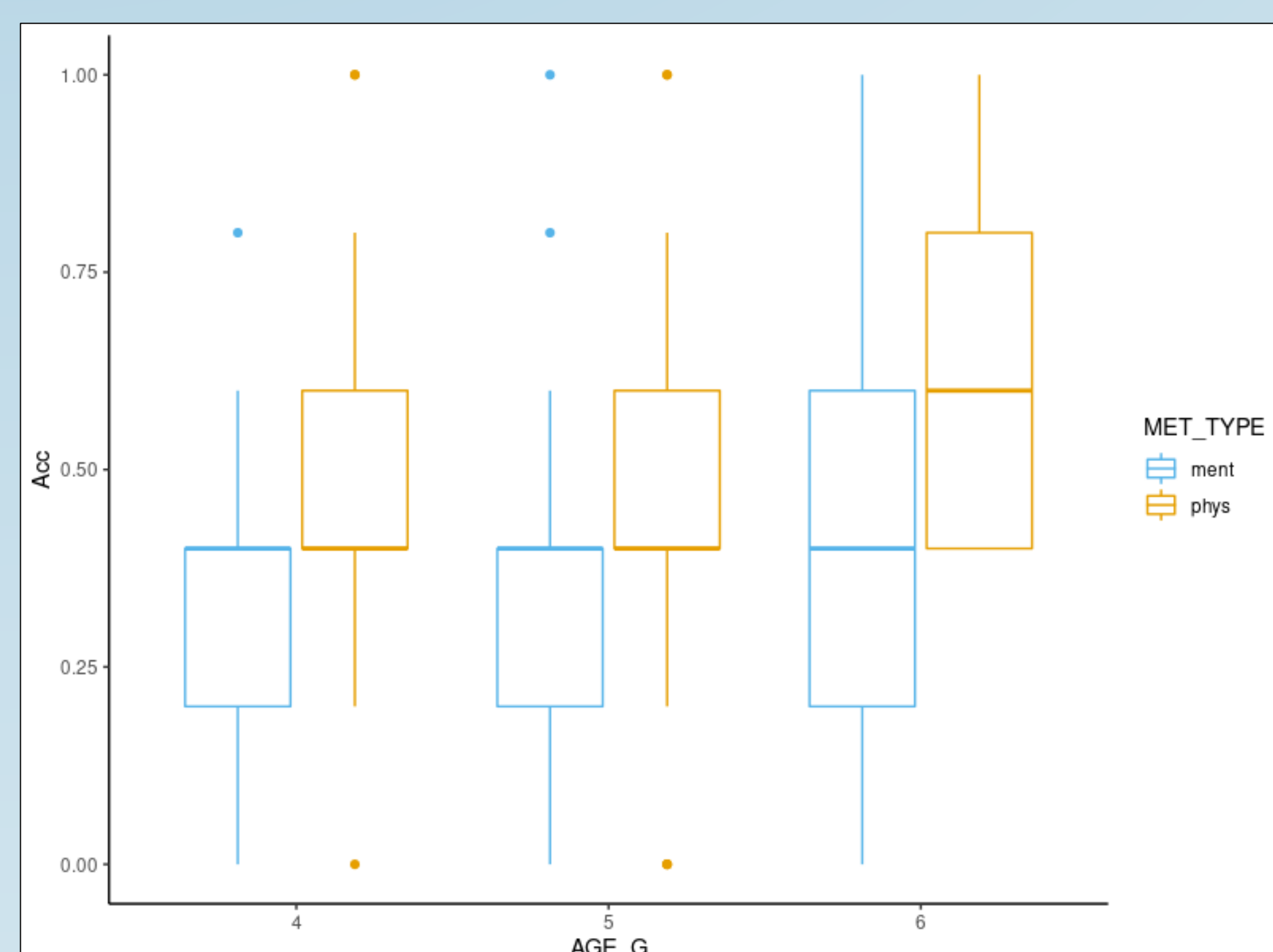 - ➤ **ToM** has a positive effect on **Mental** (but not Physical) metaphors (*Tab. 3*).

DISCUSSION & CONCLUSIONS

- Between the ages of 5 and 6, there is a marked improvement in accuracy, which reveals that this period is crucial for the development of metaphor skills. This "**jump**" seems to be driven by an increase of accuracy in physical metaphors, although the improvement is general.
- Mental metaphors are more challenging for preschoolers possibly because they require not just a pure pragmatic inference but also an **extra ToM load**.
- The role of individual differences varies depending on the metaphor type: as **vocabulary** skills increase, the ability to understand **physical** metaphors increases, whereas for **mental** metaphors **ToM** skills play a major role.

Children are, therefore, very early in **detecting the type of metaphor** and in understanding **which skills to capitalize upon**.

Figure 2
Boxplot of performance across Age Groups for Metaphor Type

1. Winner et al. (1976). Dev Psychol. 12(4):289-297. **2.** Pouscoulous & Tomasello (2020). J Pragmat. 156:160-167. **3.** Lecce et al. (2019). J Child Lang. 46(2):393-407.

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