

How parents lend a helping hand in children's puzzle solving

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Introduction

Vygotsky's theory of development asserts that adult assistance is most beneficial to children when it is given in the zone of proximal development, just above the level of what a child can achieve on his or her own (1978). Adults may provide help in multiple ways. Recently, much research has focused on the use of gestures (O'Neill, et al., 2005; Alibali & Nathan, 2007). For example, studies have shown that students taught a math problem-solving skill with gestures were more likely to succeed on a post-test (Cook & Goldin-Meadow, 2006). Gestures may serve to scaffold learning, allowing learners to gain more from lessons presented verbally. However, this research has focused on teachers' gestures and their impacts on school-aged children, with little focus on parents' gestures (Singer & Goldin-Meadow, 2005; Cook & Goldin-Meadow, 2006). This study's goal is to determine whether parents' gestures facilitate very young children's learning and whether it varies by child age.

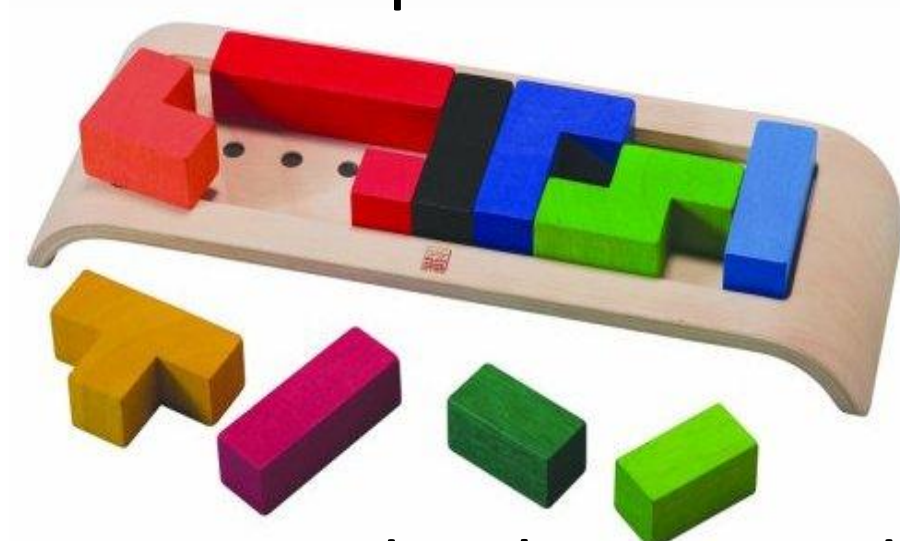
Questions

1. Does parents' use of gestures while helping their children increase children's success in solving a puzzle independently?
2. Is the benefit of parents' gesturing dependent upon child age?

Methods

Participants were recruited at the Boston Museum of Science. In total, 134 children between 1.4 and 6 years old (69 girls, 65 boys) participated. Each session was videotaped and coded later. During the session, a child was asked to work on a challenging wooden block puzzle task in three phases:

- Pre-Help: child only (1 minute)
- Parental Help (1.5 minutes)
- Post-Help: child only (1 minute)



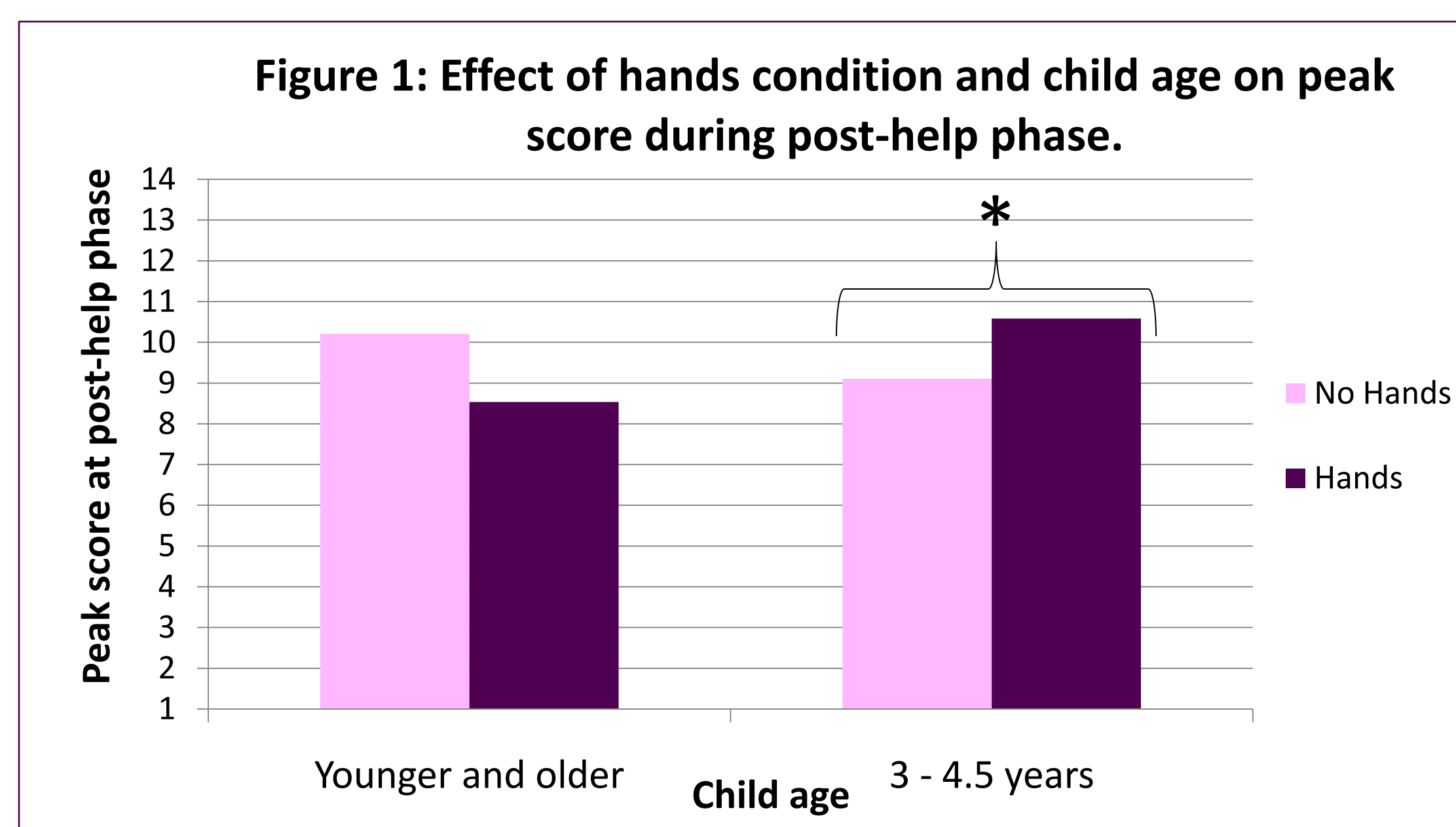
For the Parental Help phase, dyads were randomly assigned to one of two conditions: (1) Hands (the parent was free to use his or her hands) or (2) No Hands (parent was asked to sit on his or her hands).

Videos were coded and peak scores were calculated during each session based on the number of simple and complex puzzle pieces lying flat on the board. The type of pieces children used when they started solving the puzzle was also coded.

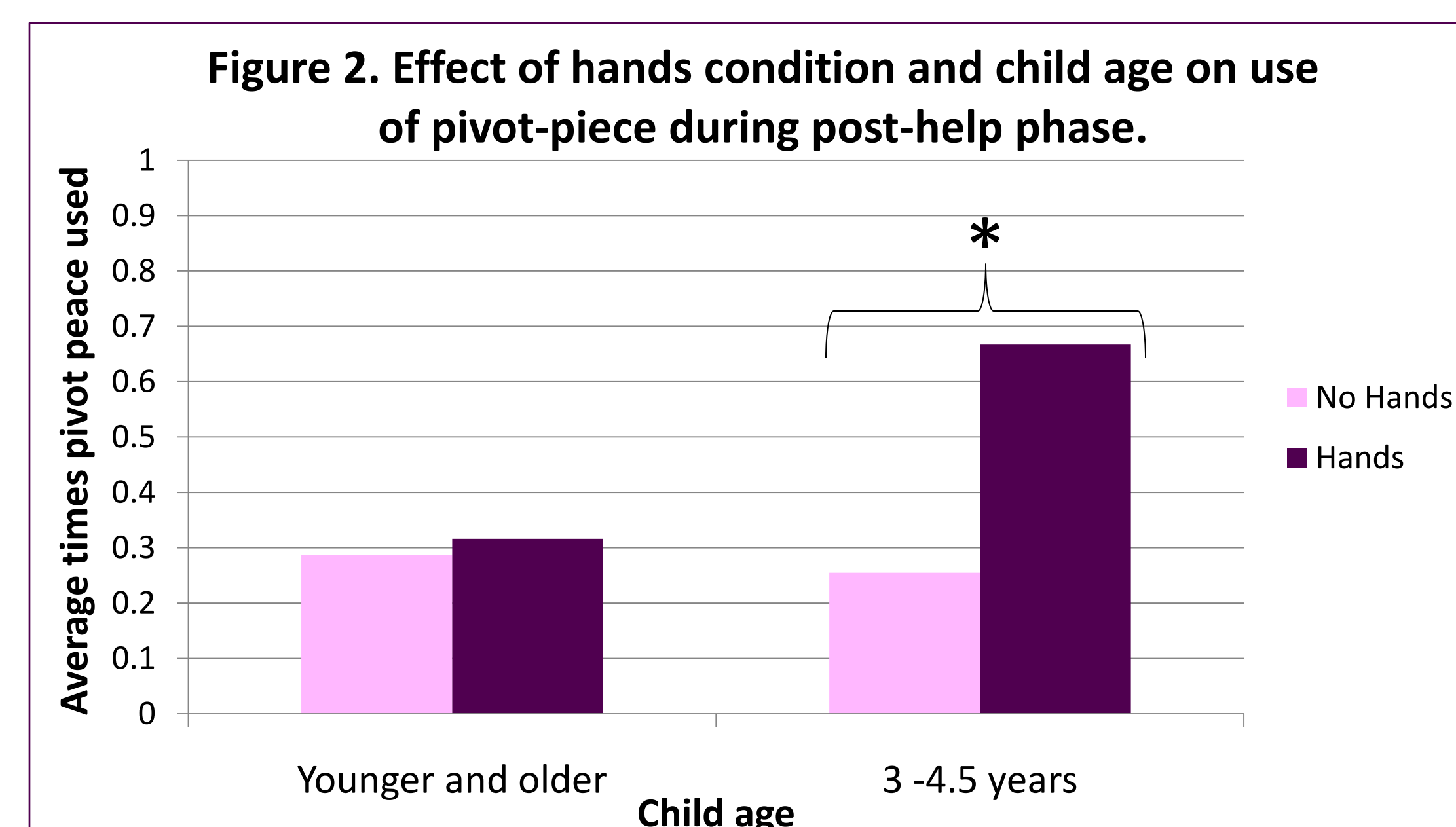
Results

1. Results showed that peak scores did not increase significantly from the pre-help phase to the post-help phase.

2. However, controlling for child gender and peak score at the pre-help phase, the hands condition ($b=-1.670$, $p=.070$), and interaction between hands and middle age group ($b=3.145$, $p=.035$) significantly affected children's post-help peak scores.



Further analysis showed that the use of the pivot piece, a key piece to solving the puzzle, varied significantly during the post-help phase between children in the middle age group whose parents had been in hands versus no hands condition. Children whose parents had been allowed to use their hands chose to use the pivot piece as their first, second, or third piece significantly more often than children whose parents could not use their hands during the help phase, but only for children between ages 3 and 4.5 years old.



Conclusions

Although children whose parents were allowed to use their hands during the help phase did not have higher peak scores overall, children aged 3 to 4.5 years old in this condition did have higher scores. In addition, children aged 3 to 4.5 years whose parents could use their hands during the help phase were more likely to use the pivot piece, a special piece crucial to solving the puzzle, within the first three pieces after receiving help. Thus, children in the 3 to 4.5 year age range who had parents that were allowed to use their hands while helping had greater success in solving the puzzle independently. These results suggest a sensitive period in which children between 3 and 4.5 years old may be more sensitive than older or younger children to parents' use of gestures, and more likely to use parents' strategies when parents have used their hands for demonstration and explanation. Alternatively, it may be that the puzzle was within the zone of proximal development for children who were between 3 and 4.5 years old and gestures provided help that children needed.

We are currently in the process of coding the specific types of gestural and verbal support parents used during the help phase. This will help determine what kinds of strategies parents provided and how they tailored these strategies to their children.

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