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INTRODUCTION

Complement clauses are recursive linguistic structures in which one proposition is embedded inside another, analogically as it happens in embedded representations involved in second-order false belief (FB) reasoning. Training studies and meta-analyses show that complement syntax understanding predicts and enhances the performance on first-order FB reasoning (Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003; Milligan, Astington & Dack, 2007). So far, the single studies suggest only that recursive complements understanding comes in before recursive, second-order FB reasoning (Hollebrandse, Hobbs, de Villiers, & Roeper, 2007; de Villiers, Hobbs & Hollebrandse, 2014). Following Juan & Astington (2012) we assume that the use of embedded, complement structures should assist children with the representation of conflicting perspectives, indispensable for second-order FB understanding. The main aim of the study was to assess the extent to which the syntax of children's utterances and their second-order ToM are related. To this aim we developed two new tasks to measure the production of recursive syntax in preschool children.

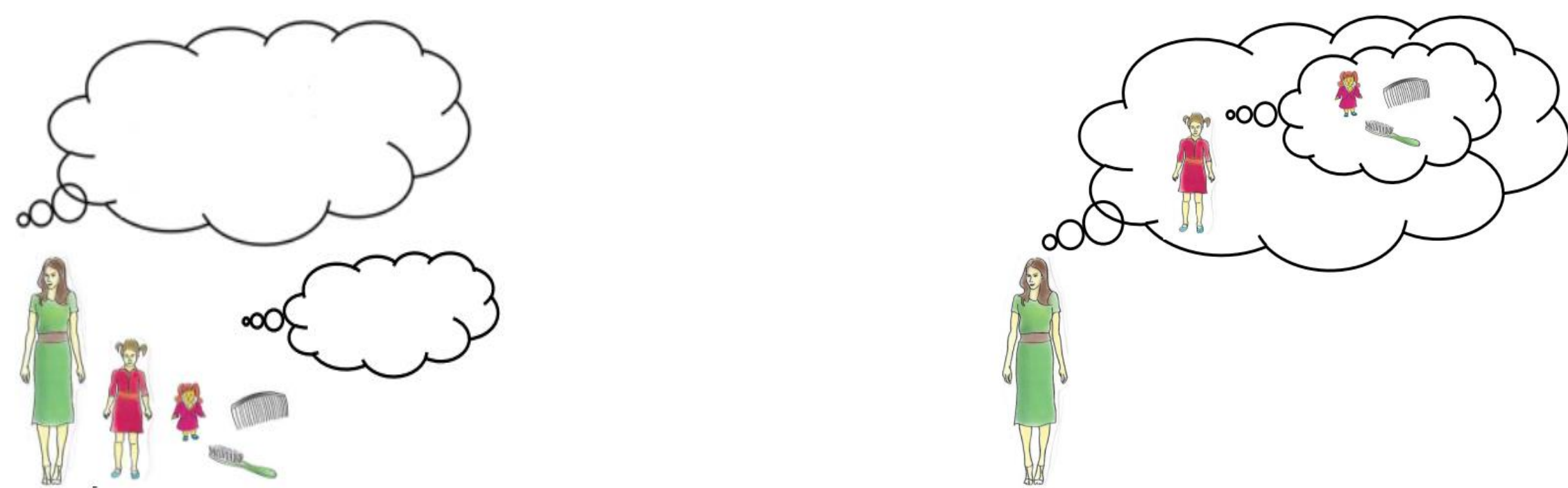
METHOD

Participants: 142 children (72 boys and 70 girls) between 66 and 71 months of age.

Recursive Syntax Production

Picture Task

The child was asked to describe pictures created by the Experimenter using complement clauses.



Target production: Mom thinks that the girl thinks that she will brush the doll's hair

Narrative Task

The child was asked to describe the thoughts of protagonists in stories narrated by the Experimenter using complement clauses.



Target production: Lady thinks that the girl thinks that it's a coin laying on the ground

All the productions from both tasks that met the grammatical criteria of complement clauses with double embedding were judged as syntactically adequate.

| CATEGORY | DESCRIPTION | EXEMPLARY PRODUCTIONS |
|--------------------|--|--|
| Syntactic adequacy | target productions with appropriate persons', objects' and actions' names and appropriate number and placement of embedded clauses within the sentence structure | Lady thinks that the girl thinks that a coin is laying on the ground Lady thinks that the girl thinks that she found a coin |

Second order FB reasoning

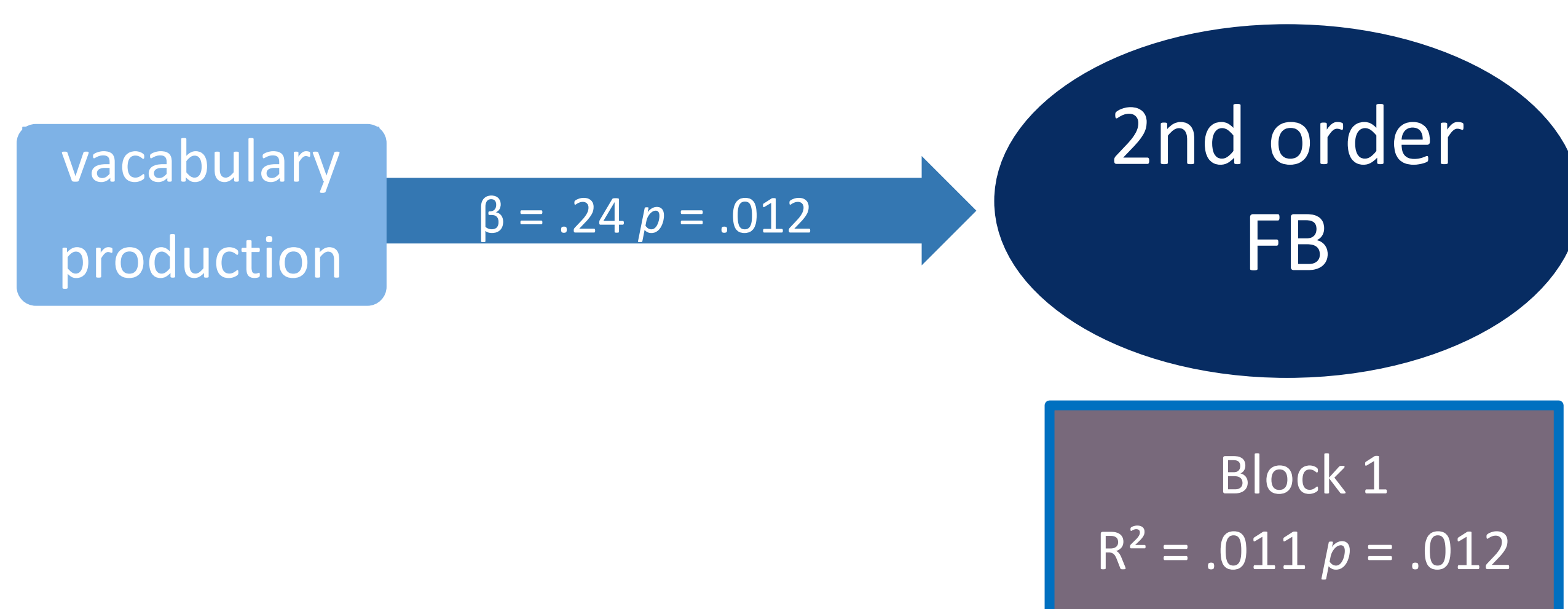
The Ice Cream Story (Perner & Wimmer, 1985) and the Birthday Puppy Story (Sullivan, Zaitchik & Tager-Flusberg, 1994) were used to assess second-order FB understanding.

Memory and language

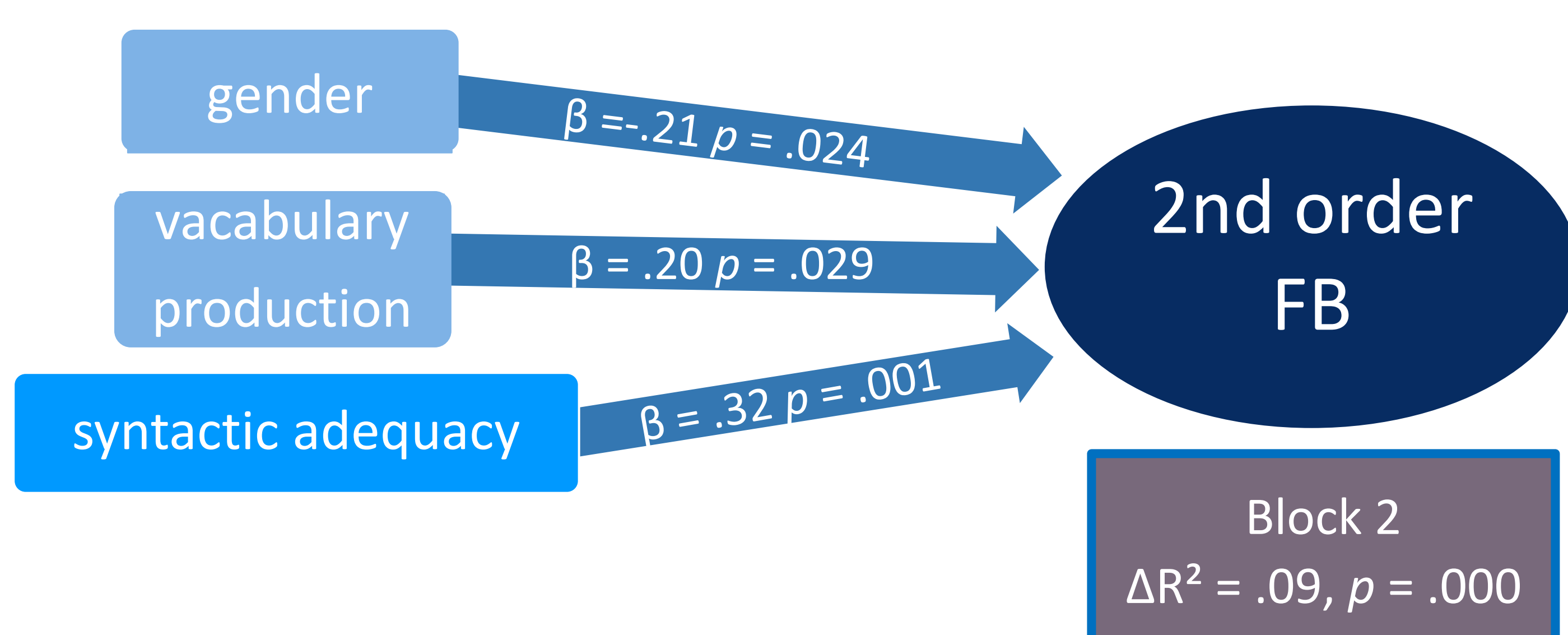
We used the Digit-Span Test (forward and backwards) as a measure of working memory and polish standardized tests to assess vocabulary production and grammar comprehension.

RESULTS

DISCUSSION



Insignificant predictors: gender, grammar comprehension and working memory



Insignificant predictors: grammar comprehension and working memory

- syntactic adequacy of sentence productions predicts second-order FB reasoning in 5 and a half year old children
- recursive complement structures can serve as a representational tool enabling complex, recursive forms of reasoning involved in second-order FB understanding
- the role of recursive syntax as providing children with resources that permit complex forms of representation extends also to second order ToM reasoning
- new recursive syntax production tasks enabled the assessment of syntactic adequacy of children's productions

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