

BAR-ILAN UNIVERSITY

**The Relationship between Linguistic Skills
and Arithmetic Performance**

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Abstract

Language is a fundamental human ability that allows us to communicate with others, express ideas, and develop different concepts and areas of knowledge, including mathematics. Mathematics is considered in western culture to be the best indicator of academic success (especially during the school years) and many resources are invested to ensure the success of students in the profession. The question is, is there a connection and to what extent between linguistics skills and mathematical performance?

The relationship between language and mathematics has been investigated in different populations (Abedi & Lord, 2001; Chow & Ekholm, 2019; Cuadro et al., 2019; Donlan et al., 2007; Kleemans et al., 2014; Powell et al., 2017; Santos & Cordes, 2021 Vukovic & Lesaux, 2013b). Previous studies focused on very specific linguistic functioning and their relationships to mathematical abilities, and found a relation between the linguistic skills tested and the mathematical ability in question. These findings suggest a relationship between linguistics skills and mathematical performance in general and arithmetic performance in particular.

The present study is one of the first studies that examines the relationship between all language characteristics (phonology, syntax, semantics, and pragmatics) and arithmetic performance (procedural arithmetic and arithmetic understanding) in the Hebrew language. The present study provides an in-depth analysis of the specific relationships between different linguistics skills and a wide range of arithmetic performances. The purpose of the present study is to enable us, educating personnel, to understand the impact of different linguistics skills (and lack of) on arithmetic performance. The current study included 40 ten-year-olds participants ($m = 129.4$ months, $sd = 5.04$), all students in the fifth grade. They were assessed using a battery of linguistic tasks (which included tasks testing phonology, morphology, syntax, semantics and pragmatics) and arithmetic abilities (procedural arithmetic performance and arithmetic comprehension). The participant's performance was examined at the group level and a comparison was made between achieving and underachieving students

The results of the present study indicate that all linguistics skills are significantly related to arithmetic performance. Phonology and morphology are the linguistic skills with the most significant connections to arithmetic performance. It is also evident that each linguistic skill has a unique affect (as seen by different patterns of correlations) to arithmetic performance. In addition, the current findings indicate that achieving participants (according to their arithmetic score) have better linguistic skills as compared to under-achieving participants.

The main study results found correlations between all linguistic skills and arithmetic performance. Language difficulty is in most cases identified as early as in the preschool years, a fact that can assist educators in predicting future arithmetic performance. The understanding of the relationship between linguistic skills and arithmetic performance will help develop an intervention plan, to reduce and maybe even prevent a future gap in arithmetic functioning. In addition, in light of the strong relationships between language and mathematics that emerges from this study, the children's linguistic skills should be taken into consideration when planning mathematical lesson plans and curriculums.