

NON-COGNITIVE AND COGNITIVE PREDICTORS OF MATH ACHIEVEMENT

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Poor mathematical knowledge implies enormous individual disadvantages for learners. Making mathematics learning successful for every student requires the early identification of difficulties. Thus, interest in predictors and risk factors of mathematical achievement has increased throughout the last decades. Besides domain-specific factors, general predictors are also considered to be important for gaining mathematical competencies. In particular, cognitive abilities like working memory or phonological awareness are intensely investigated as factors for the development of mathematical competencies. Less is known about general cognitive factors like inductive reasoning. Linguistic factors in mathematical development have been focused on recently, too. However, it is still little known which specific parameters influence mathematical performance. The influence of non-cognitive predictors like motivation and emotion also remains unclear. Though a mutual relation between math anxiety and math performance is assumed, empirical studies, particularly in young children, are missing. This symposium aims at tackling these questions in four presentations. 1) In a study with N=325 6th graders, several measures were used to assess cognitive factors like inductive reasoning and complex problem solving as predictive factors for mathematical achievement. Mathematical knowledge is differentiated regarding three dimensions: (1) mathematical reasoning, (2) application of knowledge and (3) curricular content. Regression models reveal different effects, of which cognitive measures have the greatest regarding mathematical reasoning. 2) The question of the differentiated effects of linguistic factors on different aspects of mathematical achievement is raised in the second longitudinal study with N=120 preschoolers and N=165 first graders. Math achievement is differentiated into conceptual knowledge and performance, and linguistic factors are investigated. Two regression models reveal that concepts and performance are influenced by different factors. In particular, working memory only predicts concepts, while rapid naming speed predicts both concepts and performance. 3) The third longitudinal study with N=103 first graders also deals with the influence of specific linguistic parameters (language comprehension) on arithmetical competence development. Regression models highlight the importance of language comprehension on arithmetic competence. However, when arithmetic competencies are added to the model, they and cognitive abilities are the predictors for arithmetic competencies at the end of grade 1. 4) The fourth study targets the relation of math anxiety and math performance in a total of N=1,179 fourth and fifth graders. Math anxiety is investigated with a state-trait-approach widely used in psychology. State anxiety has more negative effects on performance than trait anxiety. The chosen approach explains incoherent findings reported in literature.