THE INFLUENCE OF LINGUISTIC FACTORS ON DIFFERENT MEASURES OF MATH ACHIEVEMENT IN FIRST GRADERS

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Math achievement can be defined and measured in different ways. A performance oriented perspective focusses on how fast and reliably children can solve math tasks. In contrast, a concept based approach is interested in learners` representation of numbers and operations. These two perspectives that both describe 'math achievement' do not correspond completely. This study aims at investigating the influence of linguistic factors on both aspects of math achievement. Linguistic predictors usually include phonological working memory (PhWM), phonological awareness (PhA) and rapid naming skills including speed (RAN-s) and accuracy (RAN-e; Halberda et al., 2008; Navarro et al., 2012; Purpura & Ganley, 2014). However, these studies mostly focus on arithmetic performance. In this longitudinal study we assessed linguistic predictors (PhWM, PhA, RAN-s, RAN-e) at the middle of grade 1 (T1) and arithmetic concepts and performance at the end of grade 1 (T2). A total of N=127 learners participated (63 girls; M_{age} at T1=80.28 months; SD_{age} at T1=4.67 months). Rapid naming was assessed with the Arkansas Rapid Automatized Naming test (Mather & Wendling, 2011). Total time and amount of errors were assessed. Phonological working memory was assessed with the Mottier test (Wild & Fleck, 2013). Phonological awareness was assessed with the corresponding subtest of the BUEVA-III (Esser & Wyschkon, 2016). Arithmetic performance was assessed with the HRT 1-4 (Haffner et al., 2005). Arithmetic concepts were assessed with the MARKO-S (Ehlert et al., in press). Two regression models were carried out, for arithmetic performance and concepts as dependent variables. Independent variables were PhWM, PhA, RAN-s and RAN-e in both models. Linguistic factors account for more variance regarding concepts than performance. While RAN-s was a significant and good predictor for both measures of math achievement, RAN-e only accounts for conceptual achievement. PhWM predicted only concepts. PhA was no significant predictor for performance; however, it was for concepts with a fair coefficient. This study shows that linguistic predictors do not account for achievement in arithmetic performance and concepts in the same manner. In particular, performance is more predicted by speed than by accuracy and is not likely to be processed verbally in grade 1. PhA is involved in both measures – one reason might be underlying fact retrieval skills as a common source. This study highlights the claim for more specific investigations of linguistic predictors for math achievement in early school age and demands a clear differentiation by which measures 'math achievement' is assessed.