

## DIGITAL SCREENING FOR AT-RISK LEARNERS IN MATH AT THE BEGINNING OF PRIMARY SCHOOL

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This study aims at validating a digital version of a paper and pencil screening device (MARKO-S) for at-risk learners in math at the transition from kindergarten to primary school. The alignment of digital and non-digital items involving learners' actions with manipulatives (counters) is focused. The arithmetic knowledge that children have when they enter primary school predicts their later success in math (Aunola et al., 2004). Thus, it is important to identify children with poor pre-knowledge right at the beginning of primary school. Usability and efficiency (e.g. short test time or little interpretation effort) play a main role (Müller et al., 2017). The test device MARKO-S operationalizes the first three levels of a six-level model of arithmetic concepts (Ehlert et al., in press; Fritz et al., 2013). The MARKO-S is supposed to be used in a digital version to minimize the effort for the interpretation. N=120 preschoolers (64 girls,  $M_{age}=71.67$  months,  $SD_{age}=3.81$  months, 6 months before enrolment) and N=165 first graders (80 girls,  $M_{age}=85.28$  months,  $SD_{age}=4.83$  months, middle of grade 1) were assessed with the digital version of the MARKO-S as well as analogue items involving counters (e.g. 'Give me 4 counters'). To test whether digital (21 items) and paper and pencil (3 on level I and III each) versions are of a comparable difficulty, one-dimensional Rasch analysis was used. It was tested in two ANOVAs whether children who had acquired a certain level in the digital version show better performance in the corresponding analogue items than children who had not yet acquired this level. Infit values of the Rasch analysis are mostly good ( $0.8 < MNSQ < 1.2$  for 25 items); only one digital item (which did not involve counters) had to be omitted due to a poor MNSQ value (Wright & Linacre, 1994). According to the Rasch analysis, all items involving counters showed similar difficulties in digital and paper and pencil versions. Children below level I solved an average of 1.7 items (56,67%), while children above level I scored 2.84 (94,67%) on the average, which is significant difference, as the ANOVA shows ( $F_{(280,1)}=56.629$ ,  $p < .001$ ). In the second ANOVA we compared children above and below level III. Children below level III solved an average of 1.18 (39,33%), while children above level III scored averagely 2.57 (85,67%), which is significant ( $F_{(280,1)}=130.324$ ,  $p < .001$ ). This study substantiates the validity of the digital version of the counter-based items from the MARKO-S. The Rasch analysis reveals that there is no considerable difference in difficulty in the two versions. The ANOVAs show that children do not struggle with the analogue items on a level they have acquired in the digital test; conversely, children who lack that concept did have difficulties with the analogue items of that level and performed significantly poorer. Thus, the chosen operationalization is suitable for identifying at-risk learners in preschool and grade 1 in an efficient manner.