

**NAME:** Jake Kaufman, jake.m.kaufman@vanderbilt.edu

**PI:** Rittle-Johnson, Bethany

**First theme choice:** Clinical/Behavioral/Intervention

### ***Measuring Preschoolers' and Kindergarteners' Understanding of Different Types of Patterns***

**Authors:** Jake Kaufman, Ashli-Ann Douglas, Camille Msall, Serkan Özel, Bethany Rittle-Johnson

**Introduction:** Children's early math knowledge predicts later math and overall academic achievement (Duncan et al., 2007). One important, but often overlooked, skill related to early math development is patterning (Zippert et al., 2020). The purpose of the current study was to advance the development of a short, easy-to-administer, teacher-friendly, and researcher-friendly patterning instrument that reliably assesses the repeating (e.g., ABABAB) and growing (e.g., change by 1) patterning knowledge of both preschool and kindergarten students. Furthermore, the study aimed to provide evidence for the reliability of the assessment when administered virtually, and expand our understanding of how the difficulty of repeating and growing patterns vary by pattern task (e.g., identification, completion, extension, abstraction, pattern unit identification) and rules (e.g., AB vs ABC vs ABCD; change by 1 vs. change by 2).

**Methods:** Children ( $n = 96$ ) were assessed in Fall 2020. Participants were between the ages of 4 and 6 ( $M = 5.1$  years,  $SD = .65$  years). Based on parental self-report, 51% of participants were girls, 88% identified as White, 94% spoke only English in the home, and only 3% received financial assistance to attend school. All sessions occurred via a synchronous Zoom session, with a parent or guardian present.

**Results:** Children's repeating and growing patterning knowledge were positively correlated,  $r(95) = .40$ ,  $p < .001$ , and children were significantly better at completing repeating patterns compared to growing patterns,  $t(85) = 11.41$ ,  $p < .001$ . The online assessment reliably measured children's overall and repeating patterning knowledge; however, the growing subscale was not a reliable measure. For repeating patterns, completion items were easiest, followed by extension, identification, and abstraction - which all had similar difficulty levels. Furthermore, similar difficulty levels were observed for patterns with two, three, and four overall elements (e.g., no difference between ABC and ABCC), and patterns with two, three, and four distinct elements (e.g., no difference between ABCC and ABCD). For growing patterns, completion items were easiest, followed by extension, identification, and pattern unit identification; and patterns with a unit change of 1 were easier than patterns with a unit change of 2.

**Discussion:** Our online Early Patterning Assessment provided reliable estimates of White, middle-class preschool and kindergarten children's overall and repeating patterning knowledge. However, revisions are needed to improve the reliability of our growing patterning subscale, and the assessment needs to be administered to a more diverse sample. Our hope is that teachers will use the assessment to assess their students patterning knowledge. This can help teachers identify students who may benefit from additional patterning instruction, with the goal of improving their early math development.

**References, if any:** Duncan, G. J., Claessens, A., Magnuson, K., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, 43(6), 1428-1446. <https://doi.org/10.1037/00121649.43.6.1428> Zippert, E., Douglas, A., & Rittle-Johnson, B. (2020). Finding patterns in objects and numbers: Repeating patterning in pre-K predicts kindergarten mathematics knowledge. *Journal of Experimental Child Psychology*, 200, 104965. <https://doi.org/10.1016/j.jecp.2020.103965>.

**Keywords:**

Math, Patterns, Children