

# Patterning and Literacy at the Outset of Kindergarten



**Matthew S Peterson\***, Robert Pasnak, Julie K Kidd, Debbie A Gallington and Allison B Patterson

*Department of Psychology 3F5, George Mason University, USA*

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**\*Corresponding author:** Matthew S Peterson, Department of Psychology 3F5, George Mason University, Fairfax, VA, USA

## Abstract

Kindergarten children are routinely instructed in recognizing repeating patterns. Such instruction may improve their understanding of prealgebra and early literacy. The present research was designed to determine whether there were relations between children's understanding of patterns and early literacy at the outset of kindergarten, before instruction in recognizing patterns was begun. Accordingly, 492 kindergarten children were assessed with a patterning measure and two measures of early literacy. Significant correlations between scores on these three measures indicate that about 12-16% of a beginning kindergartner's ability in literacy can be predicted from their understanding of patterns.

**Keyword:** Initial sound fluency; Manipulatives; Dynamic indicators

**Abbreviations:** ISF: Initial Sound Fluency; LNF: Letter Naming Fluency; DIBELS: Dynamic Indicators of Basic Early Literacy Skills

## Introduction

It has been conventional for more than half a century to teach young children to recognize repeating patterns of colors, geometric shapes, or small objects. The patterns are commonly comprised of "manipulatives" – beads, blocks, and other small objects – but may be made from geometric shapes or from colors. Typical patterns follow ABABAB, ABCABC, AABAAB, or AABBAABB pattern rules. The common thesis behind such instruction is that it improves understanding of prealgebra. Patterning instruction has been part of the Common Core State Standards [1], although it is not at present. There is some empirical evidence that instruction in "patterning" improves understanding of early literacy as measured by a variety of scales Kidd et al. [2]; Pasnak et al. [3]. However, this evidence was obtained from first grade children. There is no equivalent evidence for kindergarten children, although some experiments have been conducted to test the efficacy of instructing kindergartners on patterning Shriver et al. [4]; Strauss et al. [5]. All of the published research involves instructing kindergarten children in the middle of the year and testing at the end of the year.

Pasnak et al. [6] showed that the two abilities were related for first graders. Correlations taken in the fall and spring between a patterning and literacy measures were significant. There was no indication of a relation between pretest scores on patterning

and posttest scores on literacy, or vice versa, so the researchers concluded that the relation was not causal. To date, all of the evidence obtained for relations between patterning and early literacy is from testing conducted at the end of kindergarten, or from first grade children. The missing information is what the relation may be between these two abilities at the beginning of kindergarten. The present study was conducted to provide this information.

## Methods

### Participants

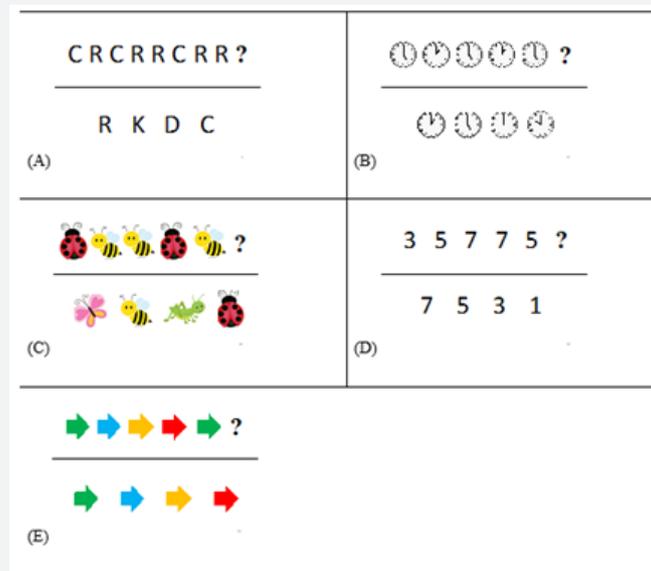
After approval by the university, school system, and parents, children enrolled in five urban elementary schools in a metropolitan area in the mid-Atlantic region were tested during October of their first year in kindergarten. There were 241 boys and 249 girls, many of whom were from immigrant families, and 53% received free or reduced lunches. Ethnicities were Asian/Pacific Islander 7%, Black 38%, Hispanic 33%, White 19%, and Multiracial 3%. Mean age was 5.34 years (SD =.29).

### Instruments and procedure

Children took three 15-minute tests one at a time in a

counterbalanced order on three separate days in early October. The Initial Sound Fluency (ISF) and Letter Naming Fluency (LNF) subtests from the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) were used to assess early literacy. For the LNF children were shown a list as many letters and asked to name as many as they could in one minute. In the assessment for the ISF children were shown pictures of familiar objects and asked to say which

picture began with a certain sound. For both tests their scores were the total number of correct answers. The test for patterning had six ABABAB patterns, six ABBABB patterns, six ABABBABBB patterns, six ABCDABCD patterns, and six ABCCBA patterns. These were composed of the letters, numbers, clock faces, shapes, and pictures of the objects. Please see Figure 1.



**Figure 1:** Examples of patterns used in the patterning test. (A) An ABABBABBB pattern of letters. (B) An ABAB pattern of clocks. (C) An ABBABB pattern of objects. (D) An ABCCBA pattern of numbers. (E) An (ABCDA) pattern of colored shapes.

## Results

Mean scores were 10.47 (SD = 5.12) on the patterning test, 8.81 (SD = 4.39) on the ISF, and 23.88 (SD = 16.60) on the LNF. All of these scores are relatively low. Patterning test scores correlated with both the ISF,  $r(488) = .42$ ,  $p < .001$ , and the LNF,  $r(488) = .34$ ,  $p < .001$ . The two early literacy tests correlated with each other,  $r(488) = .54$ ,  $p < .001$ . Coefficients of determination ( $r$  squared) indicate that about 12-18% of a child's literacy score is linearly related to the child's scores on these early literacy measures, or vice versa.

## Discussion

It is clear that patterning and early literacy are related when children have received very little instruction in from kindergarten teachers. Hence, teacher effects can have little to do with the relation. The question that remains is whether the relation between early literacy is causal is causal or reflects a third variable. One such variable is parenting. Certainly, some parents try to teach letters and letter sounds to their children. However, efforts to teach patterns are much less common. The relation could be due to the overall level of stimulus and challenge in the home. Another possibility is that some aspect of intelligence is involved. Pasnak et al. [3] speculated that gains in literacy

observed after instruction of older children in patterning were due to an improvement in cognition produced by the patterning instruction. Claims of improved cognitive functioning have been made to explain improvements in mathematics produced by patterning instruction Clements & Sarama [7]; White, Alexander & Daugherty [8]. Such explanations cannot be ruled out without experiments designed specifically to test them.

On the other hand, Pasnak et al. [3] showed in a time-lag design that cross-correlations between literacy and patterning were similar in either direction, indicating that a third variable rather than causality accounted for the relationship. The opposite was true for mathematics. Differences in the cross-correlations over time did show that the relation between patterning and mathematics was causal. Hence, the genesis of the relation between patterning and literacy remains uncertain, except that the relation exists before there has been significant classroom instruction in either. The present study has limitations. The children sampled were relatively disadvantaged. Studies of more advantaged children might produce stronger or weaker correlations. Different measures of literacy might produce no correlations, as shown by the differences in outcomes for Kidd et al. [2] when literacy measures differed. However, the conclusion that children bring a relationship between patterning and proficiencies to their kindergarten classrooms seems inescapable.

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