Symbolic Representations of Preschool Children: Relations Among Block Play, Picture Drawing and Emergent Literacy

Denise Cunningham, Missouri State University

Abstract

Young children's symbolic representations are important to emergent literacy; therefore, this study focused on children's spontaneous block building and picture drawing in preschool. The goals of this exploratory study were: 1) investigate the relation between the complexity of block play, picture drawing details, and performance on an emergent literacy assessment, 2) analyze block play complexity and its relation to details in picture drawing, and 3) explore the demographic variables related to block play and picture drawing. Nineteen preschool children from a university laboratory school were participants in this study. Results indicated that block play complexity (structure complexity, unique blocks used and total number of blocks used) were highly correlated to children's emergent literacy scores. Additionally, children's picture drawing showed strong relationships to the literacy assessment score. Further, a significant drawing-writing connection was revealed. There were no gender differences found for picture drawing; however, there was a significant gender difference in the number of blocks used during block play, with girls using more than boys. The study suggests that children who demonstrate more complexity in their block building also display more details within their picture drawing.

Keywords: *symbolic representation, block play, picture drawing, early literacy development, preschool*

Introduction

Children construct knowledge and understanding of the world through their play experiences. The benefits of play have been well-supported by significant research over the last century (Piaget, 1962, 1983; Sutton-Smith, 1967; Vygotsky, 1967, 1978). A growing body of work indicates that play in the preschool years has the potential to provide young children with a highly engaging and meaningful context for learning essential early literacy concepts and skills (Lynch, 2015; Pellegrini, 1985; Vogt et al., 2018). The potential exists because, theoretically, play and literacy share higher-order cognitive processes such as imagining, categorizing, and problem-solving (Vygotsky, 1978). The play-literacy connection has become a highly researched area of study in both early childhood and early literacy contexts (Pyle et al., 2018; Roskos & Christie, 2013; Yaden et al., 2000). This article explores the connection between preschoolers' emergent literacy and two symbolic play activities – block play and picture drawing.

Background

Play evolves from a solitary activity to more social play as a child grows and develops. As their cognitive abilities increase, children begin interacting with more symbolic play activities such as constructive play and expressive play (Anderson-McNamee & Bailey, 2010). Vygotsky (1967) hypothesized that symbolic or representational play experiences are an important step toward using and processing written symbols. Symbolic play helps children act independently of what they see. Thought is separated from objects during symbolic play and actions come from ideas rather than things. Symbolic play is one of the most important cognitive developments of the young child (Stone & Stone, 2015). Symbolic play initiates the development of representational thought. Representing objects and events symbolically in a child's mind is facilitated by symbolic play (Pellegrini, 1985). It is practice through play that develops a child's abstract or representational thought. Early childhood classrooms support symbolic play through an active curriculum that is developmentally appropriate (Copple & Bredekamp, 2008), including pretend play, socio-dramatic play, constructive play, and expressive play that allows expression through activities such as painting, drawing, and writing.

Constructive (Block) Play

The term constructive play is often used to describe play activities with Legos, blocks, woodworking, and puzzles (Oostermier et al., 2014). Constructive play generally involves the manipulation, construction, or motion of objects in space (Caldera et al., 1999). Developed by Caroline Pratt in the early 1900s, wooden unit blocks are some of the most used "construction" materials in early childhood programs (Hirsch, 1996). It is not unusual to find a set of 150+ wooden unit blocks in a preschool classroom, providing blocks of varying sizes and shapes.

Block play can promote problem-solving and logical-mathematical skills (Kami et al., 2004; Piccolo & Test, 2010), spatial skills (Cohen & Emmons, 2016; Jirout & Newcombs, 2015), and may contribute to language learning (Cohen & Uhry, 2005; Snow et al., 2018). Through the constructing and deconstructing of block structures, children develop fine and gross motor skills (Oostermier et al., 2014), perceptual and cognitive awareness (Cristenson & James, 2015) as well as visual/spatial concepts necessary for literacy and numeracy (Ferara et al., 2011; Hanline et al., 2010). Literacy-enriched block play may promote the development and practice of emergent literacy skills (Snow et al., 2018; Stroud, 1995). Literacy props (e.g., books, paper, markers, crayons) encourage children to experiment with writing (i.e. using symbols for meaning), practice narrative competence (e.g., retelling stories, creating new imaginary situations), and experience the utility of literacy in their daily life. Block play is an opportunity for children to create meaning by representing and discussing real and imaginary experiences using unit blocks (Wellhousen & Kieff, 2001). Blocks naturally promote an awareness of symbols and their purposes. Blocks are open-ended materials that allow children to impose meaning on them. Pretending that an object has a different meaning is an important step in mastering the concept of symbolic representation, which is necessary for reading and writing (Vygotsky, 1978). According to Piaget (1962), symbolic play occurs when children mentally allow one object to represent another. The basic understanding that an object or symbol can be used to represent something different is an essential first step in understanding letters – the abstract symbols used to read and write. After repeated experiences using blocks (and other objects) as symbols, children become comfortable with assigning abstract meanings to objects (Stone & Burriss, 2016). Once they can do this, children can transfer their understanding to written symbols, specifically letters and words (Robertson-Eleto et al., 2017). Hanline et al. (2010) found that children who had higher levels of representation in their block play had higher reading abilities and a faster rate of growth in reading abilities in the early elementary grades.

Children progress through predictable stages of developmental block-building (Bailey, 1933; Hirsch, 1996; Tian et al., 2020). Blocks can be used to elicit play behaviors ranging from simple, rational play (e.g., lining and stacking blocks) to complex, symbolic play (e.g., making castles with moats) (Barton et al., 2018). During the later preschool years, children begin to use more blocks to create arches or bridges by placing blocks vertically as well as horizontally. Children explore building enclosures and towers and integrating features such as symmetry and patterns into structures to create increasingly complex constructions incorporating a wide variety of details (Sluss, 2002; Tian & Lou, 2019). It is at this point when block-building becomes representational and serves as an introduction to symbolization, a necessary skill for becoming literate (Tian & Lou, 2019).

Picture Drawing

A child's main resource for literacy learning is their knowledge of ways to express experiences and to communicate using symbols. Drawing has long been recognized as a pre-writing skill (Baghban, 2007). Vygotsky (1978) describes literacy development as beginning with drawing, then writing, then reading. Emergent forms of writing begin with drawings or scribbling from left to right, creating letter-like forms or creating random strings of letters (Mayer, 2007). Young children do not distinguish between drawing and writing initially because both acts convey meaning (Levin & Bus, 2003; Schickedanz & Cassbeberghe, 2001). At about age three, children start to separate drawing and writing (Brown, 1977). The importance of drawing has strong research support (Grinnell & Burris, 1983; Hooper et al., 2010; Nagi, 2015; Wright, 1998). In fact, most descriptions of emergent readers and writers include a reliance on pictures (Clay, 1998; Morrow, 2020). With that in mind, attention to visual detail is essential for success in beginning literacy development. As a child's attention to detail in pictures develops, the foundation for later reading and writing becomes stronger (Nagi, 2015). For example, attention to details will allow children to distinguish the subtle, directional differences in the letters /b/, /d/, /p/, and /q/ or attention to letter order predicts whether a child will read the word /was/ instead of /saw/.

Children often use drawing to represent what they know or are trying to understand (Willats, 2005). Drawing, even in preschool, should not be underestimated. There is much more complexity to children's drawing than was previously considered. Vygotsky (1978) believed children's drawings are influenced by, and thus provides insight into, their individual thoughts and culture. For example, when a child thinks about "home" and draws their representation of that home, their individual circumstance or culture may emerge. Rather than a simple rectangular house with a triangle roof, a child may draw a tall, thin rectangle to represent an apartment building. Children's drawings can also provide insight into their linguistic awareness by using letters or words in their drawing and social-emotional development with attempts to communicate feelings through the use of color and bold strokes (Nagi, 2015). As the child achieves fine motor coordination and develops intellectually, drawing tends to include more details (Wilson & Ratekin, 1990).

Children must be familiarized with the use of writing tools – a familiarization that begins as practice with drawing through the preschool years (Bonoti et al., 2005). Previous research has supported the notion that children learn graphic elements through drawing; therefore, there are strong similarities between the drawing process and learning the rules of written language (Stetsenko, 1995). Children will mix writing and drawing as old as 6 years of age. This is due to the relationship between these representational forms. Steffani and Selwester (2009) found a statistically significant correlation between drawing and writing, while Bonoti and associates (2005) found a strong relationship between writing and complex drawing. This strong correlation exists between writing and drawing in children aged 5 years (Steffani & Selvester, 2009) and remains strong through age 12 (Bonoti et al., 2005). Together, these studies seem to indicate that drawing is vital to the writing process not only for young children but for children throughout the elementary grades.

Purpose of the Study

Because symbolic representations are important to emergent literacy, this study will focus on children's spontaneous block building and picture drawing in preschool. Since noticing and using detail is vital to children's writing and overall literacy development, it becomes important for children to develop detail or complexity within their works (Clay, 1998). To date, there is limited research in which preschool children's constructive play with wooden unit blocks has been observed closely enough to determine the mechanism by which the complexity of such play may be related to details in children's picture drawing and emerging literacy. The goals of this exploratory study are: 1) investigate the relation between the complexity of block play, picture drawing details, and performance on an emergent literacy assessment, 2) analyze block play complexity and its relation to details in picture drawing, and 3) explore the demographic variables related to block play and picture drawing.

Methodology

Participants

Data for this study were gathered from two university-affiliated preschool classrooms located in an urban area in the Midwest of the United States. Although 40 children were enrolled in the two preschool classrooms (20 in each), data from 21 children were not included in this study because these children did not complete all measures due to absences and moving into or out of the program. To be included in the study, children need documentation for at least four (one per week) block constructions and four picture drawings, and scores from the literacy assessment. The final 19 participants consist of 7 girls and 12 boys. The children ranged in age from 46 – 61 months (M = 53.52; SD = 6.97). None of the families qualified for the federally subsidized food program. Thirteen families were employed by the university as staff or faculty and six families were professionals in the community. Seventeen children were Caucasian, one child was Asian, and one was African. All children spoke English as their primary language.

Procedure and Measures

This is a naturalistic study, based on the premise that children should be studied within an ecologically meaningful context (Golumb, 2009). Two data sources include young children's spontaneous, child-initiated activities (i.e., block play and picture drawings), which they made without adult suggestion or intervention. The study occurred over a four-week period and utilized college students completing a field experience at the university laboratory school. The college students were Juniors and Seniors in an undergraduate child development program. The students and two graduate research assistants were trained by the researcher during the lecture portion of the course. One session provided an overview of the study and what the students' participation would entail. A second session focused on familiarizing students with block structure complexity, unique shapes used in block constructions and their role as data collector.

Students as Data Collectors

During the second session of the training, four block constructions were created for preparing students to collect data on children's block structures. Students were provided with block structure complexity coding sheets to reference as they examined the block constructions. Although students were not expected to apply the structure complexity coding, the course instructor thought the information and practice would be beneficial to their overall knowledge and skills. Students also familiarized themselves with the unique shapes coding system (Figure 1), which they would be applying during data collection. Using the provided block constructions, students practiced applying the two coding systems (i.e. block structure complexity and unique shapes). Students also counted the total number of blocks in each construction. All data were recorded on index cards. Students were placed in small groups and discussed their findings. If their findings differed from one another, they discussed rationales for their coding. The researcher provided her findings for the four block constructions. Further discussions about the application of the coding systems took place. Finally, students were presented with scenarios about possible situations they might encounter in the classroom when gathering data (e.g., two or more students constructing together, use of cars or other props, one child starts a structure and another finishes it), which would not be included in the data. The session ended with Q & A.

For the child development course, students signed up for designated lab times in the university child development center. The lab times encompassed a three-hour block of time one day per week. During this semester, there were 21 college students enrolled in the course. This allowed for two college students to be in each of the preschool classrooms during the regularly scheduled free-choice play time each morning. Although there was also free-choice time scheduled in the afternoons, that period was not included in the data collection because children were leaving with their parents at various times and often did not complete their projects before going home for the day. To preserve anonymity, the preschool teachers assigned individual (ID) numbers to the children that were used for identifying block structures, picture drawings, and the literacy assessment.

Block Play

Block play has been studied for many years (Bailey, 1933; Hanline et al. 2001, 2010; Kami et al., 2004; Oostermeijer et al., 2014; Trawick-Smith et al., 2017). Similar to the technique used by Caldera et al (1999), several components of block play were considered to measure complexity of block play for the current study: 1) structure complexity, 2) number of unique blocks used in the construction, and 3) total number of blocks used in the construction. Means were calculated for each of the measures to provide a complexity measure independent of the number of constructions built over time (Trawick-Smith et al., 2017).

A daily self-selection, or free choice, period of 60 minutes was part of the regular curriculum in the laboratory school preschool classrooms. During this time, children chose from a variety of activities, including dramatic play, science/nature, mathematics, art, library/listening center, and block play. Each classroom had similar materials in each center and had rich literacy environments with numerous books, print/labels, and children's writing attempts displayed around the room. The block area in each classroom was well-defined with a shelf for storing wooden unit blocks, toy cars, and other miscellaneous small toys used as props in constructive play. Both block areas were equipped with between 100-150 wooden unit blocks in a variety of shapes and sizes (i.e., standard set of wooden unit blocks). During free-choice time, block play did not typically include adult interactions. Data collection took place every day by the college students for four weeks.

Structure complexity: Each time a single child was observed building with blocks, a college student would place the child's ID number card by the structure and take digital photos of the completed structure for later analysis by research assistants (Hanline et al., 2001). Due to the nature of a laboratory setting, note-taking and digital photos for anecdotal records were common occurrences in these classrooms and the children were accustomed to college students writing notes as they observed/participated in classroom activities. Thus, it is likely the college students' observations and documentations did not influence children during their block play.

Each block structure photo was rated by two independent research assistants applying the structural complexity coding system adapted by Trawick-Smith et al. (2017). Coding was completed by graduate research assistants with knowledge of child development and pursuing an advanced degree in an early childhood program. The graduate research assistants were trained by the researcher with the undergraduate students (described above). Inter-rater reliability was established and described in the Coding Reliability section.

A 10-point scale was used to rate each construction. (Table 1 presents the block structure complexity scoring system.) Simple constructions of rows or stacks were scored lower while complex and more representational structures were scored higher. The block structure complexity scale is sensitive to developmental changes and lends itself for use in authentic assessment (Hanline et al., 2001, 2010).

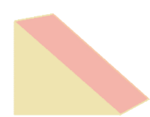
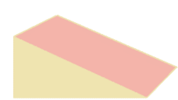
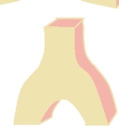
Table 1: *Block complexity rating scale (Trawick-Smith et al., 2017)*

Score	***Description of Structure***
1	No building
2	Stacks (vertical piles, one block on top of another) Lines/roads (horizontal rows, one block after the other)
3	Two or more adjoining piles or rows
4	"Fences" (rows of blocks lined on their edge)
5	Simple enclosures ("pens" or "houses" with blocks on edge, closing around a space) Simple bridges (rough bridging where a single cross-block does not precisely span uprights)
6	Complex enclosures (enclosures with blocks coming together completely "corners" and/or adjoining multiple "chambers" are created
7	Complex enclosure with "roofs" or "flooring"
8	Obviously representative structures (interior spaces are decorated, individual blocks represent objects such as trees, doors, stairs, driveway, chair, the structure "looks like something" and/or the building is "named")

9	"Towns" (several separate or adjoined structures that are obviously representational are built that clearly represent different buildings)
10	"Towns" with a sense of scale (multiple buildings are roughly built to scale—for example, a house is smaller than an apartment building)

Number of unique shapes used: As children have more experiences with blocks, they begin to incorporate more unique blocks into their constructions. For example, rather than building primarily with half units, units, double units, and quadruple units, children integrate such blocks as cylinders, curves, and triangles, which adds to the complexity of their structures (Tian et al., 2020). Once the child had completed building, the college student calculated the points for the unique shapes used in the construction, using the scale provided, and recorded the score on the child's ID card. (See Figure 1 for unique shapes criteria.)

Figure 1: Unique block names, scores and shapes.

Block Name	***Score***	***Shape***
Cylinders small large	1	
Curves circular elliptical	1	
Triangles small large	2	
Ramps	2	
Roman arch	2	
Half switch	3	
Y switches	3	

Number of blocks used: As children develop fine motor and cognitive skills, their structures become more complex and sophisticated. To build such structures, the number of blocks available to children must increase to support the increasingly complicated constructions (Caldera et al., 1999). Therefore, the number of blocks used in a structure adds to its complexity. When a block construction was completed by a child, the college student counted and recorded the total number of blocks used in the construction on the back of the child's ID card.

Picture Drawing

As described for block play, preschool children could choose to create in the art center during free-choice time. Both classrooms had a designated art center with a variety of paper, crayons, markers, and chalk accessible for use. Upon completion of a drawing, the college student assigned to that center would put the child's ID number on the back of the picture. Because the drawings were spontaneous without instructions, the types of drawings varied widely. Children's drawing has been used as an assessment tool to collect important data in a wide range of contexts such as education, psychology, and medicine (Koppitz, 1984; Nagi, 2015; Wilson & Ratekin, 1990). Using previous research on children's drawing (e.g., Cherney et al., 2006; Koppitz, 1984; La Voy et al, 2001; Levin & Bus, 2003) as well as information about developmental drawing (Wilats, 2005), criteria were established prior to the study to score the drawings. The criteria and definitions for scoring the drawings are displayed in Table 2 (next page). A mean score was calculated to provide a measure independent of the number of pictures drawn by a child.

Table 2. Drawing Codes, Score, and Definitions

Criteria		*Score*	*Definitions*
Person		1	Form that includes a head and facial features
-	Eyes	1	Circles or dots on "head"
-	Mouth	1	Line, curved or straight, placed on "head" below eyes
-	Nose	2	Circle or dot on "head" between eyes and mouth
-	Ears	2	Circles or lines on both sides of "head"
-	Hair	1	Lines, scribbles, curves on top and/or sides of "head"
-	Neck	2	Line or oval connecting "head" to "body"
-	Body	1	Line or oval extending from "head"
-	Arms	1	Line or oval extending from both sides of the "head" or "body"
-	Legs	1	Line or oval extending downward from the "head" or "body"
-	Hands	1	Line or oval at end of "arms"
-	Feet	1	Line or oval at ends of "legs"
-	Fingers	2	Line or oval extending from "hands"
-	Toes	2	Line or oval extending from "feet"
-	Clothing	2	Geometric form to represent "dress", "pants", etc
-	Hair acces.	2	Bows, pony-tails, etc. located on or in hair or head
-	Jewelry	2	Forms around neck, arms, fingers that represent jewelry
Rainbow		1	Arch
-	Multiples	2	More than one arch extending outward
-	Colors	2	Uses more than one color on arches
Sun		1	Circle at top of paper depicting an "outdoor" scene
-	Rays	2	Lines extending from "sun"
Animals		1	Shapes drawn horizontally with 4 or more legs
-	Head	1	Circle or oval
-	Face	1	Eyes on "head"; additional point for nose/mouth
-	Legs	1	legs extending from body
-	Other details	2	Tail, trunk, ears, mane, spots, etc.
Flower		1	Tall line extending from bottom of page or from "grass"
-	Stem	1	Line extending from flower, may hold leaves
-	Petals	1	Line or oval extending from "stem"
-	Leaves	2	Form extending from sides of "stem"
-	Roots	2	Lines that extend from bottom of "stem" appearing in "grass" or underground

Over the course of 20 free-choice sessions (5 days per week X 4 weeks), children produced numerous drawings. Samples ranged from 12 to 18 drawings per child. These drawings are assumed to be authentic assessments since they were child-initiated and spontaneous, without adult interaction or guidance.

Coding Reliability

Two independent research assistants, blind to the preschooler's age and other products, coded each product independently – block structure photos and picture drawings. All drawings were grouped together and coded, then all block structure photos. Each type of product (i.e., photo or drawing) was presented in random order. The final score was based on the common score of the two research assistants. In the cases when the research assistants disagreed, the mean score was calculated. Reliabilities on ten photos of block structures and ten drawings were deemed satisfactory. Inter-rater reliability for block structure was .91 and for drawings .84.

Emergent Literacy Assessment

The Teacher Rating of Oral Language and Literacy (TROLL; Dickinson, 1997) was used by the classroom teachers to assess the literacy skills of language, reading, and writing and can be completed without any prior training. The TROLL relies on a teacher's professional judgment of a child's development rather than formal testing of actual development. Nonetheless, TROLL ratings are largely consistent with those obtained through formal assessment. Correlations were found between the TROLL and these measures: 1) Peabody Picture Vocabulary Test III (Dunn & Dunn, 1997), 2) the Emergent Literacy Profile (Dickinson & Chaney, 1997b), and 3) the Early Phonemic Awareness Profile (Dickinson & Chaney, 1997a). Teacher ratings of children's literacy development on the TROLL show moderate correlation with children's scores on all three of the formal tests (.43 - .47 with $p < .001$). The TROLL is divided into three sections – oral language, reading, and writing. Each section is scored individually. The three subscales are summed to provide a total score that indicates overall literacy development.

The teachers from each preschool classroom used the TROLL to assess the children's literacy development in the spring immediately following the four-week data collection period described earlier. The assigned ID numbers were used to report the literacy scores to maintain anonymity.

Data Analyses

Descriptive statistics were calculated to identify minimums, maximums, means, and standard deviations for the variables of interest (see Table 3). Bi-variate correlations (Pearson *r*) were conducted to determine relations among the measures of block play complexity, picture drawing, and emergent literacy scores. To determine significant differences between variables of gender, block play complexity, picture drawing, and literacy scores, Independent sample *t*-tests were performed.

Table 3: *Descriptive Statistics*

	Minimum	**Maximum**	**Mean**	**SD**
Age (months)	46	61	53.526	6.97
Length of enrollment (months)	8.0	60.00	33.26	18.137
Structure complexity	1.0	5.5	3.33	1.47
Unique Shapes	1.0	24.0	13.51	8.17
Total blocks	11.50	100.66	68.91	26.23
Picture drawing details	4.50	33.66	14.976	9.28

Results

Correlations for appropriate research questions are presented in Tables 4 and 5. Findings for each research question are provided below.

Research Question #1

> *What are the relations among the complexity of block play measures, picture drawing details, and performance on a literacy assessment?* (Refer to Table 4.)

The TROLL scores were reported as a Total score as well as the three sub-groups of oral language, reading, and writing. Significant, positive relationships were identified between all three measures of block play complexity and the Total score on the TROLL: structure complexity (r = .89, p = .000); unique blocks (r = .84, p = .000); total number of blocks (r = .94, p = .00). In addition, the block play complexity measures were compared to the individual literacy sub-groups. Strong associations were also found in these areas. The writing score revealed significantly strong relationships with the complexity measures: structure complexity (r = .79, p = .000), unique shapes (r =.91, p = .000); total number of blocks (r = .90, p = .000).

These findings suggest that children who demonstrate higher levels of block play complexity in their block constructions may also have higher emergent literacy scores, with writing skills being particularly impacted. Children engaged in symbolic representations, simple to complex, are pre-cursers to literacy development (Stone & Stone, 2018). Thereby, the more complexity is found in block construction, the closer the association to the literacy scale. Children who have poor writing may benefit from additional experiences working with blocks and other representational activities.

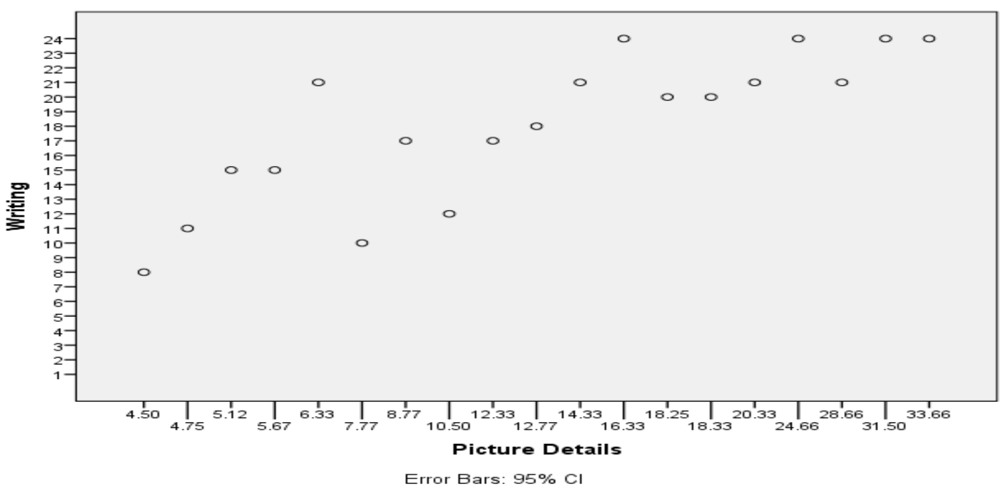
Table 4: Summary of Intercorrelations, Means and Standard Deviations for Scores on TROLL (Total and sub-groups), Block Complexity Measures and Picture Drawing.

Measure	TROLL Total	Oral Language	Writing	Reading	Mean	SD
Structure Complexity	.891**	.845**	.787**	,897**	3.33	1.47
Unique Shapes	.834**	.674**	.906**	.775**	.13.52	8.17
Total # of Blocks	.941**	.819**	.902**	.919**	68.91	26.23
Picture Drawing	.635	.395	.769**	.611	14.98	9.28
Mean	79.53	27.42	18.37	50.37	---	---
SD	14.25	4.75	4.74	68.92	---	---

p < .001

The Total TROLL score was compared to the picture drawing detail scores and indicated a statistically significant relationship (*r* =.635, *p* = .003). Next, the individual emergent literacy subgroups were compared to children's picture drawing detail. No relationship was found between picture drawing and oral language (*r* = .389, *p* = .099); however, significant correlations were found with reading and writing. Of particular interest is the strong correlation between writing and picture drawing details (*r* = *.769, p* = .000). These findings indicate a strong link between children's drawing and emergent literacy. In addition, a significant drawing-writing connection is revealed. (See Figure 2)

Figure 2: Scatter Plot – Correlation of Picture Drawing Details and Writing



Research question #2

> *What is the relationship between block play complexity and details in children's picture drawing?* (Refer to Table 5.)

Children's picture drawing was compared to the three measures of block play complexity. Moderate correlations were found among all variables: structure complexity (*r* = .467, *p* = .035), unique shapes (*r* - .660, *p* = .001); total blocks used (*r* = .656, *p* = .002). These findings indicate that children's attention to detail is reflected in their symbolic play activities of building with block. As the detail in one symbolic representation increases, it appears the details in other symbolic representations may also increase.

Table 5: Summary of Intercorrelations, Means and Standard Deviations for Picture Drawing and Block Complexity Measures.

Measure	Structure Complexity	Unique Shapes	Total # of Blocks	Mean	SD
Picture Drawing	.498*	.733**	.656**	14.98	9.28

*$p < .05$ ** $p < .01$

Research question #3

Which of the demographic variables are related to block play and picture drawing?

Data were gathered on the children's age, length of time enrolled at the center, and gender. Length of time enrolled at the laboratory school seemed important to include because children would be more apt to experience multiple episodes with wooden unit blocks while in that setting. The demographic variables were compared to the three measures of block play complexity as well as picture drawing. No significant associations were revealed for age or length of time enrolled; however, when t-tests were conducted to assess gender differences between the complexity measures, there was a significant difference between the total number of blocks used and gender. Girls (M = 76.13, SD =17.24) used more blocks than boys (M = 64.70, SD = 39.17). The difference was significant at p <.05 level: $t(17)$=.912, p=.033. There were no gender differences found for picture drawing.

Discussion

The purpose of this study was to explore the possible relationships among preschool children's symbolic representations in their block play and picture drawing, and their emergent literacy skills. In addition, the study set out to examine the association between details used in block play, which are defined as "complexity", and preschoolers use of detail in picture drawing.

The three measures of complexity used for this study – structure complexity, total number of blocks used, and unique blocks used – were found to be highly correlated to the emergent literacy skills assessed by the TROLL. Much like earlier studies (Hanline et al., 2001, 2010; Ramoniet et al., 2001; Trawick-Smith et al., 2017) constructive complexity and emergent literacy skills have much in common. Although block play complexity and the Total TROLL score was significant, it was particularly interesting to find the strong relationships between the emergent literacy skill of writing and the three complexity measures. It is not surprising that the symbolic skill of writing would align so strongly with the symbolic representations in block play. However, it was interesting to find that writing was most highly correlated to the unique blocks used in the children's constructions rather than structure complexity, which has been the complexity standard used in many studies (Hanline et al, 2001, 2010; Trawick-Smith et al., 2017). This finding may indicate that block play complexity involves more than complicated structure buildings. Perhaps the details of the types of blocks used and how many blocks are used to create the more sophisticated structures are of equal importance. Further investigation to develop a more comprehensive definition of complexity may be warranted.

When examining picture drawing as it relates to children's emergent literacy skills, it was discovered that moderate associations were found for both the Total TROLL score and the subgroups of reading and writing. Oral language and picture drawing were not significantly related. Since the act of picture drawing tends to be a more individual and personal act, it is understandable that there would not be an association. Similar to the work of Bonoti and colleagues (2005) and Steffani and Selvester (2009), a strong relationship was found between children's drawing and writing. Symbolic representations take a series of higher-order thinking and concept formation. The skill of writing may utilize the same type of cognitive processing to use and understand symbolic representations as does the act of picture drawing. In the hierarchy of symbolization, Vygotsky (1978) maintains that childrens' first-order symbolism is play and drawing, while second-order symbolism is writing. The findings of the current study reinforce the earlier works that assert a strong relationship between drawing and writing. Further, when considered with the research of Bonoti et al., (2005), the drawing-writing connection seems to be a vital skill for children age 3 – 12 years. Children represent the meaning of objects and events through the use of symbolic play and children also represent the meaning of objects and events through symbols in drawing.

Children's attention to detail is an important skill for becoming literate. The relationship between block play complexity and literacy as well as drawing and literacy seem clear. However, a connection between block play complexity and picture drawing, two highly representational activities, have limited research. This study begins to explore such connections. Drawing and the standard block complexity measure of structure complexity have only a moderate correlation, while the measures of total blocks used and unique blocks used have significant relationships to picture drawing. Because both drawing and block play complexity are strongly related to emergent literacy, especially that of writing skills, it seems likely that these two measures would also indicate a strong relationship. When considering a child's writing skills, it seems important to investigate the symbolic representations in which they engage. The acts of picture drawing and building complex block structures using many blocks and integrating uniquely shaped blocks, are tasks that require attention to shapes and details. In this manner, the relationship between children's picture drawing and block play complexity seems clear.

There are inconsistencies in the research when investigating demographic variables that may be associated with children's symbolic representations occurring in the block and art areas of the preschool classroom. The current study aligns with the literature that indicates there are no relations among block play complexity and children's age (Ramoni et al., 2014; Trawick-Smith et al., 2017). However, other studies have indicated that children's block building becomes more complex as they grow older (Hanline et al., 2001, 2010). One explanation for this inconsistency could be the age ranges being studied. Like the current study, Ramoni et al., (2014) and Trawick-smith et al.,(2017) studied children relatively close in age, while earlier studies (Hanline et al., 2001, 2010) included children in a wider age range – as young as 16 months and as old as 5.6 years. Perhaps the lack of age differences revealed in the later studies, including the present one, had more to do with children's experiences with block play rather than the natural progression of maturation. The demographic variable of gender has been studied extensively in block research. Several studies indicate there are gender differences in block play. As early as the 1950's, Erikson (1951) identified there were gender differences in the types of structures built by girls and boys.

Goodfader (1982) found that gender impacted spatial relations associated with block structure and Sluss (1999) found gender differences in how children played with blocks but not in their level of play. Findings from the current study suggest there is no relationship between gender and complexity of structures and use of uniquely shaped blocks but there was a significant difference in how many blocks were used by boys and girls. Findings reveal girls used more blocks in their block structures than boys. This is a unique finding. Caldera et al., (1998) found that boys built more structures in their block play and girls used more unique block shapes in their building. The current study did not find the same result. Although the means for number of unique blocks indicated girls used more unique blocks in their constructions, the difference was not significant. For those interested in gender differences in preschool play activities, the focus on block building may be warranted.

Limitations

There are several limitations to this research that should be noted. First, the small sample size and lack of diversity among the children included in this study makes generalization difficult. A further limitation is the fact that all children attended the same preschool that was a laboratory setting. The small number of participants also made it challenging to conduct higher levels of correlational research such as linear regression analyses. A stronger statistical analysis would allow for investigating predictive features of block play complexity and details in picture drawing. Finally, although this study provided some meaningful data regarding relationships between measures of block play complexity, picture drawing details and emergent literacy skills, a causal relationship cannot be determined.

Conclusion

It appears that current empirical studies with wooden unit blocks is limited. It could be argued that the lack of empirical research of the value of block play might be attributed to the disappearance of symbolic play in many pre-kindergarten and lower primary classrooms

Symbolic play is typical behavior of young children, as originally proposed by Piaget and Vygotsky, and seems to help develop the representational skills necessary for literacy, especially writing. Obviously, there are many opportunities offered in block building and picture drawing to create, use, and function within the symbolic realm. Such activities, growing out of the interests of the child, are an important phase in the development and refinement of the symbolic process. With most children, there is a clear connection between the pictures they draw and the constructions they build. For example, the children who lack details in their pictures often build less complex constructions. The better a child’s attention to detail within pictures and block structures, the stronger the foundation for later reading and writing. It could be said that preschoolers in this study were not only constructing block structures but also building a sense of themselves as readers and writers. Perhaps these important symbolic connections will encourage school administrators and early childhood teachers to reconsider the inclusion of symbolic play in today’s classrooms.

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Denise D. Cunningham, Ph. D., is Department Head of Childhood Education and Family Studies and currently the interim Associate Dean in the College of Education at Missouri State University. She is a Professor in the Early Childhood Education program where she supervises graduate student research. Dr. Cunningham was a primary teacher and Literacy Coach in the St. Louis Public School District before going to Missouri State. Last year, she was the editor of the book, Professional and Ethical Consideration for Early Childhood Leaders, published by IGI Global. The book is a collection of innovative research that crafts an overall understanding of the importance of early

childhood leadership in today's schools. Dr. Cunningham's research interests include early childhood curriculum, literacy development, pre-service teacher preparation, and early childhood in the public schools.