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An examination of the relationship between a child's developmental age and early literacy learning

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Abstract: American students typically attend kindergarten at the chronological age (CA) of five and currently with the implementation of Common Core State Standards, there are expectations that children learn how to read in order to meet these academic standards, despite whether or not they are developmentally ready. This mixed methods study examined age and environmental factors that relate to reading with 83 children from the ages of 4–6½ years. The relationship between developmental age (DA) via the Gesell Developmental Observation-Revised and early literacy learning via Marie's Clay observational tool, Concepts About Print (CAP), were explored. The purpose of the study was to highlight the need for better alignment of educational policies and practices as they relate to child development and to promote more effective synthesis between discoveries in the field of neuroscience about how children learn and what is known about child DAs and stages. The findings revealed a statistically significant relationship between a child's DA and early literacy learning as measured by the CAP. The descriptive statistics revealed that the DA of the children in this study was younger than their CA. Furthermore, a child's DA was found to be the strongest predictor of early literacy learning.

ABOUT THE AUTHORS

Christine E. Moran, PhD, is the dean of Student Success at Stevenson University. During her tenure as an associate professor of Education, she taught numerous courses in reading, children's literature, integrated language arts, and assessment. Her research interests focus on early literacy learning and effective teaching strategies. Moran has almost 20 years of experience in education and has provided professional development and training to K-12 schools, higher education institutions, as well as community organizations.

Karlen Senseny, EdD, is dedicated to promoting the understanding and respect of child development. Senseny has been a Gesell Institute of Child Development National Lecture Staff since 2007, providing tools and resources to educational institutions throughout the United States. With 23 years of classroom experience, Senseny understands the challenges which face today's educators. She supports administrators, teachers, and parents in understanding the connection between how children develop and how they learn.

PUBLIC INTEREST STATEMENT

There is a current national push to get kindergarteners to read before they enter first grade which places undue pressure on young children starting school as well as parents and teachers. Typically, a child must be chronologically five or close to five to begin kindergarten, and schools are designed to structure learning according to chronological age (CA) rather than taking into account the child's unique developmental needs. The purpose of the study was to highlight the need for better alignment of educational policies and practices as they relate to child development. This emphasis on age leads to concerns about the efforts to teach children to learn to read conventionally before they may be developmentally ready.

Subjects: Child Development; Childhood; Classroom Practice; Early Years; Education; Educational Psychology; Language & Literacy; Primary/Elementary Education

Keywords: chronological age; developmental age; early literacy learning; child development; reading

1. Introduction

According to the National Center for Education Statistics (NCES) (2004), kindergarten is considered to be the traditional beginning year of the American public school system as well as a time when children are expected to integrate their cognitive, social, emotional, language, and physical competencies to meet the demands of a structured educational experience (Pianta, Cox, & Snow, 2007). However, while a child must typically be chronologically five or close to five to begin kindergarten, not all five-year olds may be developmentally ready for the rigors of an increasingly academic and demanding kindergarten curriculum (Almon & Miller, 2009; Ilg, Ames, & Baker, 1981). Even though the theoretical underpinnings of child development may vary, theorists (Elkind, 1994; Erikson, 1963; Gesell et al., 1940; Montessori, 1964; Piaget & Inhelder, 1969) agree that having reached a fifth or sixth birthday does not necessarily guarantee any given level of development.

Recognizing that children develop at their own rates but still go through the same predictable stages of growth, the field of emergent literacy looks to the continuum of literacy skills development unique to each child. Correspondingly, there is an entire field of child development that also recognizes a continuum in the individual development of children that includes physical, motor, social, emotional, adaptive, and cognitive as well as language domains. An understanding of the differences in children's developmental growth reinforces the importance of designing early instruction based on a broad set of literacy experiences (Paris, 2011). Knowledge about children's early literacy learning has increased substantially in the past several decades (Claessens, Duncan, & Engel, 2008; National Early Literacy Panel, 2008); however, only in the past 10 years have sizeable efforts been directed to the understanding and development of reading related skills prior to school entry and a recognition of how these skills contribute to later academic success (Lonigan et al., 2009; Marston et al., 2007).

2. Statement of the problem

There is a lack of empirical research that not only explores the relationship between a child's early literacy learning and his developmental stage, but also that has utilized a developmentally appropriate instrument as a way to monitor a child's developmental stage in conjunction with his early literacy learning (Almon & Miller, 2009; Justice, Invernizzi, Geller, Sullivan, & Welsch, 2005; Meisels, 2006; Snow & Oh, 2011). Current curricular practices focus on teaching the child to read at a proficient level; however, these practices fail to determine if the child is developmentally ready to read. The purpose of this study was to examine the relationship between children's developmental age (DA) and early literacy learning. The aim of this study was to utilize information from the Gesell Developmental Observation-Revised (GDO-R) which measures development age in conjunction with students' scores on CAP as defined by Marie Clay (2006). The intention was to identify additional means to guide parents and teachers in making curricular decisions for their children from prekindergarten to second grade.

This study focused on the following research questions and tested the related hypotheses:

(1) How does the child's CA versus DA as measured by the GDO-R relate to the child's early literacy learning as measured by CAP?

$H_0$1: There is no statistically significant relationship between a child's CA versus DA and the child's readiness to read.

(2) What factors singly, or in combination, account for a child's early literacy learning (CAP)?

$H_0$2: There are no statistically significant factors that predict a child's early literacy learning.

3. Early reading and later academic achievement

Evidence from the early childhood longitudinal study-kindergarten (Claessens et al., 2008) clearly showed that children in the United States enter kindergarten with disparate entry-level mathematical and reading skills. Duncan et al. (2007) analyzed school readiness among six longitudinal data sets of children from the United States, Great Britain, and Canada, and found the strongest predictors of later achievement in school were entry-level reading skills as well as math skills and attention skills. Based on these findings, Duncan et al. recommended examining students' early skills prior to school entrance as these skills have important implications for early education programs.

Furthermore, the problems children experience in learning to read during the elementary years and beyond are related to the preliteracy skills they bring with them from preschool and kindergarten (Claessens et al., 2008; Lonigan, Farver, Phillips, & Clancy-Menchetti, 2009; de Witt, 2009). Lonigan, Farver, Lonigan, and Eppe (2009) referred to these preliteracy skills as "emergent literacy skills," which include the areas of phonological awareness, alphabet knowledge, and print concepts. Research indicates that a child's reading success can be predicted from these early literacy skills (Lonigan, 2006; Plaza & Cohen, 2006).

Several studies (Cabell, Justice, Konold, & McGinty, 2011; Spira, Bracken, & Fischel, 2005; Welsh, Nix, Blair, & Bierman, 2010) exploring the patterns of prekindergarten children who were identified as at-risk for later academic difficulties found emergent literacy skills to be unique predictors of kindergarten math and reading achievement. Other studies focusing on the effectiveness of early intervention also supported the importance of these skills for helping struggling readers and English language learners as well as preventing reading disabilities (Betts, Reschly, Pickart, Heistad, & Sheran, 2008; Farver et al., 2009; Justice, Kaderavek, Fan, Sofka, & Hunt, 2009; Young, 2009).

International studies (Lei et al., 2011; National Inquiry into the Teaching of Literacy, 2005; Nergård-Nilssen, 2006; Plaza & Cohen, 2006) also supported the importance of emergent literacy skills as predictors of later reading outcomes. A six-year longitudinal study in China (Lei et al., 2011) found that early literacy skills were essential in the early prediction of later reading difficulties in Chinese children. In a Norwegian longitudinal case study of children with developmental dyslexia, Nergård-Nilssen (2006) examined preschool cognitive and linguistic profiles with emergent literacy skills. The author found that delayed development in emergent literacy turned out to be the most prognostic indicator of later low reading achievement.

There is growing recognition of early reading development as a predictor of later school success and a factor in the widening achievement gap (Jacobsen-Chernoff, Flanagan, McPhee, & Park, 2007; Lonigan, Allan, & Lerner, 2011; National Inquiry into the Teaching of Literacy, 2005). There are age-appropriate developmental antecedents underlying the continuum of reading that are found early and prior to the onset of school (Lonigan et al., 2009). Many children enter kindergarten with well-developed print knowledge, phonological knowledge, and oral language; conversely, a significant number of children arrive in kindergarten with a low level of these early skills. These skills are often referred to as "emergent literacy skills," which Whitehurst and Lonigan (1998) defined as "the developmental precursors to conventional forms of reading and writing" (p. 849).

The term "emergent literacy" was coined by Clay (1966) to describe the developmental reading behaviors she observed in young children in New Zealand. The concept of emergent literacy evolved during the 1960s through the 1980s as the result of new information on how young children develop an understanding of reading and writing (Morrow, 2011). Emergent literacy may be described as the process of learning about the environment that leads to the development of meaning and concepts, including concepts about the functions of reading and writing. Koenig (1992) stated that emergent literacy "is characterized by the early development of understanding that abstract symbols have meaning and that people use these symbols for the communication of ideas" (p. 279).

Teale and Sulzby (1986) in their classic review of the research on emergent literacy found five characteristics of young children as literacy learners: (1) almost all children in a literate society are learning to read and write early in their lives; (2) literacy is functional and an integral part of a child's learning process; (3) oral language, reading, and writing develop concurrently and interrelatedly; (4) children learn through active engagement; and (5) as parents and children interact together around print, adults pave the way to a child's independence in reading and writing. This last feature is now known as the family literacy theory (Taylor, 1983; Wasik, 2004). Teale and Sulzby (1989) asserted that this quality was the most significant of the five characteristics. It is difficult to pinpoint the exact time when this literacy learning begins. According to Wolf (2007), learning to read begins the first time an infant is held and a story is read aloud to him, thereby initiating a lifelong process of learning to read and write.

Unlike the maturational theory of Gesell or stage model theory of Piaget, emergent literacy posits that literacy development begins at birth and that the home environment plays a major role in the child's literary abilities (Clay, 2001). It seeks to explain how literacy develops and what interaction is needed during the developmental continuum of the reading process. Emergent literacy is a developmental continuum revealing where a child is in his attempts to learn to read and write (Lonigan, Burgess, & Anthony, 2000; Strickland & Morrow, 1989). This literacy, like child development, is ongoing and not fixed and does not occur when a child starts school (Burns, Griffin, & Snow, 1999; Lonigan, 2006). Rather, it begins in infancy as children have had experiences with the oral and written language before they start school (National Association for the Education of Young Children, 2009). Therefore, "early literacy learning" is an ongoing process that children develop early in their language acquisition and that contributes to their future academic success.

The *Developing Early Literacy: Report of the National Early Literacy Panel* (National Early Literacy Panel, 2008) provided a meta-analysis of nearly 300 studies showing which early literacy measures correlated with later literary achievement. Its mission was to summarize the scientific evidence on early literacy development and to influence educational policy and practices on young children's early language and literacy development. A significant finding of the report was that reading and writing skills that were developed in the first five years of life had a consistently strong relationship with later conventional reading and writing skills.

The National Early Literacy Panel (NELP) (2008) identified emergent skills and abilities that predict later reading achievement, even after the influence of intelligence or socioeconomic status was taken into account. These emergent skills pertain to three broad areas:

(1) phonological awareness, or child's developing awareness of sound units with oral language independent of meaning; (2) alphabet knowledge, or a child's knowledge of names and sounds associated with printed letters; and (3) print awareness, letter and word concepts, and directionality. Children who had more of these skills learned to read sooner and more competently than those children who did not have these skills.

3.1. Print awareness and the development of visual perception

Print awareness is a prerequisite for children's success in beginning to learn to read (Fountas & Pinnell, 2011). Children acquire print awareness on a gradient with the assistance of their interactions with text (Evans & Saint-Aubins, 2011). Print awareness shows the understandings about written language that are developed slowly, steadily, and often early in children brought up in highly literate environments as found in Durkin (1966) groundbreaking study on children who learned to read before starting school. However, print awareness is also based on the child's vision development.

In 1949, Gesell and Bullis (1949) published *Vision: Its Development in Infants and Children.* Earlier, they discovered the importance of seeing in the developing infant: "In the early months, looking is half of living" (p. 253) and wrote a description of visual behavior expected within the first five years

of life. This information translates to how a child responds to the items on the Gesell assessments, especially the Copy Forms, as it requires visual discrimination. Children respond to the Copy Forms at their developmental stage of visual perceptions, and demonstrate their DA norm.

Clay (2001) found visual perception of text to be a part of the inner processing system from which the reader generates reading behaviors. She saw visual perception of text as a hidden curriculum of perceptual learning. Clay described visual perception strategies as one of the strategies, "inner controls," used by children in learning to read. It is this increased visual awareness that allows the child to progress in his emergent literacy journey.

Based on her theory about how children come to master the complex tasks of reading and writing, Clay (2001) created an assessment tool to observe and measure emergent literacy. *An Observation Survey of Early Literacy Achievement* (Clay, 2006) provided a systematic way to determine early reading behaviors. It includes six sub-tasks: Letter Identification, Word Test, Vocabulary, Hearing and Recording Sounds in Words, Text Reading, and CAP. CAP is a teacher-administered standardized assessment that determines what the child knows about the way spoken language is represented in print.

The 24 items of the CAP address several critical points of print awareness, including where to start reading, reading directionality, word-by-word matching, and distinguishing between the idea of a letter and a word. CAP assesses the literary knowledge of young children by providing information about what children know about reading before they begin to read. CAP is important because it is based on the recognition that children master CAP before they are ready for the early stages of reading instruction (Clay, 2001; Fountas & Pinnell, 1996). Nonetheless, the CAP is only a measurement of literacy and does not take into consideration the other developmental domains that impact an overall child's growth.

Accordingly, the GDO-R is an instrument that involves direct observation about a child's growth in cognitive, motor, social, and emotional domains and determines the overall DA at which a child is functioning. In *Mental Growth of the Preschool Child: A Psychological Outline of Normal Development from Birth to the Sixth Year Including a System of Developmental Diagnosis*, Gesell (1925) provided detailed norms and specific instructions for giving the Gesell Behavior Tests to children.

This developmental examination became known as the Gesell Readiness Screening Test, and later in the 1970s–1980s, it came to be known as the Gesell Developmental Observation (GDO). The GDO is not concerned with right or wrong answers; rather, it is concerned with the child's response in terms of developmental status. The factors considered in determining a child's overall DA include processes, organization, method, verbalizations, overt behaviors, and the end product. The DA is the age in years and half years that best described the child's collective behavior and performances on a developmental continuum. A child's DA may or may not correspond to his CA.

The GDO was the focus of a national study in 2008–2010 to provide current and normative data to support its validity and reliability. The result of this study was the Gesell Developmental Observation Revised (GDO-R). The *GDO-R Technical Report Ages 3–6 Data Analysis and Results* (Gesell Institute of Child Development, 2012) listed the number of items, sample size, maximum possible points, mean raw score, standard deviation, and internal consistency coefficient for each task. The new GDO-R also incorporates parent/guardian and teacher input and includes performance level evaluations and strand scoring. Strand A includes the original developmental tasks developed by Gesell: Cubes, Incomplete Man, Fine Motor, Gross Motor, and Copy Forms.

Gesell's original Copy Forms test seriated six forms of increasing difficulty: circle, cross, square, triangle, divided rectangle, and diamond. The test reveals behavior–age level from 2½ to 9 years. The significance of the test is not just in the success of copying, but the way the child copies, the size form made, the placement of the form drawn on the paper, and the organization of the six forms on the paper. It also assesses a child's competence in integrating visual information with fine motor skills.

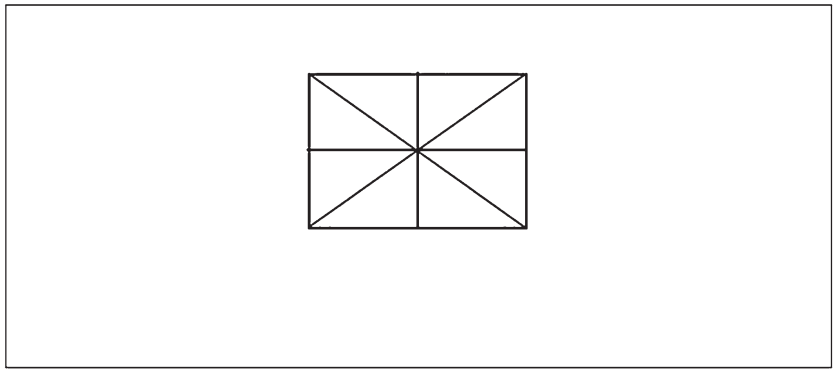

Figure 1. The Divided Rectangle Copy Form from the GDO-R Copy Form Task Card. Copyright 2012 by the Gesell Institute of Child Development.

The divided rectangle (see Figure 1) is a challenging form that tells a great deal about a child. The four and four-and-half-year olds see it as "too hard," and when willing to tackle it, they have little success in making the divided rectangle (Ilg & Ames, 1972). Children who are developmentally younger than six do not have mature enough visual perceptions to handle this Copy Form. It is not until the DA of 6 years that the child usually has success, meaning that he makes the horizontal and angled lines cross the central vertical lines. These directionality behaviors are necessary in mastering CAP and in early reading; it is an internal focus on the inner control within the child which emerges as the child uses text as the external resource in learning to read (Clay, 2001).

Today most researchers have come to understand child development, the learning process, and the early childhood underpinnings of reading ability (Hay & Fielding-Barnsley, 2009; Lonigan, 2006; Neuman & Dickinson, 2011). These findings lend support to the concept of emergent literacy as a skill set and knowledge base that begins developmentally in infancy and is further enriched in early childhood stages by exposure to language, print, and instruction. Yet, there are varying levels of early literacy learning among children entering school, and these early years are important. The process of becoming a skilled reader is highlighted by a significant body of evidence that preschool children's development in the areas of oral language, phonological awareness, and print awareness is predictive of how well they will learn to read once they are exposed to formal reading in elementary school (National Early Literacy Panel, 2008).

In light of this evidence, there are ongoing concerns about the policy and practice implications as well as literacy assessments used with preschoolers (Invernizzi, Landrum, Teichman, & Townsend, 2010). Many efforts to teach children to learn how to read before ages of four or five may be rushing them to perform tasks for which they are not biologically ready. Gesell suggested that student school success would increase if children started school based on their developmental level, or behavior readiness, rather than their age in years (Ames, 1989). Clay (2001), on the other hand, advocated that teachers meet children at the level at which they enter school.

This study utilized data from the GDO-R scores of 83 children from the ages of four to six-and-half and cross-referenced this data to the CAP. The study specifically focused on determining if there was a relationship between a child's CA, his DA, and his early reading ability. It also examined if there were factors, singly or in combination, which significantly impacted the child's emergent literacy.

4. Method

4.1. Participants

Study participants included children from the ages of 4–6 ½ attending early childhood learning centers in Texas, Pennsylvania, and Michigan. A total of 83 children (age 4, $n = 11$; age 4½, $n = 31$; age 5, $n = 27$; age 5½, $n = 6$, age 6, $n = 6$; age 6½, $n = 2$) participated in the study. There were 48 males and 35 females and their ethnicities were comprised of Caucasian, African American, Hispanic, and

Asian. Nearly, all the children (>90%) used English as their primary language. Chronological ages were determined by calculating the child's age in years and months, then rounding it off into six-month intervals. For example, a child that was 4 years and 5 months was placed in the four-year-old group.

4.2. Design and procedure

Two observational instruments were provided: the CAP and the GDO-R. The parents completed a questionnaire as part of the GDO-R assessment. The questionnaire, Gesell Parent/Guardian Questionnaire (GPQ), was filled out by parents while their child was being administered the GDO-R or at a later time. The GPQ contains 78 items that collected data regarding the child's health history, home environment, habits from birth, and social, emotional, and adaptive behaviors observed by the parents/guardian.

The data collected from the CAP scores were analyzed to reveal children's emergent literacy skills. These scores were then compared to the children's chronological and DAs. The children's DAs were determined by the GDO-R, which provided a score for developmental tasks that actually results in ages that may be younger, older, or equal to their actual CAs. Each child received a numerical score on each GDO-R task based on his performance of the items that comprise the task. The score was reported in 6 month age intervals: 4, 4½, 5, etc.

To aid in the interpreting of the task scores, each task has a benchmark that reflects the performance that can be expected of a child in each age band. In addition to the task score and benchmark, the technical data supporting the GDO-R based on a large, diverse national sample of children provided the percentage of children meeting the benchmark for each developmental task (cubes, copy forms, completing a drawing of a person, etc.) and the p-values for each item for each age band. These technical data provide information that aids in comparing an individual child's performance to a sample of same-age peers. Archived data from the GDO-R DA scores and parents' responses from the GPQ provided additional data to answer the research questions.

All data were entered into a computer database and analyzed using the Statistical Package for Social Sciences (SPSS), version 20 (SPSS-IBM, 2012). For each student in the study, the following data were collected:

(1) Chronological age.
(2) DA at time of data collection.
(3) GDO-R Copy Forms Task (overall) DA.
(4) GDO-R Copy Form Divided Rectangle DA.
(5) CAP score.
(6) Environmental factors from the GPQ.

Data were analyzed using descriptive statistics and correlation calculations using the Pearson product of movement of correlation. Mertler and Charles (2005) stated that the Pearson product of movement of correlation is most common and popular in use and is appropriate for use when the relationship between two variables is a linear one. The correlation coefficient is the index of the relationship between two variables. The coefficient shows the direction of the relationship, positive or negative, and the relative strength of the relationship (Graziano & Raulin, 2007). Pearson correlations were utilized to determine if there was a relationship between certain variables, such as child's CA, DA, and early literacy learning. Two-tailed t-tests were also run to examine the relationship between items on the GDO-R and early literacy learning.

Subsequent analyses were performed to further explore environmental factors and the possible relationships to the child's DA and early literacy learning. Specifically, a principal components factor

analysis was performed on environmental items from the parent questionnaire. Pearson correlations were utilized again to examine relationships between meaningful factors and children's DA as well as their early literacy learning. Finally, a stepwise multiple regression was employed to see which, if any, factors predict children's early literacy learning.

5. Tables and findings (analysis)

The first hypothesis stated there is no statistically significant relationship between a child's CA versus DA and his CAP score. Correlations were computed among the child's CA, the child's DA, and the child's early literacy learning as measured by CAP for 83 children. Descriptive statistics for the participants' CA, DA, and CAP are displayed in Table 1.

Participants' CAs ranged from 4-year-old (4.0) to 6 years and 9 months (6.9). The average CA of the participants was 4 years and 8 months. Participants also had the potential to score via the GDO-R DAs of 2½ years (2.5) to 7 years (7.0) with intervals of 6 months. Results showed the average DA of the same participants to be 4 years and 7 months, which would yield a DA of 4½ (4.5) as per the Gesell parameters. Furthermore, the total amount of items that the child can score on the CAP is 24. Higher scores on the CAP correlate with a child's increased likeliness to be ready to read (Clay, 2006). Table 1 clearly demonstrates that the mean score of the child's DA is lower than the child's CA. Moreover, the mean CAP score is at a 10.24 for the participants in the study.

Pearson correlations were run to determine whether a statistically significant relationship exists between a child's CA versus DA and the child's early literacy learning. The results of the Pearson correlations are presented in Table 2.

Results suggest that all correlations were found to be statistically significant. Results indicate a positive relationship between (1) the child's CA and the child's DA, $r\ (83) = .648$, $p < .000$, (2) the child's CA and child's early literacy learning as measured by the CAP $r\ (83) = .596$, $p < .000$, and (3) the child's DA and early literacy learning $r\ (83) = .683$, $p < .000$. In general, the results suggest that older children also have a higher DA and are more likely ready to read. It is important to note that the relationship between a child's DA and early literacy learning as measured by the CAP is not only statistically significant, but proves to be stronger than between CA and the CAP.

Furthermore, this study explored what factors singly, or in combination, account for a child's early literacy learning. A stepwise multiple regression was conducted using the child's CA, DA, environmental factors via the GPQ, the overall Copy Forms score, and the divided rectangle to predict the child's early literacy learning (CAP). Each predictor was entered into the regression equation in a stepwise fashion to see if it accounted for a significant proportion of the variance in the dependent variable (CAP) at the .05 significance level. Results of the stepwise multiple regression are displayed in Table 3.

It is evident in Table 3 that only one variable entered the regression equation, accounting in the final equation for 51% of the variance. Specifically, a child's DA predicts a child's early literacy learning.

Table 1. Descriptive statistics on CA, DA, and CAP scores

Variables	Mean	Standard deviation	*N*
Chronological age	4.8253	.58661	83
Developmental age	4.7470	.53176	83
CAP score	10.24	4.520	83

Table 2. Pearson correlations between CA, DA, and CAP

Variables		CA	DA	CAP score
Child's chronological age (CA)	Pearson correlation (r)	1	.648	.596
	Sig. (two-tailed)		.000**	.000
	N	83	83	83
Developmental age (DA)	Pearson correlation (r)	.648	1	.683
	Sig. (two-tailed)	.000**		.000
	N	83	83	83
Concepts about print (CAP) score	Pearson correlation (r)	.596	.683	1
	Sig. (two-tailed)	.000**	.000**	
	N	83	83	83

**$p < .01$, two-tailed; Correlation is significant.

Table 3. Stepwise multiple regression on early literacy factors

Step	Variable entered	β at final step	*R*	Adjusted *R* squared
1	Developmental age	.461	.791	.510

6. Discussion

The first research question examined how the child's CA versus DA as measured by the GDO-R relates to the child's early literacy learning as measured by CAP. Results confirmed that there is a positive relationship between a child's CA, his DA, and his CAP score. The correlation is significant at the 1% level of significance. There is a statistically significant relationship between a child's DA and his early literacy learning. The correlation is high and positive (r = .683), suggesting that the child's early literacy learning increases in connection with his DA. This finding relates to the research that highlighted the significance of the developmental aspects of early literacy, social and emotional factors, and brain growth in young children prior to entering school (Massetti, 2009; Neuman & Dickinson, 2011). It has been proven that learning to read and write are fundamental developmental milestones in a literate society and that early literacy development is a key to future success in acquiring content learning in other areas and throughout life. This study confirmed the importance of understanding child development in emergent literacy.

Further studies regarding the connection of visual perception, DA, and reading are strongly recommended. An unplanned aspect of the study was the strong connection found between the early child developmentalists (e.g. Piaget, Montessori, and Gesell) and the current neuroscientific research about the wiring of the child's brain. Additional research is needed to investigate how brain development impacts readiness for school. Research is needed to understand how to better prepare schools to be ready for the children, and rather than expecting children to be ready for school.

Another area that would be beneficial for future research is a longitudinal study with this population, which follows their DA patterns and relationship to reading skills. An interesting aspect of the study was that there were not any statistically significant relationships between the environmental factors, DA, and emergent literacy. Future research is strongly recommended on the areas of environmental factors and DA and how they impact emergent literacy. There is body of research that supports the importance of environmental issues and emergent literacy; a possible focus of future research might incorporate child developmental factors.

In summary, this study found that a child's DA has a statistically significant relationship to his emergent literacy. In factor analysis, DA was a stronger predictor than the environmental factors of the child's early literacy learning. The results of descriptive statistics revealed that the children in this

study's DA were younger than their CA. This information is important for both parents and educators to know since a child who is chronologically five may not be behaving and functioning at a fully five-year-old developmental level, but may be younger, for example, between 4½ and 5.

Based on these findings, not all five-year olds are behaving in a manner that is fully 5 and thus may not be ready for the rigors of an increasingly academic and demanding kindergarten curriculum. A child may have an above average knowledge base, but to be successful in school, a child also needs to be ready physically, socially, and emotionally, and exhibit adaptive behaviors that will support school success. In addition to a child's cognitive development, language, motor, and social development and the proficiency of self-help skills are essential to school success. Schools are currently designed to organize learning by CA, not DA; therefore, the findings of this study support the idea that DA should be considered, specifically in early literacy teaching and learning. Some suggestions may include using the developmental profile of a child to inform the content and pace of curricular expectations, as well as sequencing learning experiences to the overall developmental level of a child, rather than by his CA.

Furthermore, the findings of this study revealed that there is a statistically significant relationship between a child's DA and early literacy learning as measured by the CAP. Additionally, the child's DA was found to be the strongest predictor of the child's early literacy learning. School readiness involves all the stakeholders: the parents, the teachers, the community as well as the child, and requires more than a "one size fits all" formula. Clay (2001) underlined the importance for educators to recognize that this process is a journey and to be alert to how active learners change over time within their given context. Clay emphasized that the acquisition of reading, the importance of early literacy learning, as well as the responsibility of the educator to meet each child at his level and take his learning from that point.

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References

Almon, J., & Miller, E. (2009). *The crisis in early education: A research-based case for more play and less pressure*. College Park, MD: Alliance for Childhood.
Ames, L. B. (1989). *Arnold Gesell: Themes of his work*. New York, NY: Human Science Press.
Betts, J., Reschly, A. L., Pickart, M., Heistad, D., & Sheran, C. (2008). An examination of predictive bias for second grade reading outcomes from measures of early literacy skills in kindergarten with respect to English-language learners and ethnic subgroups. *School Psychology Quarterly, 23*, 553–570. http://dx.doi.org/10.1037/1045-3830.23.4.553
Burns, M. S., Griffin, P., & Snow, C. E. (Eds.). (1999). *Starting out right; A guide for promoting children's reading success. National Research Council*. Washington, DC: National Academy Press.
Cabell, S. Q., Justice, L. M., Konold, T. R., & McGinty, A. S. (2011). Profiles of emergent literacy skills among preschool children who are at risk for academic difficulties. *Early Childhood Research Quarterly, 26*, 1–14. http://dx.doi.org/10.1016/j.ecresq.2010.05.003
Claessens, A., Duncan, G., & Engel, M. (2008). Kindergarten skills and fifth grade achievement: Evidence from the ECLS-K. *Economics of Education Review, 28*, 415–427.
Clay, M. M. (1966). *Emergent reading behaviors* (Unpublished doctoral thesis). University of Auckland, Auckland.
Clay, M. M. (2001). *Becoming literate: The construction of inner control*. Portsmouth, NH: Heinemann.
Clay, M. M. (2006). *An observation survey of early literacy achievement*. Portsmouth, NH: Heinemann.
de Witt, M. W. (2009). Emergent literacy: Why should we be concerned? *Early Child Development and Care, 179*, 619–629. doi:10.1080/03004430701453671
Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., & Pagani, Linda S. (2007). School readiness and later achievement. *Developmental Psychology, 43*, 1428–1446. http://dx.doi.org/10.1037/0012-1649.43.6.1428
Durkin, D. (1966). *Children who read early*. New York, NY: Teachers College Press, Columbia University.
Elkind, D. (1994). *A sympathetic understanding of the child: Birth to sixteen* (3d ed.). Boston, MA: Allyn and Bacon.
Erikson, E. (1963). *Childhood and society*. New York, NY: International Universities Press.
Evans, M. A., & Saint-Aubins, J. (2011). Studying and modifying young children's visual attention during book reading. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research*, (Vol. 3, pp. 242–255). NewYork, NY: Guilford Press.
Farver, J. M., Lonigan, C. J., & Eppe, S. (2009). Effective early literacy skill development for young Spanish-speaking

English language learners: An experimental study of two methods. *Child Development, 80*, 703–719. http://dx.doi.org/10.1111/j.1467-8624.2009.01292.x

Fountas, I. C., & Pinnell, G. S. (1996). *Guided reading: Good first teaching for all children*. Portsmouth, NH: Heinemann.

Fountas, I. C., & Pinnell, G. S. (2011). *Literacy beginnings; A prekindergarten handbook*. Portsmouth, NH: Heinemann.

Gesell, A. (1925). *The mental growth of the preschool child: A psychological outline of normal development from birth to the sixth year including a system of developmental diagnosis*. New York, NY: Macmillan.

Gesell, A., & Bullis, G. E. (1949). *Vision: Its development in infant and child*. New York, NY: Paul B. Hoeber Inc.

Gesell Institute of Child Development. (2012). *Gesell developmental observation-revised and early screener technical report: Ages 3–6*. New Haven, CT: Author.

Gesell, A., Halverson, H. M., Thompson, H., Ilg, F. I., Castner, B. M., Ames, L. B., & Amatuda, C. S. (1940). *The first five years of life: A guide to the study of the preschool child*. New York, NY: Harper & Brothers.

Graziano, A. M., & Raulin, M. L. (2007). *Research methods: A process of inquiry*. Boston, MA: Pearson.

Hay, I., & Fielding-Barnsley, R. (2009). Competencies that underpin children's transition into early literacy. *Australian Journal of Language and Literacy, 32*, 148–162.

Ilg, F., & Ames, L. (1972). *School readiness: Behavior tests used at the Gesell Institute*. New York, NY: Harper & Row.

Ilg, F., Ames, L., & Baker, S. (1981). *Child behavior*. New York, NY: Harper & Row.

Invernizzi, M., Landrum, T. J., Teichman, A., & Townsend, M. (2010). Increased implementation of emergent literacy screening in pre-kindergarten. *Early Childhood Education Journal, 37*, 437–446. http://dx.doi.org/10.1007/s10643-009-0371-7

Jacobsen-Chernoff, J., Flanagan, K. D., McPhee, C., & Park, J. (2007). *Preschool findings from the preschool follow-up of the Early Childhood Longitudinal Study, Birth Cohort [ECLS-B]* (NCES Report No. 2008-025). Washington, DC: National Center for Education Statistics.

Justice, L. M., Invernizzi, M., Geller, K., Sullivan, A. K., & Welsch, J. (2005). Descriptive-developmental performance of at-risk preschoolers on early literacy tasks. *Reading Psychology, 26*, 1–25. doi:10.1080/02702710490897509

Justice, L. M., Kaderavek, J. N., Fan, X., Sofka, A., & Hunt, A. (2009). Accelerating preschoolers' early literacy development through classroom-based teacher–child storybook reading and explicit print referencing. *Language, Speech, and Hearing Services in Schools, 40*, 67–85. http://dx.doi.org/10.1044/0161-1461(2008/07-0098)

Koenig, A. J. (1992). A framework for understanding the literacy of individuals with visual impairments. *Journal of Visual Impairment and Blindness, 86*, 277–284.

Lei, L., Pan, J., Liu, H., McBride-Chang, C., Li, H., Zhang, Y., & Chen, Lang (2011). Developmental trajectories of reading development and impairment from ages 3 to 8 years in Chinese children. *Journal of Child Psychology and Psychiatry, 52*, 212–220. http://dx.doi.org/10.1111/j.1469-7610.2010.02311.x

Lonigan, C. J. (2006). Development, Assessment, and Promotion of Preliteracy Skills. *Early Education and Development, 17*, 91–114. http://dx.doi.org/10.1207/s15566935eed1701_5

Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: Evidence from a latent- variable longitudinal study. *Developmental Psychology, 36*, 596–613. http://dx.doi.org/10.1037/0012-1649.36.5.596

Lonigan, C. J., Anthony, J. L., Phillips, B. M., Purpura, D. J., Wilson, S. B., & McQueen, J. D. (2009). The nature of preschool phonological processing abilities and their relations to vocabulary, general cognitive abilities, and print knowledge. *Journal of Educational Psychology, 101*, 345–358. http://dx.doi.org/10.1037/a0013837

Lonigan, C. J., Allan, N. P., & Lerner, M. D. (2011). Assessment of preschool early literacy skills: Linking children's educational needs with empirically supported instructional activities. *Psychology in the Schools, 48*, 488–501. http://dx.doi.org/10.1002/pits.v48.5

Lonigan, C. J., Farver, J. M., Phillips, B. M., & Clancy-Menchetti, J. (2009). Promoting the development of preschool children's emergent literacy skills: A randomized evaluation of a literacy-focused curriculum and two professional development models. Published online. doi:10.1007/s11145-009-9214-6

Marston, D., Pickart, M., Reschly, A., Heistad, D., Muyskens, P., & Tindal, G. (2007). Early literacy measures for improving student reading achievement: translating research into practice. *Exceptionality, 15*, 97–117. http://dx.doi.org/10.1080/09362830701294177

Massetti, G. M. (2009). Enhancing emergent literacy skills of preschoolers from low-income environments through a classroom-based approach. *School Psychology Review, 38*, 554–569.

Meisels, S. J. (2006). *Accountability in early education: No easy answers* (Erikson Institute Occasional Paper, 6). Chicago, IL: Erikson Institute Herr Research Center.

Mertler, C. A., & Charles, C. M. (2005). *Introduction to educational research*. Boston, MA: Pearson.

Montessori, M. (1964). *The Montessori method*. New York, NY: Schocken Books.

Morrow, L. M. (2011). *Literacy development in the early years: Helping children read and write*. Boston, MA: Allyn & Bacon.

National Association for the Education of Young Children. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth to age eight*. Washington, DC: Author.

National Center for Education Statistics (NCES). (2004). *Full-day and half-day kindergarten in the United States: Findings from the early childhood longitudinal study, kindergarten class of 1998–99*. Washington, DC: Author.

National Early Literacy Panel. (2008). *Developing early literacy: Report of the National Early Literacy Panel*. Washington, DC: National Institute for Literacy.

National Inquiry into the Teaching of Literacy. (2005). *Teaching reading: Report and recommendations*. Canberra: Australian Government, Department of Education, Science and Training. Retrieved March 30, 2011, from http://www.dest.gov.au/nitl/report.htm

Nergård-Nilssen, T. (2006). Longitudinal case-studies of developmental dyslexia in Norwegian. *Dyslexia, 12*, 231–255. doi:10:102/dys.314

Neuman, S. B., & Dickinson, D. K. (Eds.). (2011). *Handbook of early literacy research*,, (Vol. 3). New York, NY: Guilford Press.

Paris, S. G. (2011). Developmental differences in early reading skills. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research*, (Vol. 3, pp. 228–241). New York, NY: Guilford Press.

Piaget, J., & Inhelder, B. (1969). *The psychology of the child*. New York, NY: Basic Books.

Pianta, R. C., Cox, M. J., & Snow, K. L. (Eds.). (2007). *School readiness and the transition to kindergarten in the era of accountability*. Baltimore, MD: Brookes.

Plaza, M., & Cohen, H. (2006). The contribution of phonological awareness and visual attention in early reading and spelling. *Dyslexia, 13*, 67–76. doi:10.1002/dys.330

Snow, C. E., & Oh, S. S. (2011). Assessment in early literacy research. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research*, (Vol. 3, pp. 375–395). New York, NY: Guilford Press.

Spira, E. G., Bracken, S. S., & Fischel, J. E. (2005). Predicting improvement after first-grade reading difficulties: The effects of oral language, emergent literacy, and behavior skills. *Developmental Psychology, 41*, 225–234. http://dx.doi.org/10.1037/0012-1649.41.1.225

Strickland, D. S., & Morrow, L. M. (Eds.). (1989). *Emerging literacy: Young children learn to read and write*. Newark, DE: International Reading Association.

Taylor, D. (1983). *Family literacy*. Portsmouth, NH: Heinemann.

Teale, W. H., & Sulzby, E. (Eds.). (1986). *Emergent literacy; Writing and reading*. Norwood, NJ: Ablex.

Teale, W. H., & Sulzby, E. (1989). Emergent literacy: New perspectives. In D.S. Strickland, L.M. Morrow (Eds.), *Emergent literacy: Young children learn to read and write* (pp. 1–15). Newark, DE: International Reading Association.

Wasik, B. H. (2004). *Handbook of family literacy*. Mahwah, NJ: Lawrence Erlbaum Associates.

Welsh, J. A., Nix, R. L., Blair, Clancy, & Bierman, K. E. (2010). The development of cognitive skills and gains in academic school readiness for children from low-income families. *Journal of Educational Psychology, 102*, 43–53. http://dx.doi.org/10.1037/a0016738

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development, 69*, 848–872. http://dx.doi.org/10.1111/cdev.1998.69.issue-3

Wolf, M. (2007). *Proust and the squid: The story and science of the reading brain*. New York, NY: Harper Collins.

Young, J. (2009). Enhancing emergent literacy potential for young children. *Australian Journal of Language and Literacy, 32*, 163–180.

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