The Role of Home Literacy Environment on the Development of Reading Comprehension Skill: A Mediation Model

by

Ezgi Aydoğdu

A Thesis Submitted to the

Graduate School of Social Sciences

In Partial Fulfillment of the Requirements for

The Degree of

Master of Arts

In

Developmental Psychology

Koç University

December, 2017

Koc University

Graduate School of Social Sciences and Humanities

This is to certify that I have examined this copy of a master's thesis by

Ezgi Aydoğdu

and have found that it is complete and satisfactory in all respects,

and that any and all revisions required by the final

examining committee have been made.

Committee Members:

_____

Assoc. Prof. Nazlı Baydar (Advisor)

_____

Prof. Dr. Aylin Küntay

_____

Asst. Prof. Berna Akçınar

Date: _____

STATEMENT OF AUTHORSHIP

This thesis contains no material which has been accepted for any award or any other degree or diploma in any university or other institution. It is affirmed by the candidate that, to the best of his knowledge, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Signed Ezgi Aydoğdu

ABSTRACT

A stimulating and enriched home literacy environment in preschool years is necessary for a successful literacy development. In this research, we focused on how home literacy environment in early childhood was associated with children's reading comprehension at school ages through language skills, verbal working memory and word reading. Children's earlier receptive vocabulary knowledge and cognitive skills (e.g. visual-spatial working memory assessed both at ages three and six and verbal working memory at age six) were used as covariates. Home literacy environment was conceptualized as the parental teaching of pre-literacy skills, shared book reading and the availability of books at home. The data of the Early Childhood Developmental Ecologies in Turkey (ECDET), which was designed as a longitudinal study and conducted with a nationally representative sample in Turkey (N=1052), was used. The results showed that supportive home literacy environment was significantly associated with receptive vocabulary knowledge and other foundational language skills. Maternal responsiveness and warmth were as closely related to children's verbal working memory development as home literacy environment. Home literacy environment in early childhood had an indirect association with reading comprehension through language skills (e.g. receptive vocabulary) and word reading, even when controlling for children's cognitive skills and earlier receptive vocabulary knowledge. However, verbal working memory did not significantly mediate the association of home literacy environment with reading comprehension. On the other hand, home literacy environment in early childhood was directly associated with reading comprehension at school ages.

Keywords: home literacy environment, word reading, reading comprehension, receptive vocabulary knowledge, language skills

ÖZET

Okulöncesi dönemde uyarıcı ve zenginleştirilmiş evdeki okuma-yazma çevresi başarılı bir okuma-yazma gelişimi için gereklidir. Bu araştırmada, erken çocukluktaki evdeki okuma-yazma çevresinin, çocuğun okuduğunu anlamasını dil becerileri, sözel çalışan bellek ve kelime okuma üzerinden nasıl etkilediği incelenmiştir. Çocukların önceki alıcı kelime bilgisi ve bilişsel becerileri (üç ve altı yaşta ölçülen görsel-uzaysal çalışan belleği ve altı yaşta ölçülen sözel çalışan belleği) eş değişken olarak kullanıldı. Evdeki okuma-yazma çevresi, ebeveynin okuma-yazma öncesi becerilerini öğretmesi, anne-çocuğun beraber kitap okuması ve evdeki kitap mevcudiyeti olarak tanımlanmıştır. Boylamsal olarak planlanan ve Türkiye'nin ulusal yapısını temsil eden bir örneklemle yapılan Türkiye'de Erken Çocukluk Gelişim Ekolojileri (TEÇGE) araştırmasının verileri kullanılmıştır (N=1052). Sonuçlar, evdeki destekleyici okuma-yazma çevresinin, alıcı kelime bilgisi ve diğer temel dil becerileri ile anlamlı olarak ilişkili olduğunu göstermektedir. Annenin duyarlılığı ve sıcaklığı, evdeki okuma-yazma çevresi kadar çocukların sözel çalışan bellek gelişmesi ile yakından ilişkilidir. Erken çocukluktaki evdeki okuma-yazma çevresi, erken alıcı kelime bilgisi ve bilişsel beceriler kontrol edildiğinde bile dil becerileri (örn. alıcı kelime bilgisi) ve kelime okuma üzerinden dolaylı olarak okuduğunu anlama ile ilişkilidir. Fakat sözel çalışan bellek becerisi, evdeki okuma-yazma çevresi ve okuduğunu anlama arasındaki ilişkiye anlamlı olarak aracılık etmemiştir. Ayrıca, erken çocukluktaki evdeki okuma-yazma çevresi, okul yaşlarındaki okuduğunu anlama ile doğrudan ilişkilidir.

Anahtar kelimeler: evdeki okuma-yazma çevresi, kelime okuma, okuduğunu anlama, alıcı kelime bilgisi, dil becerileri

ACKNOWLEDGEMENT

The process of writing down a thesis is difficult. People can encounter many challenges during this time, but they can overcome those difficulties with the support of other people around them. For this reason, taking social and emotional support from other people is so important during this challenging period. Social support coming from your family, friends, advisor or other members of your jury can decrease your stress, increase your motivation and beliefs to overcome all difficulties you encounter and to complete successfully your thesis.

Firstly, I would like to thank my family who spent so much effort and endeavor to rear me as a good person who is educated, questioning, self-contained, self-reliant and conscientious. I am lucky to have my family.

Secondly, I want to thank my advisor, Assoc. Prof. Nazlı Baydar to be there whenever I need her help during challenging and hard times. She is a very kind and supportive person. I appreciate her help and support. She taught me many valuable things during this period.

I also thank Prof. Aylin Küntay and Asst. Prof. Deniz Tahiroğlu because of their valuable support and accepting to become members of my thesis committee.

Lastly, I am grateful to TUBITAK (The Scientific and Technological Research Council of Turkey) for its financial support during two years period of my master education.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1: Introduction

The current study aims to examine how home literacy environment in early childhood influences reading comprehension skills of Turkish children at school ages. Word reading is necessary, but not enough for reading comprehension (Arrington, Kulesz, Francis, Fletcher & Barnes, 2014). Many other factors (e.g. vocabulary, listening comprehension and working memory, etc.) have important roles in the development of reading comprehension skills of children (Cain, 2010; Carver, 2003, Seigneuric, Ehrlich, Oakhill & Yuill, 2000).

Literacy related skills are supported in an enriched home literacy environment in preschool years. Many studies showed a positive effect of home literacy environment on children's language outcomes (Payne, Whitehurst & Angell, 1994; Sénéchal, LeFevre, Hudson & Lawson, 1996) and early literacy skills (Schick, 2014; Westerveld, Gillon, van Bysterveldt & Boyd, 2015). Tamis-LeMonda and Rodriguez (2009) pointed out that home literacy environment, which was conceptualized as literacy learning activities, parenting quality during those activities, and the availability of literacy learning materials (e.g., age-appropriate toys, books and newspapers) was related to early literacy skills and language development of young children. Then, high language skills contributed to reading comprehension skills of children (Foorman, Herrera, Petscher, Mitchell & Truckenmiller, 2015). Therefore, in this study, we posited a mediated association of home literacy environment with reading comprehension. The mediating effects of receptive vocabulary, language skills, verbal working memory and word reading were examined among Turkish children at age three at the beginning of the study and at age seven at the end of the study.

This study aimed to contribute to the literature in understanding the development of reading comprehension skill with a broader perspective. There have been a few studies examining

multidimensional aspects of reading comprehension (Whitehurst, 1996a). Most studies only examined a few factors affecting the development of reading comprehension skill of children (Dieterich, Assel, Swank, Smith & Landry, 2006; Muter, Hulme, Snowing & Stevenson, 2004; Babayiğit & Stainthorp, 2014; Gentaz, Sprenger-Charolles & Theurel, 2015). In this study, family characteristics (i.e., mother's education and economic status), parenting inputs (i.e., home literacy environment), cognitive skills (i.e., working memory), verbal skills (i.e., receptive vocabulary and other foundational language skills) and reading skill (i.e., reading recognition) were simultaneously examined to understand the contributions of each to reading comprehension skills of Turkish children. Moreover, this study was longitudinally conducted with a representative sample. The longitudinal design provided an opportunity to observe the precursors of reading comprehension skill for five years.

Previous studies on the association of home literacy environment with reading comprehension were mostly conducted with Western samples in English speaking countries (Bennett, Weigel & Martin, 2002; Sonnenchein & Munsterman, 2002; Aikens & Barbarin, 2008; Mol & Bus, 2011). There were only a few studies with non-Western samples (Korat, Arafat, Aram & Klein, 2013; Aram et al., 2013; Babayiğit & Stainthorp, 2014). Therefore, this study aimed to extend the literature by adding a comprehensive study conducted with a sample from a non-Western country, Turkey.

In sum, the association of home literacy environment in early childhood with reading comprehension skill at school ages through the development of receptive vocabulary, language skills, working memory development and word reading was examined. The data of the Early Childhood Developmental Ecologies in Turkey (ECDET), which were collected from 1052 mothers and their three-year-old children for five consecutive years, were used in this study.

1.1 Word reading and reading comprehension

Reading comprehension is defined as to retrieve knowledge about the meaning of each word in printed text from memory, and to derive meanings of the whole sentence and then of the whole printed text (Woolley, 2011). According to the "Simple View of Reading", reading comprehension is a combination of word reading (or decoding) and listening comprehension skills (Gough & Tunmer, 1986; Hoover & Gough, 1990). Being unsuccessful in word reading or listening comprehension or both results in poor reading comprehension after a certain age (Gough & Tunmer, 1986).

Word reading is the ability to recognize and sound out words accurately and fluently from written texts (Gough & Tunmer, 1986). It is based on phonological ability, alphabetic knowledge, print knowledge and vocabulary knowledge (Evans & Shaw, 2008). Betjemann et al. (2008) reported that word reading and reading comprehension were robustly correlated during middle childhood. However, strong word reading ability is necessary but not a guarantee for successful comprehension (Catts et al. 2005; Cutting & Scarborough, 2006; Yuill & Oakhill, 1991).

According to "Simple View of Reading", the other component of reading comprehension is listening comprehension skill. Listening comprehension is defined as the ability to derive meaning from spoken words that come together to constitute a sentence or a discourse (Farrell, Davidson, Hunter & Osenga, 2010). Rapp and van de Broek (2005) emphasized the importance of listening comprehension in reading comprehension, especially after children mastered word reading skills.

Kamhi (2007) proposed that reading comprehension included higher-level mental processes such as thinking, reasoning, imagining and interpreting (as cited in Farrell et al., 2010),

in addition to word reading, retrieving the meaning of each word and deriving meaning of the whole sentence. Word reading and reading comprehension are strongly related to each other among the children who are not proficient word readers. However, the role of listening comprehension skill in reading comprehension increases while the effect of word reading skill decreases (Keenan, Betjemann, & Olson, 2008; Vellutino, Tunmer, Jaccard, & Chen, 2007) after the children fully acquire word reading skills.

In the current study, both word reading and listening comprehension skills of children, which were indicators of language skills in the current study, were taken into account and hypothesized to mediate the association between home literacy environment at age three and reading comprehension at age seven.

1.2 Conceptualization of home literacy environment

The home literacy environment is conceptualized as having three components: (1) home-based activities (e.g. shared book reading, parental teaching of reading skills), which promote the development of language and literacy skills, (2) the availability of literacy materials, library and bookstore visits; and (3) parental literacy-related behaviors (i.e., teaching pre-literacy skills) (Leseman & de Jong, 1998; Burgess, Hecht & Lonigan, 2002; Yeo, Ong & Ng, 2014). Studies examining the effect of home literacy environment used different conceptualizations. Most studies asked the parents how often they read books to their child, the number of books at home, whether or not they had a library card and their attitudes toward reading (Griffin & Morrison, 1997; Rashid, Morris & Sevcik, 2005). Moreover, Burgess et al. (2002) compared the effects of six different conceptualizations of home literacy environment on 4 or 5-year-old children's literacy outcomes. Those conceptualizations were "limiting environment" indicated by parental education and occupation, and shared reading; "active home literacy environment (HLE)" defined as the

involvement of the child in literacy activities; “passive HLE” referring only observation of literacy activities; “interactive HLE”, which was a combination of active and passive HLE; and “overall HLE” which included all those conceptualizations. It showed that the conceptualizations of home literacy environment that included active participation of the child in literacy activities had a higher contribution to the child’s literacy outcomes than other conceptualizations of home literacy environment.

On the other hand, Sénéchal, LeFevre, Thomas and Daley (1998) pointed out another distinction related to the home literacy activities. They reported that parental involvement in the child’s literacy activities could be studied by distinguishing informal and formal literacy activities. Formal literacy activities refer to the activities where the main purpose of the activity is to teach elements of literacy. In these activities, the main focus is on the print itself, on the written words, and on the names and sounds of the letters (Smolkin & Yalden, 1992). However, informal literacy activities are defined as activities that mainly focus on the meaning of the text and the message contained in the text, not on the print itself. In those kinds of activities, children are incidentally exposed to the print itself, but the main purpose is to understand what is being read (Sénéchal et al., 1998).

The conceptualization of Burgess et al. (2002) was related to the engagement of the children in the literacy activities. On the other hand, Sénéchal et al. (1998) conceptualized home literacy environment due to the main purpose of the literacy activities. In informal home literacy activities, the main purpose is to understand the message or the gist of the text. On the other hand, formal literacy activities focus on the print itself (e.g. print concepts, alphabet knowledge and spelling structures). Both conceptualizations are important to point out the different aspects of home literacy activities. The present study utilized both perspectives to conceptualize home

literacy environment. In the current study, home literacy environment was conceptualized as shared book reading, parental teaching of pre-literacy skills and the availability of books at home. It included both informal (e.g. shared book reading) and formal (e.g. parental teaching of pre-literacy skills) literacy activities. In these literacy activities, the child had active role.

1.3 Conceptualization of language skills

Early literacy skills are defined as children's interactions with language and print before engaging in conventional reading and writing processes (Connor, Morrison & Slominski, 2006). Whitehurst and Lonigan (1998) also defined early literacy skills as the developmental precursors to conventional reading and writing, and emphasized the contributions of early literacy skills on later reading and writing skills. In the current study, early literacy skills are referred to as language skills including sentence repetition, listening comprehension, syllabification skills and receptive vocabulary knowledge.

Chapter 2: Literature Review

This section first presents the theoretical basis of the study. Then, previous research on the association of home literacy environment with vocabulary and language skills was discussed. Literature on the effects of home literacy environment on word reading and reading comprehension, the effect of working memory on reading comprehension and the effect of parental education and economic status on home literacy environment were summarized. Lastly, the conceptual framework and the hypotheses of the study were presented.

2.1 The theoretical basis

Three different approaches related to literacy development have been discussed in the literature (Mason & Sinha, 1992; Teale & Yokota, 2000; Baydık, 2003). They are neural-maturation, reading readiness and emergent literacy approaches.

Neural-maturation was a common theory in reading development from the 1920's to the 1950's (Carroll, 2013). Gesell (1940) (as cited in Mason & Sinha, 1992) advocated a naturalistic view and emphasized the role of maturation in the development. Gesell also posited that neural-maturation resulted in the development of both motor and cognitive skills. This view was based on the idea that one should "wait and see" until children were ready to learn literacy instructions (Mason & Sinha, 1992). According to this view, children passed through some core neural developmental stages before they were ready to learn to read. When children reached a specific level of neural-maturation, they would be able to learn basic reading. In this view, the general assumption was that children were not ready to learn how to read before age 6 (Crawford, 1995). According to the maturation view, parents had little influence on their child's reading ability.

The "reading readiness" approach was the second literacy approach that received support during the late 1950's. The advocates of this view also pointed out that neural-maturation was necessary to learn formal reading. However, contrary to the maturation approach, the reading readiness approach did not support the idea that waiting for maturation would be sufficient for the development of children's literacy skills. Rather, it emphasized that children must be stimulated with literacy activities and be taught some early literacy skills before formal literacy could be acquired. The literacy environment at home had a important role in improving early literacy skills. Before formal reading instruction at school, children should experience some basic activities related to literacy such as recognizing shapes. Those "early literacy skills" prepared children for

formal reading and provided them with a smooth transition to reading. Teale and Yokota (2000) suggested that children should master early reading and perceptual skills before benefiting from formal reading instruction at school. For instance, children whose mothers frequently taught them the letters before grade 1 were more ready to learn reading than children whose mothers were less frequently engaged in the teaching of the alphabet (Martini & Sénéchal, 2012). Therefore, home-based parental literacy activities are necessary to acquire core pre-reading skills and to be ready to learn reading formally.

Clay (1966) introduced the "emergent literacy" approach, which was popular during the 1980's, as an alternative to the "reading readiness" approach. Contrary to the other two views supporting that literacy development began at age six when the child was ready in terms of neural-maturation, advocates of the emergent literacy approach emphasized that literacy learning actually started at very early ages, even at birth. According to this view, children learned literacy including reading, writing and language through home-based literacy activities before formal learning of reading. Clay (2001) declared that children developed some processing systems (e.g. the syntax of oral language; the meaning of words; understanding stories) as a result of early life experiences. Children should have decoded the letters and the syllables to read written words or sentences successfully (Clay, 2001). By the time children started school, they should have developed processing systems which were necessary to learn reading. Theale (1994) declared that all children moved into formal literacy learning in different ways and at different rates (as cited in Li & Zhang, 2008, p. 46). Teale and Yokota (2000) reported some main points of the emergent literacy approach and summarized the research from the 1970's to the 1980's on this view. 1) Literacy development began long before formal reading instruction. Real life experiences (e.g. the observation of people during literacy activities like book reading or writing in daily life) and social

interactions with people (e.g. talking about the names of objects) benefited the development of literacy abilities. Children were most probably exposed to different vocabularies while people around them were communicating with each other and encountered printed texts around them through real life experiences. They learned basic literacy knowledge as an active constructor. 2) Listening, speaking, writing and reading developed concurrently and interrelatedly, instead of sequentially. 3) Cognitive development relevant to reading occurred throughout early childhood. 4) Children had some individual differences in terms of literacy development.

Contrary to the maturation view which emphasized the role of nature on literacy development, reading readiness and the emergent literacy approaches underscored the contribution of nurture or environmental factors to children's literacy development. The "reading readiness" approach advocated that knowing and practicing some basic early reading skills before formal reading got children ready to easily learn formal reading instructions. Teale and Sulzby (1992) reported how the teaching of reading and writing occurred in the reading readiness view. In this view, the formal aspects of reading were considered as important, but the functionality of reading was ignored. The skills that were necessary to become literate were broken down into isolated skills. Moreover, a skill hierarchy was arranged. For example, the teaching of writing started after children learned to read. "Reading readiness" reported that reading was best taught through direct systematic instructions rather than active participation of children (Crawford, 1995).

On the other hand, emergent literacy view pointed out that children's literacy development begin at very early ages through real life experiences and pre-literacy activities engaged at home. This view was based on two theories of child development: Piagetian and Vygotskian theories (Mason & Sinha, 1992; Carroll, 2013). As Piagetian theory declared, children had an active role in learning writing and reading. Moreover, children learned those skills through interactions with

people. Therefore, the importance of home-based activities which provide an opportunity to experience and practice basic pre-literacy skills cannot be ignored. Moreover, unlike reading readiness view, the emergent literacy approach suggested that reading, writing, listening and speaking develop in an interrelated manner rather than sequentially and hierarchically.

The present study was based on the emergent literacy approach. As suggested in this approach, we assume that literacy development starts at very early ages. Preschool years are important for the development of literacy skills. Moreover, the approach pointed out the importance of home literacy environment and the interactions during literacy activities on the children's literacy development. Based on the emergent literacy approach, the current study aimed to examine the positive effect of a rich home literacy environment at age three on reading comprehension at age seven.

2.2 The effect of home literacy environment on language skills

Language skills begin to develop from very early years, even from birth through a literacy stimulating home literacy environment. Home-based literacy activities, mostly with the mothers and other members of the family (e.g. father, older sibling, grandmother and grandfather), contribute to the development of language skills, which are important for learning to read and a successful comprehension. Most studies supported the positive effect of home literacy environment on children's vocabulary knowledge (Kim, Im & Kwon, 2015; van Steensel, 2006; Schmitt, Simpson & Friend, 2011; Kim, 2009; Farver, Xu, Lonigan & Eppe, 2013) and literacy skills (Burgess et al., 2002; Evans & Shaw, 2008; Kim, 2009). Therefore, providing a stimulating and enriched home literacy environment (e.g. parent-child shared book reading, providing books at home, teaching to the alphabet and the sound of the letters, playing educational games, going to library with the child, singing songs etc.) is important to stimulate the development of children's

expressive and receptive vocabulary (Hart & Risley, 1995) and other language skills (Scarborough & Dobrich, 1994; Bus, van IJzendoorn & Pellegrini, 1995; Schmitt et al., 2011).

Most studies showed the contribution of home literacy environment on vocabulary knowledge of the children (Hoff, Laursen & Tardif, 2002; Lawrence and Shipley, 1996; Payne et al., 1994). A study found that 31% variance in receptive vocabulary was explained by a comprehensive measure of home literacy environment (Umek, Podlesek & Fekonja, 2005). On the other hand, Frijters, Barron & Brunello (2000) found that home literacy environment including reports of parental literacy activities at home and child storybook title recognition explained 21% of variance in vocabulary. Children were exposed to a variety of words during home literacy activities, which resulted in a successful development of vocabulary skills in early childhood (Evans & Show, 2008). On the other hand, the study conducted by Weigel, Martin & Bennett (2006a) showed that parent-child literacy activities at home were not associated with expressive and receptive vocabulary knowledge of the child. The researchers of the study explained the reason of the non-significant association as a narrow conceptualization of home literacy environment.

Some evidence on the contribution of home literacy environment on vocabulary development came from samples which were bilingual. Li and Tan (2016) conducted a study with Singaporean Chinese–English bilingual children. The results showed that both inputs in Chinese language and home literacy activities were associated with the development of vocabulary in Chinese language. Moreover, for bilingual immigrant Moroccan–Dutch and Turkish–Dutch preschoolers, parental communication with children in their first language and home literacy activities in their first language had a direct association with children's receptive vocabulary in their first language (Scheele, Leseman & Mayo, 2010).

The availability of books at home is one of the indicators of home literacy environment. It is likely that the availability of books at home increases the likelihood of parent-child book reading. The more books there are in the home, the more the parents and their children may read them together (Bracken & Fischel, 2008). Studies showed that the amount of books at home was related to children's vocabulary knowledge. Hood, Conlon and Andrews (2008) reported that the number of books at home and parental reading before formal education were beneficial for receptive vocabulary in Grade 1. The results of another study conducted with a large kindergarten and first-grade sample indicated that the number of books at home was associated with expressive vocabulary of children whose mothers had above-average reading ability (Johnson, Martin, Brooks-Gunn & Petrill, 2008).

Shared book reading uniquely contributed to the development of vocabulary knowledge (Sénéchal et al., 1996). A 5-year-longitudinal study conducted with Canadian children showed that storybook exposure was significantly associated with children's receptive vocabulary (Sénéchal & LeFevre, 2002). Yeo et al. (2014) also supported that shared-book reading positively influenced the development of vocabulary. A longitudinal study reported that shared book reading had a direct effect on the development of receptive vocabulary among the children who were 18 months (Deckner, Adamson, & Bakeman, 2006). Shared book reading provided children an opportunity to be exposed novel concepts and vocabularies which were rarely encountered in everyday conversation (DeTemple & Snow, 2003; Montag, Jones, & Smith, 2015). Moreover, an intervention providing families with information about how to improve home literacy environment of their children at kindergarten not only resulted in enriching children's home literacy environment, but also increased children's vocabulary knowledge (Niklas & Schneider, 2015).

Home literacy environment (HLE) is also associated with the development of other language skills such as phonological awareness and listening comprehension, in addition to vocabulary development (Sénéchal et al., 1998; Bus et al., 1995). Burgess (2002) found that HLE at preschool years was uniquely related to children's phonological awareness one year later. Another study found that home literacy environment (e.g. number of books at home) contributed to concurrent phonological awareness of the children (Johnson et al., 2008). Similar association between home literacy environment and phonological awareness have been found in different samples. For example, a rich home literacy environment resulted in strong phonological awareness skill among 192 preschoolers in South Korea (Kim, 2009). Kalia and Reese (2009) found that home literacy environment via questionnaires and a children's book title checklist predicted phonological awareness of the children who become literate in English in India. Sénéchal et al. (1998) found that storybook reading was associated with the development of listening comprehension. Another study conducted by Sénéchal and LeFevre (2002) also showed that children's exposure to books was related to listening comprehension skills, but parental teaching of reading and writing was not associated.

2.3 The effects of home literacy environment on word reading and reading comprehension

Most studies showed that home literacy environment had a positive effect on word reading and eventually reading comprehension. Sparks and Reese (2013) reported that the parents' reports of shared book reading were related to children's decoding skills. Baker (2013) conducted a study on the relation between father-child shared book reading and children's reading skills, including word recognition. The results showed that African American fathers who frequently engaged in shared book reading with their children at 24 months positively contributed to their children's early reading skills in preschool years. The parental teaching of print through literacy activities was

associated with alphabet knowledge, print concepts and decoding (Sénéchal et al., 1998). Korat et al. (2013) found that home literacy environment, including the number of books at home, the frequency of parental reading books to the child, and the availability of educational games at home significantly contributed to the literacy level of Arabic-speaking children in Israel. Moreover, Hood et al. (2008) and Evans, Shaw & Bell (2000) found that parental teaching activities at home such as reading had a positive effect on the development of children's reading skills.

A recent study conducted in Singapore with preschool children showed that family literacy activities such as parental engagement of child in reading, parental modeling of reading, going to the library and bookstore, contributed 10.5% of the unique variance in reading competence including reading recognition and reading comprehension after controlling for child's age and parental education (Yeo et al., 2014). In a study by Baker (2013), some activities associated with literacy such as telling stories and singing songs had a significant positive effect on children's reading development. A Finnish study indicated that boys whose parents reported more teaching of reading to their sons had better word reading skills than their peers whose parents reported less teaching of reading (Silinkas et al., 2012). A study that longitudinally examined several reading-related activities at home found that maternal teaching of reading was the best predictor of the development of word reading skills (Silinkas et al., 2010).

Previous studies showed that the parental teaching of pre-literacy skills at home significantly contributed to children's reading and reading comprehension skills. However, the association of parental teaching of reading with children's reading abilities might be bidirectional. Children's reading abilities could also influence the frequency of parental teaching of literacy. Therefore, the underlying mechanisms or directions of the association could be questioned. Silinkas et al. (2013) found that children's reading skills directly and negatively predicted the

frequency of maternal teaching of reading. Mothers who had children with low reading skills reported a higher frequency of helping in reading and consequently, maternal teaching behaviors in reading contributed to the development of these children's reading skills. However, the same study showed that maternal teaching behaviors did not lead to additional improvement for children with good reading skills at the beginning of the study. Maternal teaching for the children who already had good reading skills had only a marginal contribution. Children who had low reading skills benefitted more from maternal teaching practices of reading compared to the children with good reading skills. Another study of Silinkas et al. (2010) found a reverse association. They found that good reading skills that children had at the beginning of kindergarten increased the maternal teaching of reading that children received in subsequent years.

Han and Neuharth-Pritchett (2014) reported that meaning-related interactions during shared book reading contributed to the development of reading comprehension skills of the children. A meaning-related interaction occurs when parents help their children understand what they have just read. They make elaborations about events, characters and objects in the books, paraphrase sentences, illustrate written information with examples from their children's daily life and children's own experiences, and ask questions about the text. As Han and Neuharth-Pritchett (2014) proposed, meaning-related interaction and parental elaborations in shared book reading strengthened the child's understanding of the text or stories. Children learned how to connect pieces of information in a book and to derive meaning from the text during shared-book reading with their parents. Sparks and Reese (2013) conducted a longitudinal study about maternal elaborations and children's comprehension of books with a small sample. The results showed that maternal elaboration during unfamiliar shared book reading uniquely predicted the story comprehension of children with a mean age of 4 years 10 months. Therefore, shared book reading

is important for teaching children some strategies for making connections among the events or the objects in books and for understanding the stories or the written texts.

A print-related interaction refers to asking questions and talking about printed letters, their sounds, and printed words (Han & Neuharth-Pritchett, 2014). It mainly focuses on formal instruction of pre-literacy skills. Children have the opportunity to observe how their parents read the words and sound out the letters during shared book reading. Justice, Weber, Ezell and Bakeman (2002) indicated that print-related interactions in shared reading were significantly associated with children's letter knowledge and awareness of printed words. As a result, the meaning-related and print-related interactions in shared book reading help children learn some basic skills necessary for recognizing and understanding the meaning of written texts. Therefore, shared book reading contributes to reading and then, reading comprehension. Begeny, Krouse, Ross and Mitchell (2009) indicated a strong correlation between reading fluency and comprehension.

Some intervention studies also supported the significant effect of shared book reading on reading skills and reading comprehension. Intervention studies were designed to increase the effectiveness and the quality of parent-child interactions during shared book reading. Jordan, Snow and Porche (2000) conducted an intervention study to teach parents how to engage in high quality interaction during book reading. They found that children with families in the intervention group who learned how to strengthen their children's vocabulary, how to extend narrative understanding, how to develop letter recognition and sound awareness, and how to produce narrative retelling showed more gains in story comprehension and vocabulary subtests than children in control group. Moreover, Roberts (2013) conducted an experimental study with a small sample in which parents were taught some strategies to use during shared book reading. The results revealed that parents in the intervention group showed a significant change in interactions with their children during

book reading. Consequently, this positive change in parent-child interactions during shared book reading contributed to children's reading comprehension skills. Combining 16 intervention studies with a total of 1,340 families, Sénéchal and Young (2008) showed that active parental involvement during shared book reading was positively associated with the learning of letter names, letter sounds, early decoding skills, word recognition and reading comprehension with a large effect size.

Some studies examined the association of the number of books at home with reading achievement among older children. Park (2008) reported that the number of books at home was significantly associated with the reading performance of fourth-grade students from 25 different countries, even after controlling for parental education and characteristics such as gender, family structure and language minority status. Another international study with fifteen-year-olds also showed that there was a positive correlation between the number of books at home and the reading achievement of children (Chiu & McBride-Chang, 2006). Moreover, Chiu, McBride-Chang and Lin (2012) conducted a study about ecological (e.g. number of books at home), psychological and cognitive predictors of reading difficulties with a very large multinational sample. According to the results of this study, children who had more books at home were less likely to have low reading achievement, which was measured with a test including 50% reading recognition and 50% reading comprehension questions. Children's reading fluency was predicted by the number of books at home, even after controlling for parental reading fluency (Bergen, Zuijen, Bishop & Jong, 2016). Aikens and Barbarin (2008) reported that the number of books at home was associated with word reading and reading comprehension skill for a nationally representative sample of kindergarten children.

Home literacy environment also indirectly influences word reading and reading comprehension through vocabulary and other language skills such as listening comprehension, phonological awareness and grammatical skills. Previous studies showed that the development of decoding and listening comprehension skills were necessary to have a good reading comprehension skill (Gough and Tunmer, 1986; Hoover and Gough, 1990). Moreover, receptive vocabulary in preschool years significantly predicted later reading comprehension (Lonigan, Schatschneider & Westberg, 2008; Storch & Whitehurst, 2002). Weak oral language skills and difficulties in vocabulary development resulted in poor reading comprehension skills (Clarke, Snowling, Truelove & Hulme, 2010; Elwér, Keenan, Olson, Byrne & Samuelsson, 2013).

As suggested by the above review, home literacy environment (e.g. the number of books at home, parental teaching of pre-literacy skills, and shared book reading) significantly influences the development of language skills. In turn, better language skills lead to successful reading comprehension (Lonigan, Burgess & Anthony, 2000; Storch & Whitehurst, 2002). Sénéchal and LeFevre (2002) found that early language skills directly predicted word reading at the end of grade 1. Word reading at the end of grade 1, in turn, predicted reading comprehension at grade 3. The availability of books at home positively influenced vocabulary development, and then increasing vocabulary knowledge resulted in high reading comprehension. In other words, vocabulary mediated the association of the availability of books at home with reading comprehension. Sénéchal and LeFevre (2002) also reported that book reading at home benefited preschool children's vocabulary knowledge and indirectly influenced reading comprehension at grade 3 through vocabulary knowledge. De Jong and Leseman (2001) conducted a longitudinal study with a Dutch sample on the association of home educational environment with reading comprehension. They reported that vocabulary knowledge of Dutch children mediated the relation between home

literacy environment and reading comprehension in the first grade. Moreover, home educational environment continued to have an effect on third-grade reading comprehension even when first-grade word reading and reading comprehension were controlled.

2.4 The effect of working memory on reading comprehension

Working memory is necessary for temporary storage and processing of the information in written texts for reading comprehension (Swanson, 1999). Most studies showed that early working memory skill uniquely predicted the development of reading comprehension skill (Oakhill, Cain & Bryant, 2003; Cain, Oakhill & Bryant, 2004a; Goff, Pratt & Ong, 2005; Swanson, 2011; Seigneuric & Ehrlich, 2005). Arrington et al. (2014) found that domain-general working memory directly influenced both single word reading and reading comprehension. Another study showed that the correlation between working memory and reading comprehension was moderately significant in second and fourth grades (Ribeiro, Cadime, Freitas & Viana, 2016). Poor verbal working memory resulted in problems in word reading and reading comprehension (Jacobson et al., 2011; Swanson & Jerman, 2007).

Some studies examined the effect of different modalities (e.g. verbal, numerical and visual-spatial) of working memory on reading comprehension. For example, in a study conducted by Seigneuric et al. (2000), five working memory tasks (two verbal, two numerical and one spatial) were given to the fourth grade students. The study showed that both verbal and numerical working memory measures were significantly correlated with reading comprehension skill. Another study also found that reading comprehension was correlated with working memory assessed by a digit span task in eight and nine year old children (Cain et al., 2004a). Therefore, we included measures of working memory in the current study.

2.5 The effects of economic status and parental education on home literacy environment

Economic status of the family has a significant effect on children's literacy development (Ransdell, 2012). The economic well-being of families relates to the richness of home literacy environment. Klebanov, Brooks-Gunn and Duncan (1994) posited that economic well-being was an important factor that contributed to the physical environment and learning experiences at home. Much research showed that children from high economic status had better literacy outcomes compared to children from low economic status. Aber, Jones and Cohen (2000) emphasized that socioeconomic risk factors were strongly associated with children's long-term language development. Hart and Risley (2003) showed that children from high-income families were exposed to more spoken words than their peers from low-income families. Economic status also indirectly influences children's literacy abilities (Twitchell, Morford & Hauser, 2015), through home literacy environment (Korat et al., 2013). Steensel (2006) reported that children from high economic status had more stimulating home literacy environment than children form low economic status. More specifically, children from high economic status had more opportunity to engage in literacy activities like shared book reading and possessed more books at home than their peers from low economic status (Twitchell et al., 2015).

Similar to family economic status, parental education is another important indicator of children's literacy development. Davis-Kean (2005) found that parental education indirectly influenced child's reading achievement through parental beliefs and behaviors. More educated mothers might tend to create a rich home literacy environment for their children's literacy development than less educated mothers. For example, Yarosz and Barnett (2001) reported that less educated mothers were less frequently engaged in shared-book reading with their children compared to more educated mothers. Also, less educated mothers most probably provided a less

stimulating environment compared to more educated mothers, which resulted in poor development in their children (Guerrero et al., 2013). Likewise, Smith, Brooks-Gunn and Klebanov (1997) emphasized that the association of parents' education with children's academic achievement was mediated by home environment. The education level of parents could influence the quantity and quality of home literacy activities. In a study conducted with 72 low-income African American mothers, a positive correlation between maternal education and maternal sensitivity during shared-book reading was found (Roberts, Jurgens & Burchinal, 2005). Therefore, parental education is an influential factor in terms of both the quantity and the quality of home literacy environment, which significantly contributes to child's literacy outcomes.

2.6 The conceptual model and hypotheses

Based on the previous studies that were discussed in detail above, a conceptual model was proposed and estimated (see Figure 1.1). The conceptual model was based on two main causal associations that were posited in this study. The heavy lines in Figure 1.1 indicated processes that would be based on those causal associations. First one was the positive association of family characteristics (e.g. mother's education and economic status) with home literacy environment at age three. Second one was the positive association of parenting inputs, conceptualized as the literacy environment provided to children at home, with the verbal development and eventually with the reading development of preschool children. The conceptual model included four indicators of language skills (e.g. listening comprehension, phonological awareness, expressive and grammatical skills and receptive vocabulary) at age five. However, at age four, only receptive vocabulary knowledge as one of indicators of language skills, was added to the conceptual model, because the data of other indicators of language skills at age four (e.g. listening comprehension,

phonological awareness etc.) were not available. The light lines in Figure 1.1 referred to the associations of control variables with other variables.

The primary aim of the current study was to investigate a mediated path between home literacy environment at age three and reading comprehension at age seven. Based on this hypothesized mediation, this study examined the roles of verbal abilities, composed of receptive vocabulary at age four and five, other foundational indicators of language skills at age five (e.g. listening comprehension, phonological awareness and expressive/grammatical skills) and word reading at age seven, in the association of home literacy environment with reading comprehension.

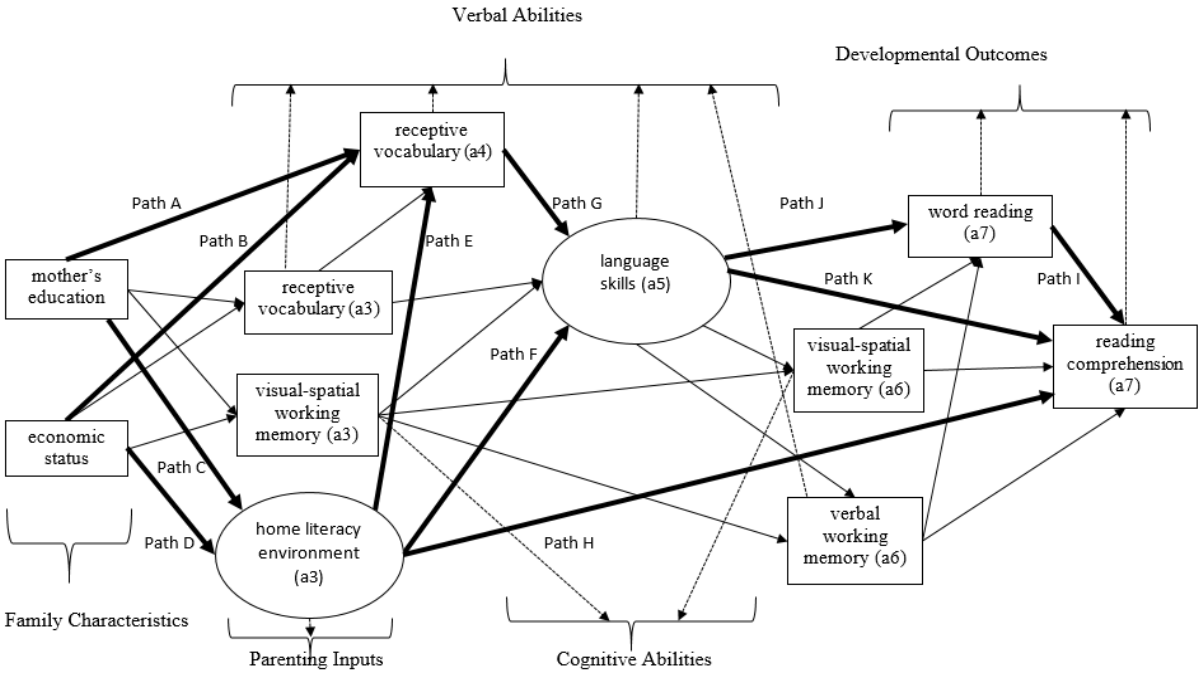

Figure 1.1. Conceptual model of the study.

Note: The heavy lines show main hypotheses in the study, while the thin lines represent the associations with control variables.

The hypotheses of this study were the following:

1) Previous studies showed that both maternal education and economic status of the family were associated with the children's vocabulary growth (Hoff & Naigles, 2002; Hart & Risley, 2003; Rowe, 2008; Gonzalez et al.; 2017). Based on this literature, it was expected that maternal education and economic status of the family measured at age three would be directly associated with the children's receptive vocabulary at age four (Path A and Path B). Moreover, some studies found that children who came from a high economic background (Foster, Lambert, Abbott-Shim, McCarty & Franze, 2005; van Steensel, 2006) and who had mothers with high education level (Davis-Kean & Sexton, 2009), in general, had supportive home literacy environment. However, another study conducted with a British sample found small differences across socioeconomic groups in terms of engaging in literacy related activities (Hartas, 2011). In this study, it was expected that maternal education and family economic status would have direct association with home literacy environment of the children (Path C and Path D).
2) Recent studies showed that enriched home literacy environment had a positive effect on the growth of vocabulary knowledge, which is an indicator of language skills (Sénéchal & LeFevre, 2014; Kim et al., 2015; Willard, Agache, Jäkel, Glück & Leyendecker, 2015; Yeung & King, 2016). Moreover, other studies showed that home literacy environment was also related to other foundational language skills of children (e.g. phonological awareness; Foy & Mann, 2003; Kalia & Reese, 2009; Manolitsis, Georgiou & Tziraki, 2013). In line with this literature, it was hypothesized that home literacy environment at age three would have direct associations with the children's

receptive vocabulary at age four, which is one indicator of language skills, and language skills construct at age five, which included four indicators of language skills assessed at age five (e.g. listening comprehension, phonological awareness, expressive/grammatical skills and receptive vocabulary) (Path E and Path F).

3) Based on domain-general account emphasizing executive attention as a common component of all working memory assessments from different modalities (e.g. visual-spatial and verbal) (Engle, 2002; Shipstead & Yonehiro, 2016), it was expected that the path from visual-spatial working memory at age three to verbal working memory at age six would be significant (Białecka-Pikul, Kosno & Byczewska-Konieczny, 2016).
4) Previous studies showed that working memory capacity measured with verbally mediated tasks (e.g. word-, sentence- and number-based tasks) was related to children's reading comprehension even after controlling decoding, word recognition skill, and vocabulary knowledge (Swanson & Berninger, 1995; Cain et al., 2004a). For this reason, the children's working memory skills (e.g. visual-spatial working memory at age three, verbal and visual-spatial working memory at age six) and receptive vocabulary at age three were used as covariates. It was expected that home literacy environment would have significant associations with the children's word reading and comprehension skills even after controlling for those covariates.
5) Previous studies showed that home literacy activities contributed to early literacy skills and vocabulary knowledge of children (Hart & Risley, 1995; Baroody & Diamond, 2012; Farver et al. 2013). To become successful readers and comprehenders in school years, language skills, such as receptive vocabulary, and decoding skills, such as phonological awareness, had a key role (Poe, Burchinal & Roberts, 2004). Therefore,

a mediation model was proposed in this study. The main hypothesis was that home literacy environment at age three would have an indirect association with reading comprehension skill at age seven through receptive vocabulary at age four, language skills construct with four indicators at age five and word reading at age seven. In other words, it was expected that the relation between home literacy and reading comprehension would be fully mediated by receptive vocabulary at age four, language skills at age five and word reading at age seven. Moreover, a direct path from home literacy environment to reading comprehension was added to the model in order to understand whether the association of home literacy environment with reading comprehension was fully or partially mediated (Path H).

Chapter 3: Method

3.1 The ECDET study

The ECDET is a nationally representative longitudinal study of early childhood development with an ecological perspective. Three-year-old children were followed annually for 5 years to understand their social, cognitive and language development. The study was longitudinally designed to examine how social contexts influenced children's developmental trajectories. Based on the ecological systems theory, it examined the relationships between parents and their children between mothers and fathers, between neighborhood and children. It included questionnaires on parenting, marital satisfaction, social support to mothers, and neighborhood (Baydar, Küntay, Gökşen, Yağmurlu & Cemalcılar, 2008). Moreover, children's cognitive, social, language and emotional development, and academic achievement were assessed.

The data were collected by trained interviewers who were research assistants and professional interviewers. All interviewers were trained by the academic team of the study each year. Moreover, interviewers were knowledgeable about the local culture and the dialects of the regions where they collected data. The protocol of the study included questionnaires for the mothers, observational measures and assessments for the children. Interviewers visited the families in their homes at a certain time, which was arranged before the visits and administered the protocol of the study face to face for approximately 2 hours. The sequence of the questionnaires for mothers and the assessments for the children was organized in order to avoid respondent fatigue. In the current study, the data from the mothers, observers and children from all five waves were used.

3.2 Sample

The ECDET sample included 1,052 mothers and their 3-year-old children from 24 communities with an average of 45 families in each community in 19 provinces of Turkey. The sample was a stratified cluster sample. The ECDET data were nationally representative of mothers and their 36-47 month old children at baseline. The sample consisted of 917 mothers at the second follow-up, 871 mothers at the third follow-up, 820 mothers at the fourth follow-up, and 793 mothers at the fifth follow-up. Almost 25% of 1,052 participants attrited from the study during 5-year period, which is a moderate rate of attrition for a nationally representative sample.

3.3 Measures of the study

Table 3.1 shows the assessments administered to the children at each year, the questionnaires given to the mothers, and observational measures. In the current study, observational data collected in the first year of the ECDET study were used to measure three-year-old children's home literacy environment. In the ECDET study, the Corsi block tapping task was

given both at age 3 and at age six. In the current study, we used the assessments of Corsi block tapping task from both time points. In the ECDET study, the receptive vocabulary assessment was available in each year, but we used the data of the assessment administered at age three, at age four and at age five (see Table 3.1). The sentence repetition assessment was given at age four and at age five in the ECDET study. However, we only used the assessment administered at age five. Syllabification measure was given at age five and at age six. In the current study, we used syllabification assessment administered at age five. Listening comprehension assessment administered only at age five in the ECDET study was used. Forward digit task given only at age six, word reading and reading comprehension assessments given only at age seven in ECDET study were used in the current study.

Table 3.1

The Measures Given to Mother-Child Dyads for Each Age of the Study

Age 3	Age 4	Age 5	Age 6	Age 7
Corsi Block Tapping Task-TR (CORSİ)	Turkish Receptive Language Test(TRLT)	Sentence Repetition	Forward Digit Span Task	Word reading in one minute task
Turkish Receptive Language Test(TRLT)		Syllabification	Corsi Block Tapping Task-TR (CORSİ)	Reading Comprehension
Home Observation for Measurement of the Environment (HOME-TR)		Listening Comprehension		
-Availability of books -Shared-book reading -Parental teaching of pre-literacy skills		Turkish Receptive Language Test(TRLT)		
Demographic Information -Economic status -Maternal education				

3.3.1 Child assessments

3.3.1.1 Corsi block tapping task- TR

The original Corsi Block Tapping Task (Corsi, 1972) measured visual short term/working memory capacity for children. The original Corsi apparatus consisted of nine, wooden blocks fixed to a 9 in. ×11 in. (23 cm × 28 cm) wooden board (Berch, Krikorian, & Huha, 1998). The blocks were 1.25 in. (3.2 cm) cubes. Children were asked to reproduce the same tapped sequences immediately after the interviewer pointed to certain blocks with a pencil or a finger. The Turkish version of Corsi Block Tapping Task adapted by Baydar et al. (2008) was used at age three and at age six of children. For 3-year-old children, Corsi-TR apparatus consisted of five beige blocks fixed to a 33.5 cm × 25 cm green board. The blocks were 4 cm × 4 cm squares. Corsi-TR board included seven blocks for six-year-old children. In the Corsi-TR apparatus, a toy monkey was used to show the places where children were asked to repeat the same tapped sequences instead of pointing with a pencil or a finger as in the original version.

It consisted of 5 levels with 3 sequences in each level for 3-year-old children and 7 levels with 3 sequences in each level for 6-year-old children. At each level, each sequence included an equal number of digits with that certain level. For example, when children were on the third level, three digits were pointed to place the monkey. The performance of the child for each sequence was scored 0 for incorrect location and order, 1 for correct location, but incorrect order and 2 for both correct location and order. If children did not get 2 points in a level, the assessment was finalized. In the current study, the assessments given at age 3 and 6 were used to control the child's cognitive skills. Age standardized scores were calculated by regressing the total raw scores getting from the

task on cubic and quadratic indicators of age in months and obtaining the residualized scores. In the analysis, age standardized scores were used.

3.3.1.2 Forward digit span task

The forward digit span task was used to measure children's working memory. It was used at age six in the ECDET study. The task required the children to repeat the same sequence of numbers after the interviewer read the sequence. The test composed of five levels with three items in each level and began with three digits at the first level. The number of digits increased by one at each subsequent level if the child correctly repeated at least one the sequence of digits at the previous level. If the child received 0 points at a given level, the task was aborted. The test was scored 0 for incorrect digits and incorrect orders, 1 for correct digits, but incorrect order, and 2 for correct digits and correct orders. Age standardized scores were calculated by regressing the total raw scores getting from the task on cubic and quadratic indicators of age in months and obtaining the residualized scores. The age standardized scores were used.

3.3.1.3 Child's language skills

In the current study, four indicators of language skills (receptive vocabulary, phonological awareness, expressive/grammatical skills and listening comprehension) were assessed. Children's receptive vocabulary knowledge, which is one indicator of language skills, were assessed at age three, four and five. However, other foundational indicators of language skills were only assessed at age five in the current study.

3.3.1.3.1 Turkish receptive language test (TRLT)

The Turkish Receptive Language Test (TRLT) was developed to measure receptive vocabulary of children between the ages 2-12 (Berument & Guven, 2010). The test required the children to choose among four pictures, that best represented a word read by the assessor. It was administered each year of the ECDET study. In the current study, the TRLT assessed at ages 3, 4 and 5 were used. For 3-year old children, it started with 2 training items and included the baseline level with 9 items, age 3 level with 18 items, age 4 level with 15 items, age 5 level with 24 items, age 6 level with 15 items. For 4-year-old children, it also included age 7 level with 18 items. For 5-year-old children, it composed of 2 training items, age 4, age 5, age 6, age 7 levels and age 8 level with 17 items. TRLT is an adaptive test. The upper and lower limits were determined according to the children's performance. It was aborted if the child incorrectly answered 2/3rd of the items in any given level. A three-parameter logistic Item Response Theory (IRT) was used to calculate latent vocabulary ability scores for the children. The estimated latent ability scores were age standardized by regressing them on linear and quadratic indicators of age in months and obtaining the residualized scores (Baydar et al., 2014).

3.3.1.3.2 Sentence repetition at age 5

The sentence repetition test was developed to measure expressive language abilities of children (Taylan, Aksu-Koç & Bekman, 2002). The original version of the test included 20 sentences. However, it was reorganized by Baydar, Küntay, Gökşen, Yağmurlu and Cemalcılar (2009) to use in the ECDET study. Two practice sentences were added. The assessment included 18 sentences. Children were asked to repeat given sentences after read them aloud. The difficulty of the questions increased progressively. The numbers of the words in a sentence increased from 2 to 6. The test was ended if the child could not correctly repeat three consecutive sentences.

Correctly repeated sentences were scored 1, incorrect repetition or failing to repeat were scored 0. The item-total correlation of the sentence repetition test varied between .42 and .84. Age standardized scores were calculated by regressing the total raw scores getting from the task on cubic and quadratic indicators of age in months and obtaining the residualized scores. The age standardized scores were used in the analyses.

3.3.1.3.3 Syllabification at age 5

Syllabification task was developed by Durgunoğlu and Öney (1999) to determine children's phonological awareness. The original test was composed of 8 nonsense words with one, two and three syllables. Adapted version of the syllabification task (Baydar, Küntay, Gökşen, Yağmurlu & Cemalcılar, 2010) was used at age five. The task included 12 nonsense words (2 words with one syllable, 5 words with two syllables and 5 words with three syllables) with three training words. A word was read by the assessor, and the task required the children to say each syllable aloud. Children were also given three buttons to use during syllabification. Children could push one button forward while saying each syllable. For example, the word was "butabik". While the child was saying each syllable of the word like "bu", "ta" and "bik", she/he could push the first button forward for the first syllable, the second button for the second syllable and the third button for the third syllable respectively. When the child was unsuccessful to segment consecutive three nonsense words into syllables, the task was finalized. If the children correctly syllabified the given word, it was scored 1. Otherwise, they got 0. Age standardized scores were calculated by regressing the total raw scores getting from the task on cubic and quadratic indicators of age in months and obtaining the residualized scores. Like other child measures, the age standardized scores were used.

3.3.1.3.4 Listening comprehension at age 5

A task on story comprehension was developed by Schulz, Bonawitz, & Griffiths (2007). The task included two story books and some cause-effect questions about those books. The adapted version (Baydar et al., 2010) of the task was used for five-year-old children. There were two story books with pictures. The book was read aloud, and the child was asked to answer three questions about the book. In each question, the main event occurred in the story was repeatedly given to the children. Same cause and effect of the event were also repeatedly given in each question. In addition to the same cause and effect statements given in each question, another cause was added in the subsequent question. The questions were presented in this form: (AB—E), (CA—E) and (AD—E). When assumed the parenthesis refers to each question, A is the cause of the event and E is the effect of the event. B, C and D refer to different causes of the event. The form of the questions was identical in the two stories. However, the domains of the causes were different in the two stories. In the first story, the causes of the event were from the same domain (e.g. Why does the cat have itchy spots? Is it because of running through the garden or because of running through the cattails?"). In the second story, the domains of the causes were different (e.g. "Why does Bunny have a tummy ache? Is it because of feeling scared or eating the sandwich?").

The any choices for the answers of the questions were not given to the children. However, the interviewers had four choices for the answers of the questions. The first one was the correct answer of the question. The second choice was the incorrect answer, but it was also given in the question. The third choice was that the child did not answer the question. In the fourth one, the interviewer wrote down what the child gave as an answer, but the answer was different from the causes given in the previous choices. The children got 5 points for the correct answer of the first question, 4 points for the correct answer of the second question and 3 points for the correct answer

of the third question. The scoring of the first question was the highest because the first question directly asked the cause of the event (e.g. Why does the cat have itchy spots?). However, other two questions represented two causes, which included the correct cause and another cause from the same domain (e.g. Is it because of running through the garden or because of running through the cattails?). If the children answered the questions by saying other cause of the event, instead of the correct cause, they got 2 points. If the children answered the questions by saying a different cause not given in the question, they got 1 point. If they did not give any answer to the questions, they got 0 points. Age standardized scores were calculated by regressing the sum of the raw scores getting from the two story book on cubic and quadratic indicators of age in months and obtaining the residualized scores. Age standardized scores were used in the analyses.

3.3.1.4 Home literacy environment

The original Home Observation for Measurement of the Environment (HOME; Bradley & Caldwell, 1984) included observational items and unstructured interviews about the quality of the home environment. It was used to measure environmental factors affecting the child's development with a systematic observation during home visits (Bradley, 1981; Bradley, & Caldwell, 1979). The original HOME consisted of 55 items for 3-year-old children. However, the ECDET study used the Turkish version of HOME (HOME-TR; Baydar & Bekar, 2007). The Home-TR included 52 items. Interview items were structured as close-ended items in order to facilitate administration and coding.

In the current study, home literacy environment of 3-year-old children was measured using items pertaining to parental teaching of pre-literacy skills, shared book reading and availability of books at home.

3.3.1.4.1 Parental teaching of pre-literacy skills

The five items of the HOME-TR were used to measure how often the mothers helped their children learn pre-literacy skills at age 3. The mothers were asked to answer 5 items (e.g. “Do you help your child learn letters in the alphabet, for example, do you teach your child to write his/her name?”, “Do you help your child learn songs, poems or nursery rhymes?”, and “Do you teach your child some words like under, below, beside, behind, bigger and smaller in order to describe a place or an object?”). The responses were three-point scales (*1* = Yes, Always, *2* = Yes, Sometimes, *3* = No, I don’t engage in). The responses of the mothers were coded in order to have high scores indicating frequent teaching of pre-literacy skills ranging from 1 to 3. The reliability of the items was .81.

3.3.1.4.2 Shared-book reading

This was a single item measure (“How frequently do you or the other members of the family read a book to your child?”). The mothers were asked to answer this question on a six-point scale (*1* = Absolutely, every day, *2* = A couple of times in a week, *3* = One time in a week, *4* = Rarely, *5* = Never, *6* = Illiterate). The responses of the mothers were coded in order to have high scores indicating frequent shared book reading ranging from 0 to 6.

3.3.1.4.3 Availability of books at home

Two observer-report yes/no items of the HOME-TR were used to indicate the availability of books. “The child has at least three children’s books at home.” and “There are at least 10 books for the family members other than the child”). The scores of availability of books at home were sum of the scores for those two items, (ranging 0-2).

3.3.1.5 Child's developmental outcomes

3.3.1.5.1 Word reading at age seven

A reading test was developed for this study (Baydar, Küntay, & Akcinar, 2012). There are also similar measures for word reading skills (e.g. Word Identification and Word Attack subtests of Woodcock-Reading Mastery Test - WRMT-III, Woodcock, 2011; Reading subtest of the Wide Range Achievement Test - WRAT-4, Wilkinson & Robertson, 2006) (as cited in Chaves-Sousa et al., 2017). The task measured how many words the child was able to read in one minute. Children were given a word list, including 98 words and asked to read as possible as in one minute. The assessor was reported both how many words the children read and how many of them the children read incorrectly. Children received 1 point for each correctly read word. The raw scores of the children were calculated by subtracting the numbers of words the children read from the numbers of words the children read incorrectly. They read 40 words on average and correctly pronounced 38 words among those forty. Age-standardized scores of the children were calculated by regressing the raw scores getting from the task on cubic and quadratic indicators of age in months and obtaining the residualized scores.

3.3.1.5.2 Reading comprehension at age seven

This test included two sections. The first section was only based on reading comprehension skill, while the second section was related to both reading comprehension and writing skills. Children required to read the story books and answered four questions about each story in the first section. However, in the second section, children also wrote their answers. Answers were written, therefore it measured writing ability as well as reading comprehension. Moreover, Turkish is a

phonetic language, therefore spelling tends not to be a problem for the children. Babayiğit and Stainthorp (2007) reported that Turkish orthography is transparent for both reading and spelling.

A reading comprehension task developed by Baydar, Küntay and İmer (2012) was given to children at age seven. The task required the children to read two books and to answer four questions about each book. The books were given to children and asked to read aloud. There was no time restriction for reading. When the children finished the book, four questions about the story were asked and the interviewer wrote the answers given by the children.

The children's answers to the questions about the first story book were coded over 4 points. If the children gave the correct and thorough answers, they got full points. When they gave the correct but not thorough answers, they got 1, 2, or 3 according to the level of comprehension evident in their answers. The children's answers to the questions about the second story were coded as follows: 0-3 for the first question, 0-4 for the second question, 0-6 for the third question and 0-10 for the fourth question. The criteria for the coding of the children's answers depended on the accuracy of their answers and whether their answers included sufficient detail. The children's scores for each question in the second story book were divided by the maximum points for that question to arrive at total scores that equally weighted the four questions.

The reading comprehension test also included a section on filling the blanks in a story. The children were given a story which included four missing words and asked to complete those missing words by choosing the most appropriate word among a word list by writing down those words in the blank spaces. The task was scored 2 full points for both correct word and writing, 1 point for correct word, but incorrect writing, and 0 points for incorrect answers. Like the previous section, there was no time restriction. A factor score of three indicators, including scores of the first story, the second story and the fill-in-the-blanks section was calculated. The age standardized

scores were calculated by regressing the factor scores on cubic and quadratic indicators of age in months and obtaining the residualized scores.

3.3.2 Economic status of family and mother's education

Economic status of the families was calculated as a factor score of the four indicators: "The material possessions of the family, the maternal report of the monthly per-person expenditures of the family, the value of the residence of the family reported by the mother in terms of actual or estimated monthly rent, and the quality of the physical environment scale score from the Turkish adaptation of the Home Observation for Measurement of the Environment (HOME; Bradley & Caldwell, 1979)" (Baydar et al., 2014). The levels of mothers' education were learned with a question ("What is your degree which you graduate latest?") from the demographic questionnaire given at baseline (Baydar et al., 2007).

The indicators of the material possessions of the family were based on the mothers' report on the ownership of 12 material possessions including both durable goods (e.g. refrigerator, television) and nonessential items such as a credit card, a computer or a car. Per-person expenditures of the family were calculated by dividing the maternal report of total expenditures of the family by the numbers of members of the households. The mothers were asked the actual monthly rent or, if they owned their home, they reported the estimated monthly rent that they would be paid to rent their home. The quality of physical environment was rated by the interviewers. They rated the quality and safety of the residence and its immediate surroundings on seven yes-no questions from the HOME-TR (Baydar et al., 2014).

3.4 Data analysis

Structural Equation Modeling (SEM) was used to estimate a model as described in Figure 1.1. For the current study, structural equation modeling was the most appropriate method to analyze the data because the study included both a few latent variables (e.g. home literacy environment and language skills) and some observed variables (e.g. mother's education, economic status, receptive vocabulary knowledge, word reading and reading comprehension etc.). It aimed to understand the direct and mediated associations among those variables. Therefore, SEM models were estimated with MPLUS 7 software. By default, Mplus used the Full Information Maximum Likelihood (FIML) estimation to handle missing values.

Chapter 4: Results

4.1 Description of the sample

Table 4.1 presents the demographic information for the sample. In the sample, 44.6% of the children were female. Based on the mothers' reports, 54% of the mothers lived in urban areas for most of their lives. Almost 54% of the mothers continued their education until the end of 5 years of primary school, whereas 19% of them completed high school education or higher. Majority of the families (69.5%) had less than three children.

Table 4.1 *Characteristics of the Sample*

Characteristics	Sample N=1052
Female children	44.6%
Male children	55.4%
Age of mothers (in years)	30.0 (5.73)
Mother's level of education (%)	
Not completed primary school	11.3%
Primary school	53.4%
Middle school	8.4%
High school	14.5%
University	4.5%
Mothers mostly lived in (%)	
Urban	54.0%
Rural	46.0%
Number of children (%)	
0-1-2 children	69.5%
3+ children	30.5%

Note: Values in parentheses indicate standard deviation values

4.2 The characteristics of participants who attrited from the ECDET study

Attrition is a common problem in longitudinal studies, and the ECDET study was no exception. The characteristics of the participants lost to each follow-up are reported in Table 4.2. The highest attrition was reported at age four. Table 4.2 also includes the comparisons of attrited and retained mothers based on the mother's age, years of completed education, number of children,

economic status of the families, sex of the children and the urbanity of where the mothers lived the longest. Continuous variables (e.g. mother's age, education, number of children and economic status) were compared with *t*-tests, while the ordinal and nominal variables (e.g. sex of the children and where the mothers lived the longest) were compared with χ^2 tests. The attrited mothers attended school for longer than the retained mothers, t (399.20) = -2.13, p<.05. The attrited mothers had less number of children than the retained mothers, t (1050) = 5.92, p<.001. There was a significant difference between the attrited and the retained mothers on the economic status, t (382.15) = -2.39, p<.05. The attrited mothers had better economic status as compared to the retained mothers. Moreover, the attrited mothers reported that they lived at an urban area for most time of their lives more frequently than the retained mothers, χ^2 (1, 1052) = 11.76, p<.001. In sum, the attrited mothers attended school for longer years, had less number of children, had better economic status' and were more likely to be living in urban areas when compared to the retained mothers.

Table 4.2 *Comparing Attrited and Retained Mother-Child Dyads from the ECDET Study on Mother's Age, Education (year), Number of Children, Economic Status, Sex and Where Mothers Lived at Most Time at Baseline*

		Attrited at age 4	Attrited at age 5	Attrited at age 6	Attrited at age 7	Attending at all ages	*df*	*t*	χ^2
Mother's age in year (baseline)	*M*	28.72	30.51	30.29	31.34	30.24			
	N	121	46	42	24	695	926	1.41	
	SD	5.43	5.94	6.52	4.40	5.74			
Mother's education in year[a] (baseline)	*M*	6.41	6.42	6.79	6.44	5.90			
	N	134	48	53	25	789	399.20	-2.13*	
	SD	4.22	3.74	3.74	3.85	3.51			
Number of children mother had (baseline)	*M*	1.63	1.90	2.13	2.35	2.26			
	N	136	48	53	26	789	1050	5.92***	
	SD	0.83	0.97	1.11	0.98	0.97			
Family's economic status[a] (baseline)	*M*	0.11	0.03	0.32	0.12	-0.05			
	SD	1.14	1.09	1.21	1.00	0.95	382.15	-2.39*	
	N	132	46	52	26	759			
Where mothers lived at most time[b] (baseline)									
Rural		34.6%	37.5%	45.3%	30.8%	49%			
Urban		65.4%	62.5%	54.7%	69.2%	51%	1		11.76***
	N	136	48	53	26	789			
Sex[b]									
Female		41.9%	35.4%	45.3%	50%	45.4%			
Male		58.1%	64.6%	54.7%	50%	54.6%	1		0.80
	N	136	48	53	26	789			

Notes: $^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$. [a] Homogeneity of variance not assumed. [b]Chi-square (χ^2) test was used for the nominal variables (N=1052).

4.3 Descriptive statistics and preliminary analyses

The descriptive statistics related to home literacy environment indicators were reported in Table 4.3.

Table 4.3

Descriptive Statistics of Home Literacy Environment Indicators (N= 1052)

Variables	*M*	*SD*	Min	Max
Parental teaching of pre-literacy skills (1-3)	1.99	0.58	1.00	3.00
Shared book reading (0-4)	0.96	1.26	0.00	4.00
Availability of books at home (0-2)	0.61	0.80	0.00	2.00

Results of the exploratory factor analyses conducted to determine the number of factors the 5 items that were taken from the HOME-TR scale, used to measure the parental teaching of pre-literacy skills, are presented in Table 4.4. The Kaiser-Meyer-Olkin measure of sampling adequacy was .85, above the commonly recommended value of .6. Only one factor (parental teaching of pre-literacy skills) was extracted from the five items. Factor loadings of all items were above .70. All 5 items cumulatively explained 57% of the item variance. Moreover, the reliability of 5 items measuring parental teaching of pre-literacy skills was high (α=0.81).

Table 4.4

Factor loadings for 5 items measuring parental teaching of pre-literacy skills (N=1052)

	Factor loadings
Child is encouraged to learn letters	.76
Child is encouraged to learn song, poem or nursery rhyme	.80
Child is encouraged to learn some terms like under, below, beside, behind, bigger and smaller	.72
Child is encouraged to learn numbers	.77
Child is encouraged to learn some shapes like square, circle or triangle	.75

Bivariate correlations were estimated in order to understand the associations among the variables in the study. While Pearson product-moment correlation coefficients were used for the continuous variables, Spearman rank correlation coefficients were used for the ordinal variables. Table 4.5 shows that all of the variables were positively and significantly correlated each other, and these correlations ranged from .08 to .66. Mother's education was positively correlated with the economic status of the family, r=.55, p<.01. There was a positive correlation among mother's education and home literacy indicators (r=.40, p<.01 for the parental teaching of pre-literacy skills, r=.41, p<.01 for the availability of books and r=.35, p<.01 for shared-book reading).

There were moderate positive associations among home literacy indicators at age three and the child's receptive vocabulary knowledge at age four (r=.36, p<.01 for the parental teaching of pre-literacy skills, r=.44, p<.01 for the availability of books and r=.37, p<.01 for shared-book reading). The results showed that the richer the home literacy environment was, the greater the vocabulary knowledge acquisition of the child was, one year later. Home literacy indicators at age three were also positively correlated with the child's vocabulary knowledge at age five (r=.40,

$p<.01$ for parental teaching of pre-literacy skills, $r=.44$, $p<.01$ for availability of books and $r=.39$, $p<.01$ for shared-book reading). Moreover, the associations of home literacy indicators with both word reading and reading comprehension were statistically significant and ranged from .21 to .30 (Table 4.5). Weak but significant correlations were found between the home literacy indicators at age three with listening comprehension and syllabification skills at age five (Table 4.5). The children's receptive vocabulary measured in preschool years had moderate positive correlations ranging from .36 to .41 with word reading and reading comprehension skill assessed at age seven.

Table 4.5

Bivariate correlations of all predictors and outcome variables

Variables	*M*	*SD*	*N*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Mother's Education	6.05	3.64	1049	-														
2. Economic Status	0.00	1.00	1017	.55**	-													
3. Child's Receptive Vocabulary at age 3	-0.02	0.94	907	.35**	.45**	-												
4. Child's Visual-Spatial Working Memory at age 3	3.00	4.31	1043	.19**	.16**	.39**	-											
5. Parental Teaching of Pre-Literacy Skills at age 3	1.99	0.58	1052	.40**	.44**	.41**	.19**	-										
6. Availability of Books at Home at age 3	0.61	0.80	1052	.41**	.60**	.48**	.21**	.48**	-									
7. Shared Book Reading at age 3	0.96	1.26	1052	.35**	.46**	.41**	.20**	.56**	.57**	-								
8. Child's Receptive Vocabulary at age 4	0.05	0.89	900	.40**	.47**	.54**	.21**	.36**	.44**	.37**	-							
9. Listening Comprehension at age 5	0.00	2.17	845	.19**	.19**	.31**	.21**	.24**	.18**	.17**	.32**	-						
10. Sentence Repetition at age 5	0.00	6.09	844	.31**	.36**	.44**	.26**	.34**	.33**	.30**	.46**	.41**	-					
11. Syllabification at age 5	0.00	4.54	843	.29**	.29**	.36**	.22**	.25**	.28**	.27**	.41**	.27**	.48**	-				
12 .Child's Receptive Vocabulary at age 5	0.01	0.80	848	.40**	.46**	.57**	.27**	.40**	.44**	.39**	.66**	.40**	.54**	.46**	-			
13. Child's Visual-Spatial Working Memory at age 6	0.00	5.70	797	.17**	.21**	.30**	.21**	.18**	.23**	.21**	.32**	.17**	.29**	.28**	.34**	-		
14. Child's Verbal Working Memory at age 6	0.00	5.62	797	.08*	.10**	.21**	.14**	.13**	.11**	.10**	.24**	.22**	.40**	.25**	.29**	.48**	-	
15. Word Reading at age 7	0.00	21.27	790	.22**	.27**	.36**	.22**	.27**	.29**	.29**	.38**	.25**	.34**	.32**	.41**	.28**	.22**	-
16. Reading Comprehension at age 7	0.00	0.90	739	.28**	.28**	.38**	.21**	.30**	.28**	.21**	.36**	.26**	.34**	.30**	.40**	.28**	28**	.52**

*Note: ***p<.001, **p<.01, *p<.05.*

4.4 Measurement models

In this study, a two-step SEM modeling was used. First, measurement models were estimated to understand how well the latent constructs account for the indicators. Then, we tested the structural models to examine how well the hypothesized model fits the data. For the models that included only the continuous variables, Likelihood ratio χ^2, Comparative Fit Index (*CFI*), Tucker-Lewis Index (*TLI*), Root Mean Square Error of Approximation *(RMSEA*) and Standardized Root Mean Square Residual (*SRMR*) fit indices were used. For the models that included both the continuous and ordered-categorical variables, in addition to other fit indices, Weighted Root-Mean-Square Residual (*WRMR*) fit index was used instead of *SRMR*. To evaluate whether the models fit the data well, the cutoff values were a non-significant *p*-value for χ^2, greater than .95 for *CFI* and *TLI*, less than .06 for *RMSEA* within 90% *CI* with an upper limit less than .10, less than .08 for *SRMR* (Hu & Bentler, 1999) and less than 1.0 for *WRMR* (Yu & Muthén, 2002).

In the current study, home literacy environment was one of the latent constructs. Availability of books at home, shared-book reading and parental teaching of pre-literacy skills were the indicators of the home literacy environment. A confirmatory factor analysis (CFA) was conducted to determine the adequacy of this measurement model. The measurement model for home literacy environment was a saturated model, so the likelihood ratio χ^2, degree of freedom, *RMSEA* and *WRMR* were equal to zero. *CFI* and *TLI* were equal to one.

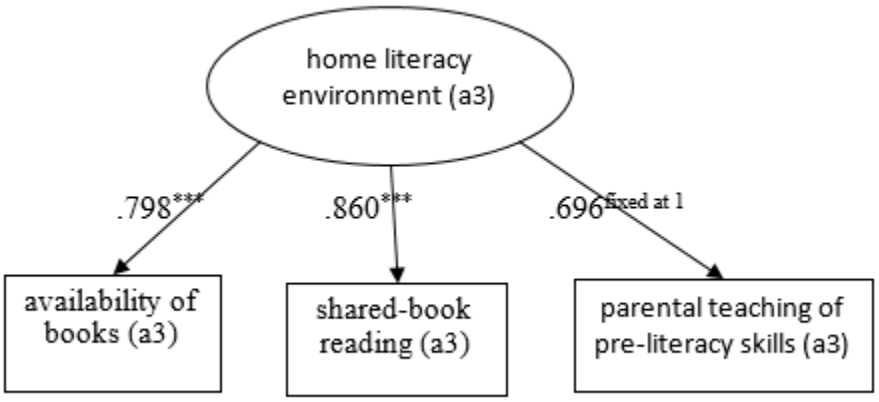

Figure 4.1. The measurement model for the latent construct of home literacy environment

Note. ***p<.001.

The standardized factor loadings of home literacy environment were statistically significant and all above .690 (see Figure 4.1). Therefore, the availability of books at home, shared-book reading and parental teaching of pre-literacy skills were strong indicators of the home literacy environment construct.

Language skills at age five was another latent construct in the current study. It had four indicators: listening comprehension, sentence repetition, syllabification and receptive vocabulary. The fit indices indicated that the measurement model of the language skills fitted the data well, χ^2 (2, N = 1052) = 8.07, p < .05, *CFI* =.99, *TLI* =.98, *SRMR* = .02, *RMSEA* = .06 (90 % CI = .02 - .11). The standardized factor loadings of language skills were statistically significant and above .500 (see Figure *4.2*).

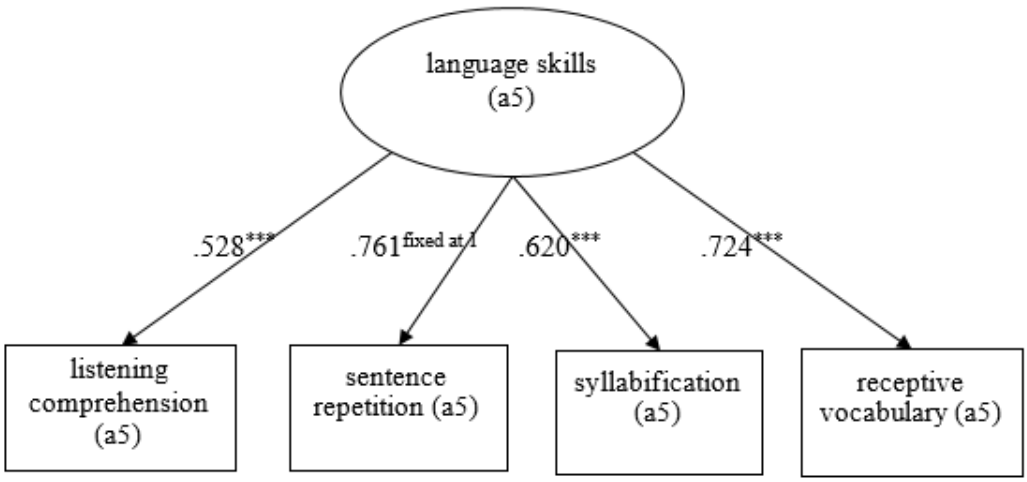

Figure 4.2. The measurement model for the latent construct of language skills

Note. ****p*<.001.

4.5 The structural model

The variables tested in the study were added into a structural model in a stepwise fashion. The standardized and unstandardized factor loadings and path coefficients were reported for each model.

4.5.1 Model 1: The associations among visual-spatial working memory and receptive vocabulary at age three, receptive vocabulary at age four and language skills construct at age five

As shown in Figure 4.3, Model 1 examined the associations among visual-spatial working memory at age three, receptive vocabulary at age three, receptive vocabulary at age four and language skills construct at age five. These assessments required a combination of some verbal

working memory skills with verbal (or language) skills. Therefore, verbal working memory was added to the model as a second latent construct. Three indicators of language skills construct (e.g. listening comprehension, sentence repetition and syllabification) loaded on verbal working memory construct. The fit indices showed that Model 1 fitted the data well, χ^2 (6, N = 1050) = 4.96, p>.05, *CFI* = 1.00, *TLI* = 1.00, *SRMR* = .01, *RMSEA* = .00 (90 % CI = .00 - .04).

The standardized and unstandardized path coefficients were reported in Table 4.6. Figure 4.3 also presents the standardized path coefficients of Model 1. As expected, all paths were statistically significant, except for the paths from both visual-spatial working memory at age 3 and receptive vocabulary at age four to verbal working memory at age five. The path from receptive vocabulary at age three to receptive vocabulary at age four (β = .545) was significant. Children's receptive vocabulary at age three was strongly associated with their receptive vocabulary one year later. Moreover, both receptive vocabulary at age three (β = .323) and at age four (β = .565) significantly predicted the child's language skills construct at age five, which included four indicators of language skills (e.g. receptive vocabulary, syllabification, sentence repetition and listening comprehension). However, the path from visual-spatial working memory at age three to language skills construct at age five (β =.061) was significant, but small. The unstandardized and standardized factor loadings of the latent constructs, i.e., language skills and verbal working memory on their indicators were listed in Table 4.7. All indicators significantly loaded on their corresponding latent constructs. The standardized factor loadings of verbal working memory ranged from .253 to .595. The standardized factor loadings of language skills indicated significant loadings ranging from 488 to .882.

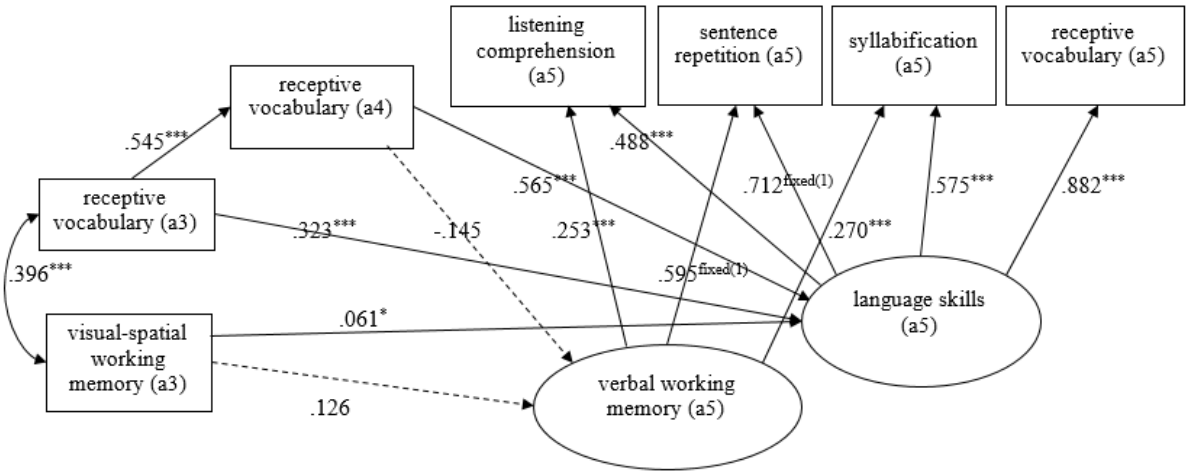

Figure 4.3. Model 1: Dashed lines show the non-significant paths

Notes. $^{***}p<.001$, $^{*}p<.05$. The standardized path coefficients were presented in the model.

Contrary to expectations, the path from visual-spatial working memory at age three to verbal working memory at age five was non-significant. It was expected that the child's receptive vocabulary knowledge at age four would be positively associated with verbal working memory one year later. However, the path from receptive vocabulary at age four to verbal working memory at age five also was non-significant. Therefore, Model 1 (baseline) was compared to Model 2 (reduced model) which constrained the non-significant path from receptive vocabulary at age four to verbal working memory at age five to zero. The non-significant path from visual-spatial working memory at age three to verbal working memory at age five was not omitted from Model 1. Domain-general approach posits that all working memory assessments from different modalities (e.g. verbal and visual) are associated with each other because a common skill, executive function, that is necessary to be successful in all working memory assessments. The fit indices of Model 2 showed a good fit to the data, χ^2 (7, N = 1050) = 5.89, $p > .05$; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* =

.00 (90 % CI = .00 - .03), *SRMR* = .01. The chi-square difference test showed that there is no significant difference, $\Delta\chi^2 = .93$, $\Delta df = 1$, $p > .05$. The standardized and unstandardized path coefficients of the reduced model are reported in Table 4.6. As seen in Figure 4.4, in Model 2 all path coefficients were statistically significant except for the path from visual-spatial working memory at age three to language skills construct at age five. Table 4.7 presents the factor loadings of the latent constructs in Model 2.

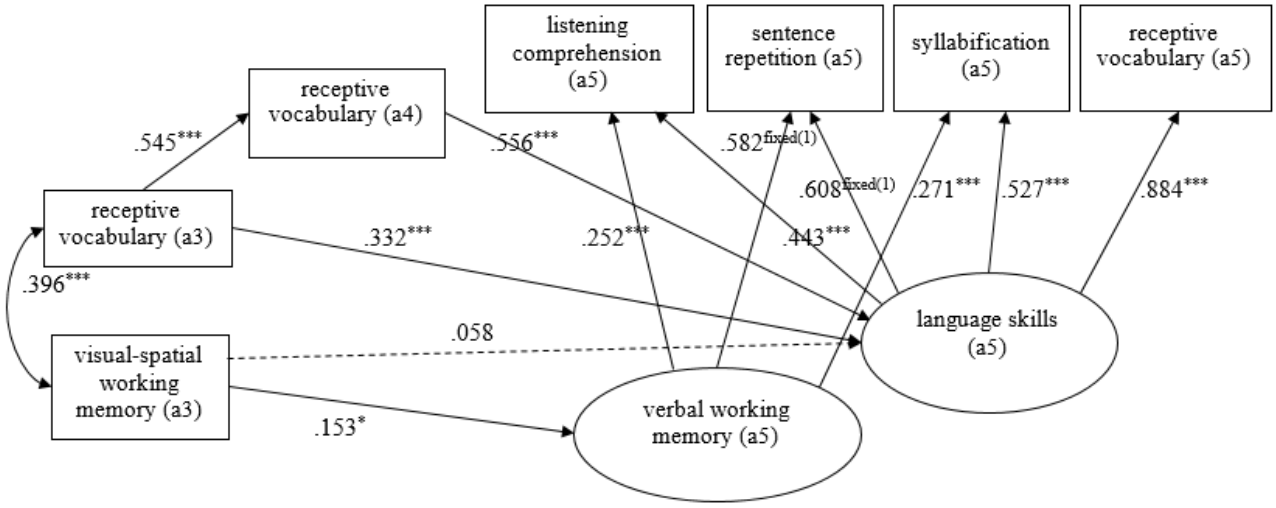

Figure 4.4. Model 2: The path from receptive vocabulary at age 4 to verbal working memory latent construct at age 5 omitted

Notes. ***p<.001, *p<.05. Same as Model 1, except for the non-significant path from receptive vocabulary at age 4 to verbal working memory latent construct at age 5. The standardized path coefficients were presented in the model.

Table 4.6

Unstandardized and Standardized Path Coefficients for Model 1 in Figure 4.3 and Model 2 in Figure 4.4 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Receptive vocabulary (a3)→Receptive vocabulary (a4)	.515 (0.03)	.545***	.515 (0.03)	.545***
Receptive vocabulary (a3)→Language skills (a5)	1.482 (0.24)	.323***	1.302 (0.15)	.332***
Visual-spatial working memory (a3)→Language skills (a5)	.062 (0.03)	.061*	.050 (0.03)	.058
Visual-spatial working memory (a3)→Verbal working memory (a5)	.106 (0.05)	.126	.127 (0.05)	.153*
Receptive vocabulary (a4)→Language skills (a5)	2.750 (0.52)	.565***	2.312 (0.18)	.556***
Receptive vocabulary (a4)→Verbal working memory (a5)	-.588 (0.63)	-.145	--	--
Covariance between errors of receptive vocabulary (a3) and visual-spatial working memory (a3)	1.618 (0.15)	.396***	1.618 (0.15)	.396***

Notes: ***p<.001, *p<.05.

Full Model (Model 1): χ^2 (6) = 4.96, p = > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % *CI* = .00 - .04), *SRMR* = .01.

Reduced Model (Model 2): χ^2 (7) = 5.89, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % *CI* = .00 - .03), *SRMR* = .01.

Table 4.7

Unstandardized and Standardized Factor Loadings of the Latent Constructs for Model 1 in Figure 4.3 and Model 2 in Figure 4.4 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Language skills (a5)				
Listening comprehension	.243 (0.02)	.488***	.259 (0.02)	.443***
Sentence repetition	1.000 (0.00)	.712fixed(1)	1.000 (0.00)	.608fixed(1)
Syllabification	.338 (0.13)	.575***	.645 (0.05)	.527***
Receptive vocabulary	.162 (0.03)	.882***	.191 (0.01)	.884***
Verbal Working Memory (a5)				
Sentence repetition	1.000 (0.00)	.595fixed(1)	1.000 (0.00)	.582fixed(1)
Listening comprehension	.151 (0.06)	.253***	.154 (0.06)	.252***
Syllabification	.338 (0.13)	.270***	.346 (0.13)	.271***

Note: ***p<.001, *p<.05.

4.5.2 Model 3: Adding visual-spatial working memory and verbal working memory at age six to Model 2

Visual-spatial working memory and verbal working memory assessed at age six were added to Model 2. The fit indices showed that Model 3 fitted the data well, χ^2 (16, N = 1051) = 13.81, p > .05, *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .03), *SRMR* = .01. Table 4.8 presents all standardized and unstandardized path coefficients in Model 3. Except for two paths, all other standardized path coefficients were statistically significant as presented in Figure 4.5. As expected, language skills at age five were significantly associated with the child's visual-spatial working memory at age six (β =.389) and verbal working memory at age six (β =.302).

Moreover, verbal working memory at age five had a direct association with verbal working memory at age six, (β = .353). As seen in Figure 4.5 *v*isual-spatial and verbal working memory at age six were significantly correlated.

Verbal working memory at age five was not significantly associated with visual-spatial working memory at age six. The path from visual-spatial working memory at age three to verbal working memory at age six was also non-significant. On the other hand, the path from visual-spatial working memory at age three and visual-spatial working memory at age six was statistically significant, although the time lag between them was three years.

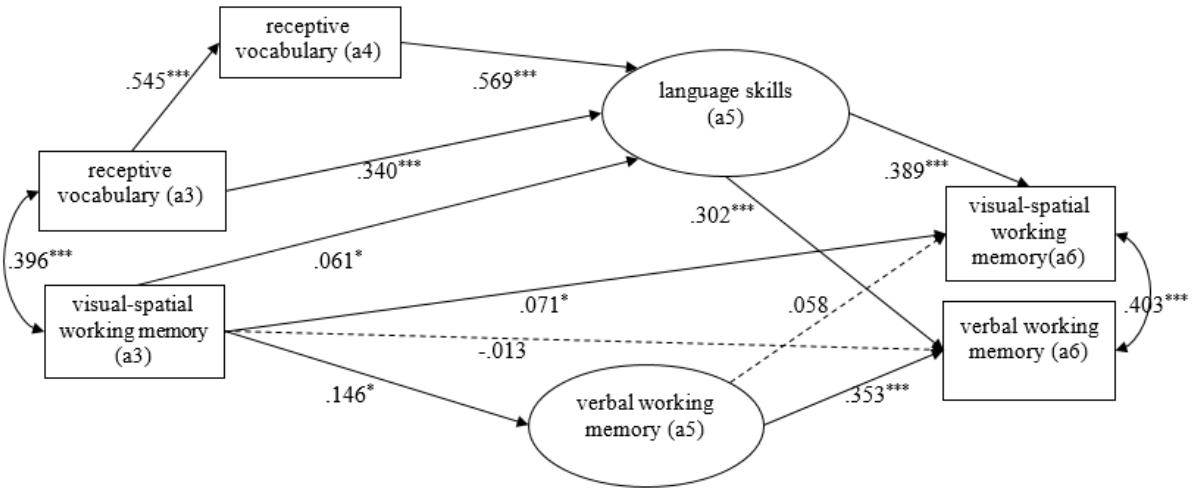

Figure 4.5. Model 3: Visual-spatial working memory and verbal working memory at age six added to Model 2

Notes. ***p<.001, *p<.05. The standardized path coefficients were presented in the model. Dashed lines represent non-significant paths.

The non-significant paths were omitted from Model 3. The reduced model (Model 4) was compared to Model 3. The fit indices indicated that the reduced model had a good to fit the data,

χ^2 (18, N = 1051) = 15.36, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01. The chi-square difference test showed that the reduced model did not worsen the fitting of the model, $\Delta\chi^2$ = 1.55, Δdf = 2, p > .05. The standardized path coefficients of the reduced model were reported in Figure 4.6. All standardized path coefficients were significant. Table 4.9 presents the factor loadings of the latent constructs in Model 3 and Model 4.

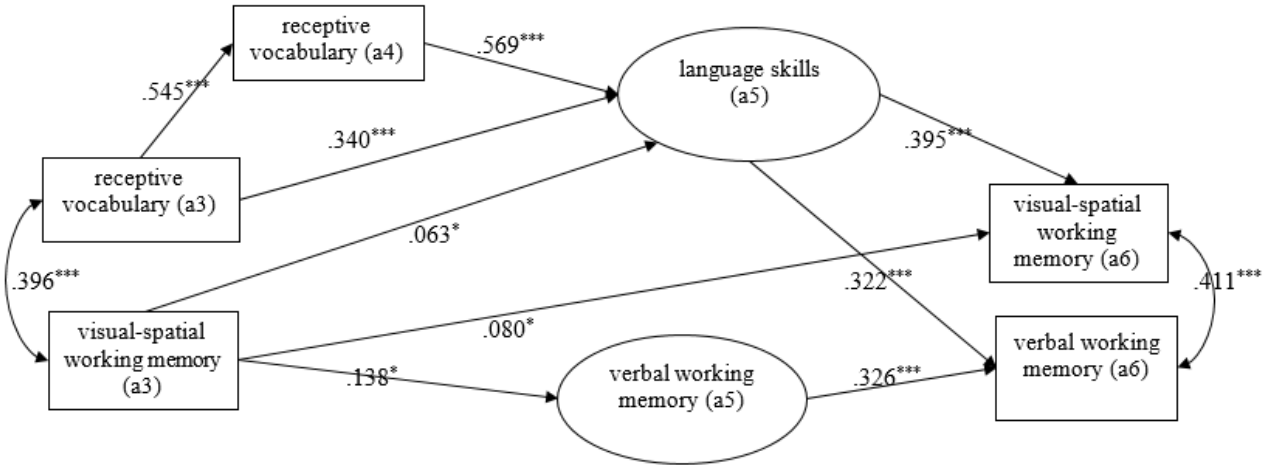

Figure 4.6. Model 4: The non-significant paths of Model 3 omitted

Notes. $^{***}p$<.001, $^{*}p$<.05. The standardized path coefficients were presented in the model.

Table 4.8

Unstandardized and Standardized Path Coefficients for Model 3 in Figure 4.5 and Model 4 in Figure 4.6 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Receptive vocabulary (a3)→Receptive vocabulary (a4)	.515 (0.03)	.545***	.515 (0.03)	.545***
Receptive vocabulary (a3)→Language skills (a5)	1.318 (0.15)	.340***	1.328 (0.15)	.340***
Visual-spatial working memory (a3)→Language skills (a5)	.052 (0.03)	.061*	.054 (0.03)	.063*
Visual-spatial working memory (a3)→Verbal working memory (a5)	.122 (0.05)	.146*	.116 (0.05)	.138*
Visual-spatial working memory (a3)→ Visual-spatial working memory (a6)	.094 (0.05)	.071*	.106 (0.05)	.080*
Visual-spatial working memory (a3)→Verbal working memory (a6)	-.017 (0.05)	-.013	--	--
Receptive vocabulary (a4)→Language skills (a5)	2.337 (0.17)	.569***	2.354 (0.17)	.569***
Verbal working memory (a5)→ Verbal working memory (a6)	.555 (0.14)	.353***	.505 (0.12)	.326***
Verbal working memory (a5)→ Visual-spatial working memory (a6)	.092 (0.08)	.058	--	--

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 3): χ^2 (16) = 13.81, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .03), *SRMR* = .01.

Reduced Model (Model 4): χ^2 (18) = 15.36, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01.

(continued)

	Full Model		Reduced Model	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Language skills (a5)→ Verbal working memory (a6)	.492 (0.06)	.320***	.490 (0.06)	.322***
Language skills (a5)→ Visual-spatial working memory (a6)	.605 (0.07)	.389***	.610 (0.07)	.395***
Covariance between errors of receptive vocabulary (a3) and visual-spatial working memory (a3)	1.615 (0.15)	.396***	1.615 (0.15)	.396***
Covariance between errors of visual-spatial (a3) and verbal working memory (a6)	10.309 (1.05)	.403***	10.558 (1.03)	.411***

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 3): χ^2 (16) = 13.81, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .03), *SRMR* = .01.

Reduced Model (Model 4): χ^2 (18) = 15.36, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01.

Table 4.9

Unstandardized and Standardized Factor Loadings of the Latent Constructs for Model 3 in Figure 4.5 and Model 4 in Figure 4.6 (Standard Errors in Parentheses; N = 1052)

	Full Model		Reduced Model	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Language skills (a5)				
Listening comprehension	.259 (0.02)	.437***	.258 (0.02)	.439***
Sentence repetition	1.000 (0.00)	.599fixed(1)	1.000 (0.00)	.604***
Syllabification	.659 (0.05)	.532***	.658 (0.05)	.535***
Receptive vocabulary (a5)	.188 (0.01)	.862***	.186 (0.01)	.859***
Verbal Working Memory (a5)				
Sentence repetition	1.000 (0.00)	.586fixed(1)	1.000 (0.00)	.592fixed(1)
Listening comprehension	.147 (0.04)	.243***	.143 (0.04)	.239**
Syllabification	.303 (0.07)	.239***	.289 (0.07)	.230***

Notes: ***p<.001, **p<.01, *p<.05.

4.5.3 Model 5: Adding word reading at age seven to Model 4

Word reading assessed at age seven was added to Model 4 (see Figure 4.7). The results indicated that Model 5 had a good fit to the data, χ^2 (23, N = 1052) = 21.02, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01. The standardized and unstandardized path coefficients were reported in Table 4.10. As expected, the child's language skills construct at age five was significantly associated with word reading at age seven (β = .463). The higher the language skills of the children at age five, the better their performance in word reading task at age seven. As seen in Figure 4.7, the path from visual-spatial working memory at age six to word reading at age seven was significant, but small (β = .085). However, verbal working memory at age five and at age six were not significantly associated with word reading at age seven.

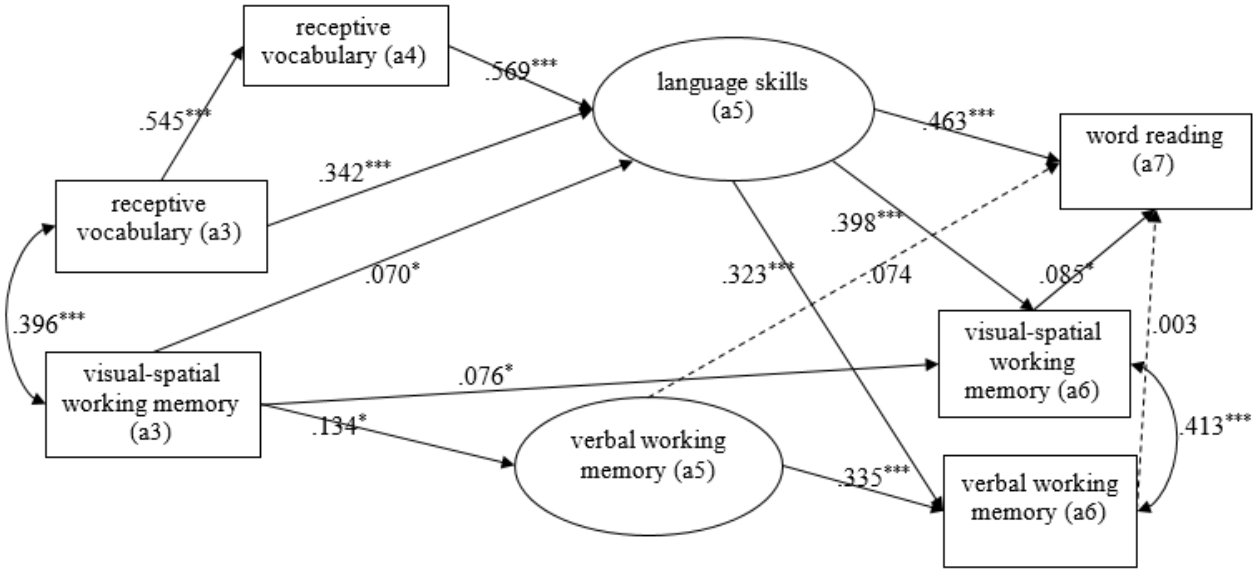

Figure 4.7. Model 5: Word reading added to Model 4

Notes. ***p<.001, *p<.05. The standardized path coefficients were presented in the model. Dashed lines represent the non-significant paths.

Model 5 was retested after the non-significant path connecting verbal working memory at age six to word reading at age seven was fixed to zero. The fit indices indicated that the reduced model (Model 6) fitted the data well, χ^2 (24, N = 1052) = 21.02, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01 (see Table 4.10). The chi-square difference test indicated that the reduced model had a good fit to the data, $\Delta\chi^2$ =.00, Δdf = 1, p > .05. Figure 4.8 showed the standardized path coefficients which were all significant, except for the path from verbal working memory at age five to word reading at age seven. Table 4.11 presents the factor coefficients of latent constructs in Model 5 and Model 6.

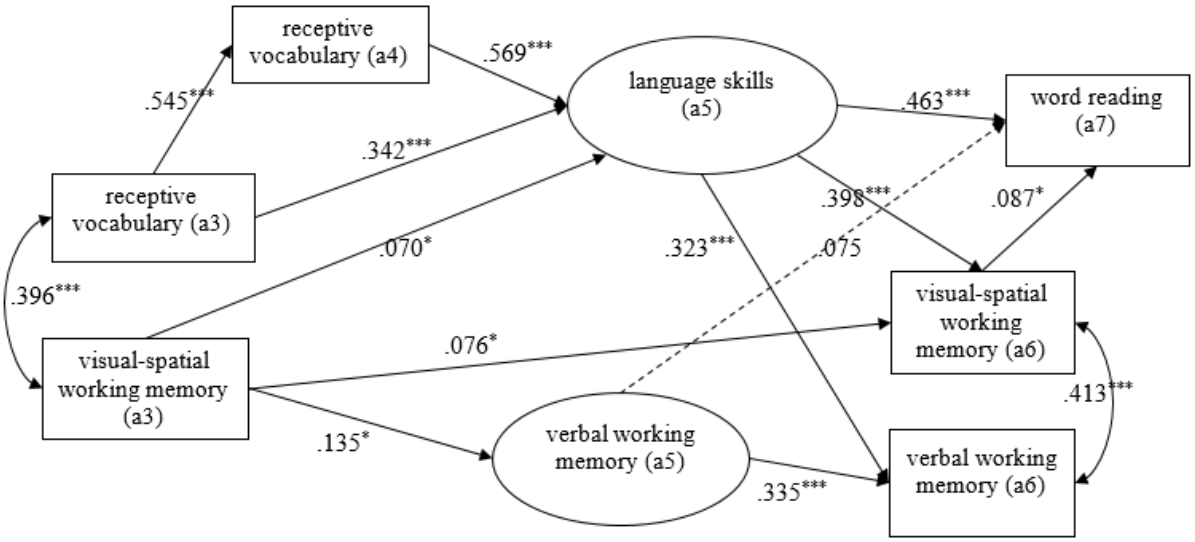

Figure 4.8. Model 6: The non-significant path from verbal working memory at age six to word reading at age omitted

Notes. ***p<.001, *p<.05. The standardized path coefficients were presented in the model.

Table 4.10

Unstandardized and Standardized Path Coefficients for Model 5 in Figure 4.7 and Model 6 in Figure 4.8 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Receptive vocabulary (a3)→Receptive vocabulary (a4)	.514 (0.03)	.545***	.514 (0.03)	.545***
Receptive vocabulary (a3)→Language skills (a5)	1.342 (0.15)	.342***	1.342 (0.15)	.342***
Visual-spatial working memory (a3)→Language skills (a5)	.060 (0.03)	.070*	.060 (0.03)	.070*
Visual-spatial working memory (a3)→Verbal working memory (a5)	.110 (0.05)	.134*	.110 (0.05)	.135*
Visual-spatial working memory (a3)→ Visual-spatial working memory (a6)	.101 (0.05)	.076*	.102 (0.05)	.076*
Receptive vocabulary (a4)→Language skills (a5)	2.364 (0.17)	.569***	2.364 (0.17)	.569***
Language skills (a5)→ Verbal working memory (a6)	.488 (0.06)	.323***	.489 (0.06)	.323***
Language skills (a5)→ Visual-spatial working memory (a6)	.611 (0.07)	.398***	.611 (0.07)	.398***

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 5): χ^2 (23) = 21.02, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01.

Reduced Model (Model 6): χ^2 (24) = 21.02, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01.

(continued)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Verbal working memory (a5)→ Verbal working memory (a6)	.535 (0.13)	.335***	.537 (0.13)	.335***
Language skills (a5)→Word reading (a7)	2.652 (0.25)	.463***	2.654 (0.25)	.463***
Verbal working memory (a5)→Word reading (a7)	.445 (0.36)	.074	.457 (0.30)	.075
Visual-spatial working memory (a6)→Word reading (a7)	.318 (0.15)	.085*	.323 (0.13)	.087*
Verbal working memory (a6)→Word reading (a7)	.011 (0.17)	.003	--	--
Covariance between errors of receptive vocabulary (a3) and visual-spatial working memory (a3)	1.617 (0.15)	.396***	1.617 (0.15)	.396***
Covariance between errors of visual-spatial and verbal working memory (a6)	10.561 (1.03)	.413***	10.560 (1.03)	.413***

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 5): χ^2 (23) = 21.02, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01.

Reduced Model (Model 6): χ^2 (24) = 21.02, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .01.

Table 4.11

Unstandardized and Standardized Factor Loadings of the Latent Constructs for Model 5 in Figure 4.7 and Model 6 in Figure 4.8 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Language skills (a5)				
Listening comprehension	.258 (0.02)	.441***	.258 (0.02)	.441***
Sentence repetition	1.000 (0.00)	.606fixed(1)	1.000 (0.00)	.606fixed(1)
Syllabification	.662 (0.05)	.540***	.662 (0.05)	.540***
Receptive vocabulary (a5)	.184 (0.01)	.853***	.184 (0.01)	.853***
Verbal Working Memory (a5)				
Sentence repetition	1.000 (0.00)	.573fixed(1)	1.000 (0.00)	.572fixed(1)
Listening comprehension	.151 (0.04)	.244***	.151 (0.04)	.244***
Syllabification	.299 (0.07)	.230***	.299 (0.07)	.231***

Note: ***p<.001, **p<.01, *p<.05.

4.5.4 Model 7: Adding reading comprehension at age seven to Model 6

Reading comprehension was added to Model 6. The results showed that Model 7, including also reading comprehension fitted the data well, χ^2 (29, N = 1052) = 27.65, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .02 (see Table 4.12). The standardized path coefficients were presented in Figure 4.9. As expected, language skills with four indicators and word reading were significantly associated with reading comprehension (β = .258 and β = .383, respectively). Visual-spatial working memory at age six and verbal working memory at age five were not significantly associated with reading comprehension. However, verbal working memory at age six (β = .110) significantly predicted to reading comprehension at age seven. As seen in Figure 4.9, the results indicated that verbal working memory at age six measured with

forward-digit-span task had a significant direct association with reading comprehension.

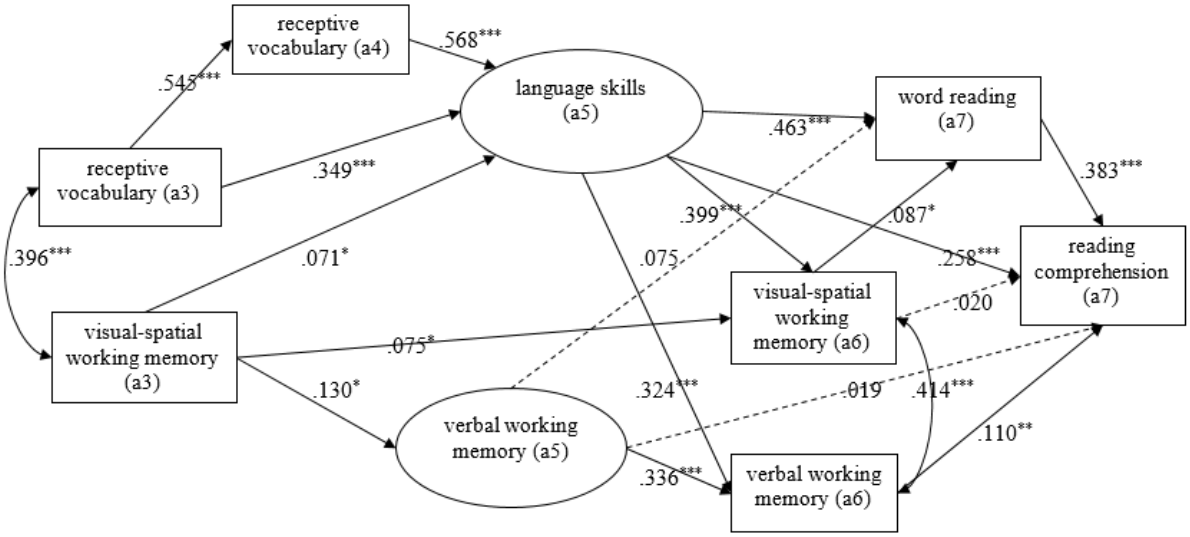

Figure 4.9. Model 7: Reading comprehension at age 7 added to Model 6

Notes. $^{***}p<.001$, $^{**}p<.01$, $^{*}p<.05$. The standardized path coefficients were presented in the model. Dashed lines represent non-significant paths.

A reduced model (Model 8) without the non-significant path from visual-spatial working memory at age six to reading comprehension at age seven was tested. The fit indices showed that the reduced model did not worsen the fit of the model to the data, χ^2 (30, N = 1052) = 27.92, p > .05; *CFI* = 1.00, *TLI* = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .02 (see Table 4.12). The standardized path coefficients of Model 8 were reported in Figure 4.10. In Model 8, all standardized path coefficients were significant, except for the paths from verbal working memory at age five to both word reading and reading comprehension at age seven. The chi-square difference test indicated that the fit of reduced model did not significantly differ from Model 7, $\Delta\chi^2$ = .28, Δdf = 1, p > .05. Table 4.13 presents the factor loadings of latent constructs in Model 7 and Model 8.

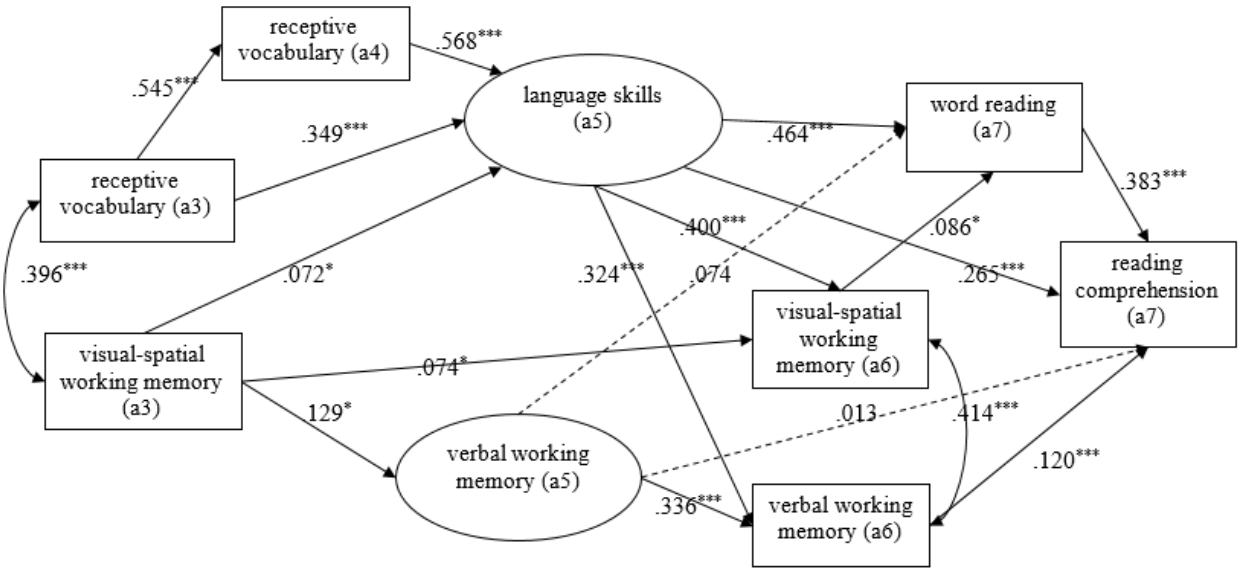

Figure 4.10. Model 8: The non-significant path from visual-spatial working memory at age 6 to reading comprehension at age 7 omitted

Notes. $^{***}p<.001$, $^{*}p<.05$. The standardized path coefficients were presented in the model. Dashed lines represent non-significant paths.

Table 4.12

Unstandardized and Standardized Path Coefficients for Model 7 in Figure 4.9 and Model 8 in Figure 4.10 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Receptive vocabulary (a3)→Receptive vocabulary (a4)	.514 (0.03)	.545***	.514 (0.03)	.545***
Receptive vocabulary (a3)→Language skills (a5)	1.369 (0.15)	.349***	1.371 (0.15)	.349***

Notes: $^{***}p<.001$, $^{**}p<.01$, $^{*}p<.05$.
Full Model (Model 7): χ^2 (29) = 27.65, $p > .05$; *CFI* = 1.00, TLI = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .02.
Reduced Model (Model 8): χ^2 (30) = 27.92, $p > .05$; *CFI* = 1.00, TLI = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .02.

(continued)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Visual-spatial working memory (a3)→Language skills (a5)	.062 (0.03)	.071*	.062 (0.03)	.072*
Visual-spatial working memory (a3)→Verbal working memory (a5)	.106 (0.05)	.130*	.105 (0.05)	.129*
Visual-spatial working memory (a3)→ Visual-spatial working memory (a6)	.099 (0.05)	.075*	.098 (0.05)	.074*
Receptive vocabulary (a4)→Language skills (a5)	2 .365 (0.17)	.568***	2 .365 (0.17)	.568***
Language skills (a5)→ Verbal working memory (a6)	.490 (0.06)	.324***	.490 (0.06)	.324***
Language skills (a5)→ Visual-spatial working memory (a6)	.612 (0.07)	.399***	.614 (0.07)	.400***
Verbal working memory (a5)→ Verbal working memory (a6)	.541 (0.13)	.336***	.540 (0.13)	.336***
Language skills (a5)→Word reading (a7)	2.646 (0.25)	.463***	2.647 (0.25)	.464***
Verbal working memory (a5)→Word reading (a7)	.455 (0.31)	.075	.452 (0.30)	.074
Visual-spatial working memory (a6)→Word reading (a7)	.325 (0.13)	.087*	.322 (0.13)	.086*
Language skills (a5)→Reading comprehension (a7)	.064 (0.01)	.258***	.065 (0.01)	.265***
Verbal working memory (a5)→ Reading comprehension (a7)	.005 (0.01)	.019	.003 (0.01)	.013

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 7): χ^2 (29) = 27.65, p > .05; *CFI* = 1.00, TLI = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .02.

Reduced Model (Model 8): χ^2 (30) = 27.92, p > .05; *CFI* = 1.00, TLI = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .02.

(continued)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Visual-spatial working memory (a6)→ Reading comprehension (a7)	.003 (0.01)	.020	--	--
Verbal working memory (a6)→ Reading comprehension (a7)	.018 (0.01)	.110**	.020 (0.01)	.120***
Word reading (a7)→ Reading comprehension (a7)	.017 (0.00)	.383***	.017 (0.00)	.383***
Covariance between errors of receptive vocabulary (a3) and visual-spatial working memory (a3)	1.618 (0.15)	.396***	1.618 (0.15)	.396***
Covariance between errors of visual-spatial (a6) and verbal working memory (a6)	10.587 (1.03)	.414***	10.582 (1.03)	.414***

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 7): χ^2 (29) = 27.65, p > .05; *CFI* = 1.00, TLI = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .02.

Reduced Model (Model 8): χ^2 (30) = 27.92, p > .05; *CFI* = 1.00, TLI = 1.00, *RMSEA* = .00 (90 % CI = .00 - .02), *SRMR* = .02.

Table 4.13

Unstandardized and Standardized Factor Loadings of the Latent Constructs for Model 7 in Figure 4.9 and Model 8 in Figure 4.10 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Language skills (a5)				
Listening comprehension	.259 (0.00)	.443***	.259 (0.02)	.444***
Sentence repetition	1.000 (0.00)	.607fixed(1)	1.000 (0.00)	.607fixed(1)
Syllabification	.662 (0.05)	.541***	.662 (0.05)	.541***
Receptive vocabulary (a5)	.183 (0.01)	.849***	.183 (0.01)	.848***
Verbal Working Memory (a5)				
Sentence repetition	1.000 (0.00)	.570fixed(1)	1.000 (0.00)	.571fixed(1)
Listening comprehension	.151 (0.04)	.243***	.151 (0.04)	.243***
Syllabification	.300 (0.07)	.230***	.299 (0.07)	.230***

Note: ***p<.001, **p<.01, *p<.05.

4.5.5 Model 9: Adding home literacy environment measured at age three to Model 8

Home literacy environment measured at age three was added to Model 8. In this model, the estimator was weighted least squares (WLSMW) because the two indicators of home literacy environment were ordered-categorical. The results showed that the model fits the data well, χ^2 (58, N = 1052) = 80.98, p <.05, *CFI* =.99, *TLI* = .99, *RMSEA* =.02 (90 % CI = .01 - .03), *WRMR*=.50. Table 4.14 shows the standardized and unstandardized path coefficients. As expected, the paths from home literacy environment to both receptive vocabulary at age four (β = .381) and language skills construct at age five (β = .304) were statistically significant, as presented in Figure 4.11. The more stimulating the home literacy environment of the child at age three, the better the receptive vocabulary one year later and language skills two years later. Unexpectedly, the path from home literacy environment to verbal working memory at age five was significant and negative, (β = -

.281). Literacy environment surrounding the children at home was negatively associated with the children's verbal working memory two years later. Moreover, home literacy environment was significantly correlated with both receptive vocabulary at age three (r = .618, p<.001) and visual-spatial working memory at age three (r = .293, p<.001). Table 4.15 shows that the standardized and unstandardized factor loadings of home literacy environment were significant.

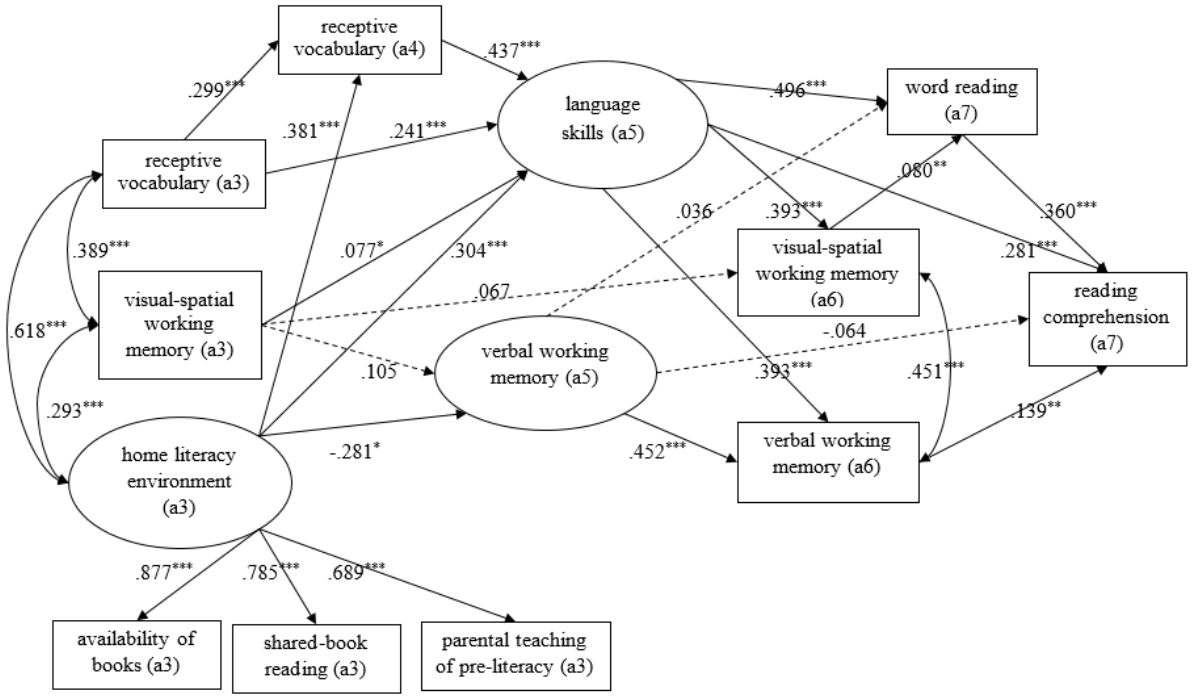

Figure 4.11. Model 9: Home literacy environment at age three added to Model 8

Notes. ***p<.001, **p<.01, *p<.05. The standardized path coefficients were presented in the model. Dashed lines represent non-significant paths.

Table 4.14

Unstandardized and Standardized Path Coefficients of Model 9 in Figure 4.11 (Standard Errors in Parentheses; N = 1052)

	Full Model	
Parameter Estimate	*Unstandardized*	*Standardized*
Receptive vocabulary (a3)→ Receptive vocabulary (a4)	.282 (0.04)	.299***
Receptive vocabulary (a3)→Language skills (a5)	.230 (0.04)	.241***
Visual-spatial working memory (a3)→Language skills (a5)	.016 (0.01)	.077*
Visual-spatial working memory (a3)→Verbal working memory (a5)	.013 (0.01)	.105
Visual-spatial working memory (a3)→ Visual-spatial working memory (a6)	.018 (0.01)	.067
Home literacy environment (a3)→ Receptive vocabulary (a4)	.843 (0.10)	.381***
Home literacy environment (a3)→ Verbal working memory (a5)	-.357 (0.17)	-.281*
Home literacy environment (a3)→ Language skills (a5)	.682 (0.15)	.304***
Receptive vocabulary (a4)→Language skills (a5)	.442 (0.05)	.437***
Language skills (a5)→ Verbal working memory (a6)	.490 (0.06)	.393***
Language skills (a5)→ Visual-spatial working memory (a6)	.497 (0.06)	.393***
Verbal working memory (a5)→ Verbal working memory (a6)	.996 (0.31)	.452***
Language skills (a5)→Word reading (a7)	1.171 (0.13)	.496***
Verbal working memory (a5)→Word reading (a7)	.152 (0.21)	.036
Visual-spatial working memory (a6)→Word reading (a7)	.150 (0.59)	.080**
Language skills (a5)→Reading comprehension (a7)	.282 (0.05)	.281***
Verbal working memory (a5)→ Reading comprehension (a7)	-.114 (0.12)	-.064
Verbal working memory (a6)→ Reading comprehension (a7)	.112 (0.04)	.139**
Word reading (a7)→ Reading comprehension (a7)	.153 (0.01)	.360***

Notes: ***p<.001, **p<.01, *p<.05.
Full Model: χ^2 (58) = 80.98, p < .05; *CFI* = .99, *TLI* = .99, *RMSEA* = .02 (90 % CI = .01 - .03), W*RMR*= .50.

(continued)

	Full Model	
Parameter Estimate	*Unstandardized*	*Standardized*
Covariance between errors of receptive vocabulary (a3) and visual-spatial working memory (a3)	1.582 (0.14)	.389***
Covariance between errors of receptive vocabulary (a3) and home literacy environment (a3)	.235 (0.02)	.618***
Covariance between errors of visual-spatial working memory (a3) and home literacy environment (a3)	.506 (0.07)	.293***
Covariance between errors of visual-spatial (a6) and verbal working memory (a6)	.439 (0.04)	.451***

Notes: ***p<.001, **p<.01, *p<.05.
Full Model: χ^2 (58) = 80.98, p < .05; *CFI* = .99, *TLI* = .99, *RMSEA* = .02 (90 % CI = .01 - .03), W*RMR*= .50.

Table 4.15

Unstandardized and Standardized Factor Loadings of the Latent Constructs for Model 9 in Figure 4.11 (Standard Errors in Parentheses; N = 1052)

	Full Model	
Parameter Estimate	*Unstandardized*	*Standardized*
Language skills (a5)		
Listening comprehension	1.185 (0.10)	.491***
Sentence repetition	1.000 (0.00)	.740fixed(1)
Syllabification	.598 (0.06)	.594***
Receptive vocabulary (a5)	.733 (0.07)	.825***
Verbal Working Memory (a5)		
Sentence repetition	1.000 (0.00)	.419fixed(1)
Listening comprehension	.973 (0.29)	.229***
Syllabification	.300 (0.10)	.169**
Home Literacy Environment (a3)		
Availability of books at home (a3)	2.181 (0.14)	.877***
Parental teaching of pre-literacy skills (a3)	1.000 (0.00)	.689fixed(1)
Shared-book reading (a3)	1.953 (0.12)	.785***

Note: ***p<.001, **p<.01.

4.5.6 Additional analyses for the unexpected negative association between home literacy environment at age three and verbal working memory at age five

Unexpectedly, the path from home literacy environment at age three to verbal working memory at age five was negative. To understand the underlying reason for this counterintuitive negative association, some additional analyses were conducted. First, two groups of children were identified: the children who had discordant scores in home literacy environment at age three and verbal working memory at age five; and, those children who had similarly high or similarly low scores in both home literacy environment and verbal working memory at age five. These two groups were compared in terms of their characteristics at age three (e.g. mother's verbal working memory and vocabulary knowledge, mother's warmth and responsivity, inductive reasoning and child's temperament) and demographics (e.g. economic status and mother's education). Table 4.16 shows the results of these comparisons. The results showed that there was no significant differences between the children with high literacy environment but low verbal working memory and the children with high literacy environment and high verbal working memory.

On the other hand, there was a significant difference between the children with low literacy environment and low verbal working memory at age five, and the children with low literacy environment but high verbal working memory in terms of mother's verbal working memory, maternal warmth, responsivity and inductive reasoning to the child, mother's education and economic status (see Table 4.16). The mothers of the children who had a high level verbal working memory despite a relatively poor literacy environment, had higher scores on verbal working memory, t (377) = 3.09, p<.01. Both groups had a low level of literacy environment, but the children whose the mothers had high scores in verbal working memory had better performance in verbal working memory at age five than the others. It could be explained with genetically transfer

of the mothers' verbal working memory ability to their children. The children with low literacy environment but high verbal working memory had the mothers who had a high level of maternal warmth and responsivity, (t (378) = 3.05, p<.01; t (378) = 1.94, p<.05, respectively). Moreover, the mothers of children with low literacy environment but high verbal working memory reported more maternal inductive reasoning in childrearing than the mothers of the children with low literacy environment and low verbal working memory, t (378) = 3.72, p<.001.

As result of those analyses, it could be concluded that home literacy environment resulted in good development in language skills of the children, but among those who had a poor home literacy environment, some other additional factors such as mother's responsivity, warmth and inductive reasoning and the child's temperament especially reactivity were also necessary for a good development of verbal working memory in addition to high level of literacy environment. However, in the current study, those factors expect for demographic information were not controlled. Therefore, an unexpected negative association of home literacy environment at age three with verbal working memory at age five was observed.

Table 4. 16 *Comparing discordant children on some characteristics at age three and demographics*

	Children with high literacy environment low verbal working memory			Children with high literacy environment high verbal working memory				Children with low literacy environment high verbal working memory			Children with low literacy environment low verbal working memory			
Variables	n	*M*	*SD*	n	*M*	*SD*	*t*	n	*M*	*SD*	n	*M*	*SD*	*t*
Mother's verbal working memory	60	19.10	3.31	72	18.99	3.43	0.19	158	15.69	4.97	221	14.09	4.98	3.09**
Mother's vocabulary knowledge	60	10.17	4.69	72	10.89	4.97	-0.85	158	6.80	4.64	222	6.34	4.10	1.01
Warmth	60	91.16	10.15	72	91.74	7.87	-0.37	158	82.40	13.67	222	78.03	13.86	3.05**
Responsivity	60	77.71	19.27	72	80.90	18.64	-0.96	158	55.30	28.96	222	49.32	29.96	1.94*
Inductive reasoning	60	85.12	11.89	72	83.93	10.55	0.61	158	74.73	14.86	222	68.47	17.03	3.72***
Child's temperament														
Approach	60	61.37	14.78	72	61.86	16.18	-0.18	158	52.85	16.61	222	55.15	15.75	-1.37
Persistence	60	59.35	15.45	72	55.01	14.93	1.63	158	48.24	17.48	222	46.81	16.35	0.81
Rhythmicity	60	62.08	13.25	72	63.89	13.58	-0.77	158	59.15	13.59	222	58.22	11.62	0.72
Reactivity	60	46.90	15.49	72	43.02	13.55	1.54	158	50.77	15.78	222	50.78	17.04	-0.00
Economic status	58	0.47	0.77	71	0.53	1.03	-0.36	154	-0.25	1.02	211	-0.44	0.82	1.98*
Mother's education	60	7.52	3.62	72	8.10	3.58	-0.92	158	5.09	2.95	222	4.44	3.09	2.07*

Note: *p<.05, **p<.01, **p<.001.

4.5.7 Model 10 and Model 11(Full structural model of the current study)

Model 10was formed by adding two covariates (e.g. economic status and mother's education) to Model 9. Direct paths from mother's education and economic status to all other variables was added to Model 9. A direct path from home literacy environment to reading comprehension was also added to examine whether the association of home literacy environment with reading comprehension was partially or fully mediated by receptive vocabulary at age four, language skills construct at age five, verbal working memory at age five and word reading at age seven. The results showed that Model 10 had a good fit to the data, χ^2 (64, N = 1052) = 85.69, $p < .05$, *CFI* = .996, *TLI* = .99, *RMSEA* = .02 (90 % CI = .01 - .03), *WRMR* = .45. Table 4.17 shows that the paths from economic status and mother's education to receptive vocabulary at age three and four, home literacy environment and visual-spatial working memory at age three were significant. However, mother's education and economic status were not significantly associated with other variables in the model (e.g. verbal working memory at age five, language skills at age five, verbal and visual-spatial working memory at age six, word reading and reading comprehension at age seven).

A reduced model (Model 11) without the non-significant paths of mother's education and economic status was tested. The fit indices showed that the reduced model did not worsen the fit of the model to the data, χ^2 (76, N = 1052) = 101.5, $p < .05$; *CFI* = .996, *TLI* = .99, *RMSEA* = .02 (90 % CI = .01 - .03), *WRMR* = .50 (see Table 4.17). The standardized path coefficients of Model 11, which was the full structural model of the current study, were reported in Figure 4.12. The chi-square difference test indicated that the fit of reduced model (Model 11) did not significantly differ from Model 10, $\Delta\chi^2$ = 15.81, Δdf = 12, $p > .05$.

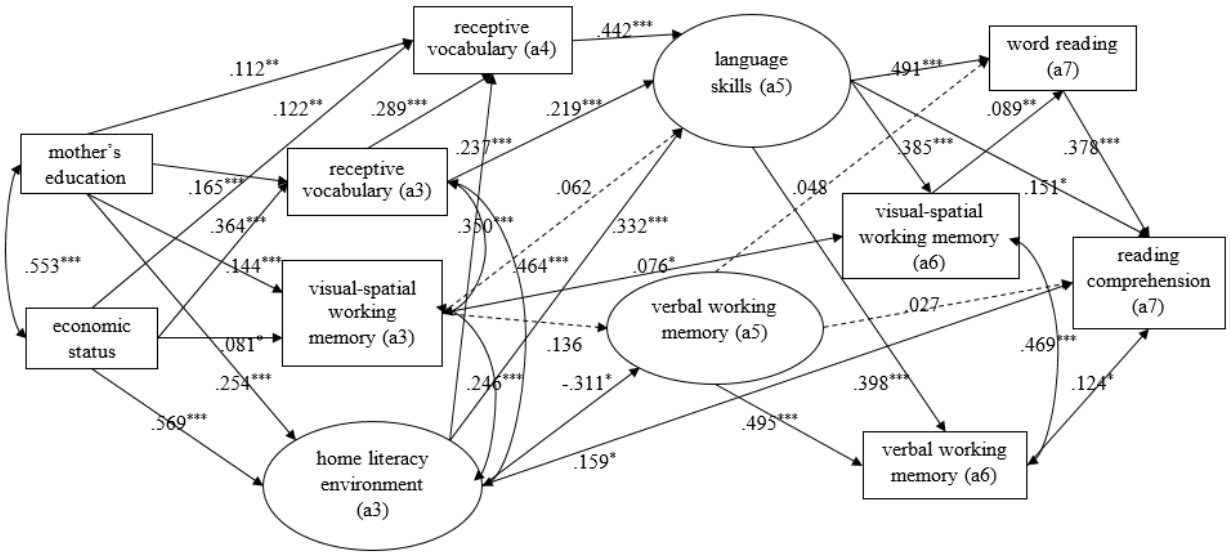

Figure 4.12. Model 11: Non-significant paths from mother's education and economic status omitted

Notes. $^{***}p<.001$, $^{**}p<.01$, $^{*}p<.05$. The standardized path coefficients were presented in the model. Dashed lines represent non-significant paths.

Figure 4.12 shows that in Model 11, the full structural model of the current study, the correlation between mother's education and economic status was significant and strong, $r = .553$, $p<.001$. Mothers who had a high level of education came from high level of economic status. Moreover, mother's education was significantly associated with the child's receptive vocabulary both at age three ($\beta = .165$) and four ($\beta = .112$), and visual-spatial working memory at age three ($\beta = .144$) (see Figure 4.12). As hypothesized, the direct path from mother's education to home literacy environment was significant ($\beta = .254$).

As shown in Table 4.17, economic status was significantly associated with the child's receptive vocabulary at age three ($\beta = .364$) in Model 11. The economic status of the family predicted the child's receptive vocabulary at age four ($\beta = .122$). Economic status was strongly

associated with home literacy environment (β = .569). The better economic conditions the mothers had, the more stimulating and enriched home literacy environment they could provide to their children. The correlation between home literacy environment and receptive vocabulary at age three was significant, r = .464, p<.001. An enriched home literacy environment was most likely to influence receptive vocabulary knowledge of the child in a positive way. Home literacy context also had positive association with visual-spatial working memory at age three, r= .246, p<.001.

Table 4.17 shows the standardized and unstandardized path coefficients in the full model of the current study (Model 11). The results indicated that all paths in the model were statistically significant, except for the path from visual-spatial working memory at age three to language skills at age five, the path from visual-spatial working memory at age three to verbal working memory at age five, the path from verbal working memory at age five to word reading and the path from verbal working memory at age five to reading comprehension. Language skills construct with four indicators at age five was significantly associated with the children's word reading and reading comprehension skills at age seven. However, verbal working memory at age five, which had three common indicators with language skills, was not significantly associated with either of them.

As expected, home literacy environment at age three significantly predicted the child's receptive vocabulary at age four (β = .237) and language skills construct at age five (β = .332), even after controlling for receptive vocabulary and visual-spatial working memory at age three. Moreover, the child's receptive vocabulary at age four was significantly associated with language skills construct with four indicators one year later (β = .442), which in turn, directly predicted word reading (β = .491) and reading comprehension (β = .151) at age seven. The direct path from home literacy environment at age three to reading comprehension at age seven was significant (β = .159).

Table 4.18 shows the standardized and unstandardized factor loadings of the latent constructs in Model 10 and Model 11.

Table 4.17

Unstandardized and Standardized Path Coefficients for Model 10 and Model 11 in Figure 4.12 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Mother's education→Receptive vocabulary (a3)	.041 (0.01)	.158***	.043 (0.01)	.165***
Mother's education→ Visual-spatial working memory (a3)	.170 (0.04)	.144***	.170 (0.04)	.144***
Mother's education→ Home literacy environment (a3)	.025 (0.00)	.243***	.026 (0.00)	.254***
Mother's education→Receptive vocabulary (a4)	.023 (0.01)	.093**	.027 (0.01)	.112**
Mother's education→Verbal working memory (a5)	.001 (0.01)	.009	--	--
Mother's education→ Language skills (a5)	.013 (0.01)	.060	--	--
Mother's education→Visual-spatial working memory (a6)	-.011 (0.01)	-.035	--	--

Notes: ***p<.001, **p<.01, *p<.05.
Full Model (Model 10): χ^2 (64) = 85.69, p < .05, *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .45.
Reduced Model (Model 11): χ^2 (76) = 101.05, p < .05; *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .50.

(continued)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Mother's education→Verbal working memory (a6)	-.021 (0.02)	-.069	--	--
Mother's education →Word reading (a7)	-.011 (0.03)	-.019	--	--
Mother's education→Reading comprehension (a7)	.012 (0.01)	.050	--	--
Economic status (a3)→Receptive vocabulary (a3)	.344 (0.03)	.364***	.344 (0.03)	.364***
Economic status (a3)→ Visual-spatial working memory (a3)	.355 (0.17)	.083*	.351 (0.17)	.081*
Economic status (a3)→ Home literacy environment (a3)	.218 (0.01)	.570***	.216 (0.01)	.569***
Economic status (a3)→Receptive vocabulary (a4)	.101(0.03)	.114**	.108 (0.04)	.122**
Economic status→Verbal working memory (a5)	-.022 (0.06)	-.038	--	--
Economic status→Language skills (a5)	.042 (0.03)	.052	--	--
Economic status→ Visual-spatial working memory (a6)	-.023 (0.05)	-.020	--	--
Economic status→Verbal working memory (a6)	-.089 (0.06)	-.079	--	--
Economic status→Word reading (a7)	.023 (0.06)	.011	--	--

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 10): χ^2 (64) = 85.69, p < .05, *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .45.

Reduced Model (Model 11): χ^2 (76) = 101.05, p < .05; *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .50.

(continued)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Economic status→Reading comprehension (a7)	-.029 (0.06)	-.032	--	--
Receptive vocabulary (a3)→Receptive vocabulary (a4)	.270 (0.04)	.286***	.272 (0.04)	.289***
Receptive vocabulary (a3)→Language skills (a5)	.206 (0.04)	.242***	.211 (0.04)	.219***
Visual-spatial working memory (a3)→Language skills (a5)	.012 (0.01)	.062	.013 (0.01)	.062
Visual-spatial working memory (a3)→Verbal working memory (a5)	.020 (0.01)	.143*	.015 (0.01)	.136
Visual-spatial working memory (a3)→ Visual-spatial working memory (a6)	.019 (0.01)	.073*	.020 (0.01)	.076*
Home literacy environment (a3)→ Receptive vocabulary (a4)	.608 (0.16)	.260***	.557 (0.16)	.237***
Home literacy environment (a3)→ Verbal working memory (a5)	-.109 (0.24)	-.070	-.384 (0.17)	-.311*
Home literacy environment (a3)→ Language skills (a5)	.465 (0.17)	.220**	.797 (0.15)	.332***
Home literacy environment (a3)→ Reading comprehension (a7)	.348 (0.20)	.147	.379 (0.19)	.159*

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 10): χ^2 (64) = 85.69, p < .05, *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .45.

Reduced Model (Model 11): χ^2 (76) = 101.05, p < .05; *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .50.

(continued)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Receptive vocabulary (a4)→Language skills (a5)	.400 (0.05)	.444***	.452 (0.05)	.442***
Language skills (a5)→Verbal working memory (a6)	.565 (0.08)	.404***	.492 (0.07)	.398***
Language skills (a5)→Visual-spatial working memory (a6)	.606 (0.08)	.427***	.484 (0.06)	.385***
Verbal working memory (a5)→Verbal working memory (a6)	.707 (0.21)	.372***	1.190 (0.36)	.495***
Language skills (a5)→Word reading (a7)	1.290 (0.16)	.488***	1.148 (0.12)	.491***
Verbal working memory (a5)→Word reading (a7)	.245 (0.19)	.068	.217 (0.22)	.048
Visual-spatial working memory (a6)→Word reading (a7)	.150 (0.06)	.081*	.166 (0.06)	.089**
Language skills (a5)→Reading comprehension (a7)	.168 (0.08)	.149*	.150 (0.07)	.151*
Verbal working memory (a5)→ Reading comprehension (a7)	.035 (0.08)	.023	.053 (0.14)	.027
Verbal working memory (a6)→ Reading comprehension (a7)	.099 (0.04)	.123*	.100 (0.04)	.124*
Word reading (a7)→ Reading comprehension (a7)	.161 (0.01)	.380***	.161 (0.01)	.378***

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 10): χ^2 (64) = 85.69, p < .05, *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .45.

Reduced Model (Model 11): χ^2 (76) = 101.05, p < .05; *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .50.

(continued)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Covariance between mother's education and economic status	2.009 (0.10)	.553***	2.011 (0.10)	.553***
Covariance between errors of visual-spatial (a6) and verbal (a6) working memory	.430 (0.04)	.431***	.447 (0.04)	.469***
Covariance between errors of receptive vocabulary (a3) and visual-spatial working memory (a3)	1.223 (0.12)	.348***	1.225 (0.12)	.350***
Covariance between errors of receptive vocabulary (a3) and home literacy environment (a3)	.102 (0.01)	.471***	.098 (0.01)	.464***
Covariance between errors of visual-spatial working memory (a3) and home literacy environment (a3)	.266 (0.05)	.244***	.264 (0.05)	.246***
Covariance between errors of parental teaching of pre-literacy skills (a3) and shared-book reading (a3)	.067 (0.01)	.226***	.070 (0.01)	.234***

Notes: ***p<.001, **p<.01, *p<.05.

Full Model (Model 10): χ^2 (64) = 85.69, p < .05, *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .45.

Reduced Model (Model 11): χ^2 (76) = 101.05, p < .05; *CFI* = .996, *TLI* = .99, *RMSEA* = .02, (90 % CI = .01 - .03), *WRMR* = .50.

Table 4.18

Unstandardized and Standardized Factor Loadings of the Latent Constructs for Model 10 and Model 11 in Figure 4.12 (Standard Errors in Parentheses; N = 1052)

	Full Model		***Reduced Model***	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Language skills (a5)				
Listening comprehension (a5)	1.186 (0.11)	.439***	1.176 (0.10)	.491***
Sentence repetition (a5)	1.000 (0.00)	.660fixed(1)	1.000 (0.00)	.745fixed(1)
Syllabification (a5)	.636 (0.07)	.564***	.600 (0.06)	.600***
Receptive vocabulary (a5)	.837 (0.09)	.840***	.739 (0.07)	.838***
Verbal Working Memory (a5)				
Sentence repetition (a5)	1.000 (0.00)	.485fixed(1)	1.000 (0.00)	.384fixed(1)
Listening comprehension (a5)	1.001 (0.31)	.272***	1.124 (0.33)	.242***
Syllabification (a5)	.297 (0.10)	.194***	.316 (0.11)	.163**
Home Literacy Environment (a3)				
Availability of books at home (a3)	2.384 (0.14)	.909***	2.388 (0.14)	.904***
Parental teaching of pre-literacy skills (a3)	1.000 (0.00)	.652fixed(1)	1.000 (0.00)	.648fixed(1)
Shared-book reading (a3)	1.945 (0.11)	.741***	1.950 (0.11)	.738***

Note: ***p<.001, **p<.01, *p<.05.

4.5.8 The mediating roles of receptive vocabulary, other foundational language skills, verbal working memory and word reading in the association of home literacy environment with reading comprehension

The current study primarily aimed to examine the mediating roles of receptive vocabulary at age four, language skills construct at age five and word reading skills at age seven in the association of home literacy environment with reading comprehension. Table 4.19 shows the

unstandardized, standardized path coefficients and the significance levels of the mediating effects. The indirect effect of home literacy environment at age three on reading comprehension at age seven through language skills construct at age five was statistically significant, (β = .050). As expected, the indirect path from home literacy environment at age three to reading comprehension at age seven through receptive vocabulary at age four, language skills construct at age five and word reading at age seven was also significant (β = .019). The children's home literacy environment at age three predicted their children's language skills at age five and in turn, the language skills resulted in successful word reading and then reading comprehension at age seven. However, when word reading was removed from this path, the indirect effect of home literacy environment on reading comprehension was non-significant. This result supported that word reading is a proximate predictor of reading comprehension. The indirect effect of home literacy environment at age three on reading comprehension at age seven through verbal working memory at age five was non-significant, (β = -.009).

Home literacy environment at age three not only indirectly, but also directly predicted reading comprehension at age seven, (β = .159). Therefore, the child's receptive vocabulary at age four, language skills construct at age five and word reading skill at age seven partially mediated the association between home literacy environment at age three and reading comprehension at age seven, after controlling for receptive vocabulary at age three, visual-spatial working memory at age three, verbal working memory and visual-spatial working memory at age six.

Table 4.19

Unstandardized and standardized mediating effects of receptive vocabulary, language skills, verbal working memory and word reading between home literacy environment and reading comprehension (Standard Errors in Parentheses; N = 1052)

Paths	*Unstandardized*	*Standardized*
Home literacy environment-language skills-reading comprehension	.119 (0.06)	.050*
Home literacy environment-language skills-word reading-reading comprehension	.147 (0.03)	.062***
Home literacy environment-verbal working memory at age five-reading comprehension	-.020 (0.06)	-.009
Home literacy environment-verbal working memory at age five-word reading-reading comprehension	-.013 (0.01)	-.006
Home literacy environment-receptive vocabulary at age four-language skills-reading comprehension	.038 (0.02)	.016
Home literacy environment-receptive vocabulary at age four-language skills-word reading-reading comprehension	.046 (0.02)	.019***
Direct effect	.379 (0.19)	.159*

Note: ***$p<.001$, *$p<.05$.

Table 4.20 shows how well endogenous variables (e.g. home literacy environment at age three, receptive vocabulary at age four, language skills at age five, verbal working memory at age five, word reading and reading comprehension at age seven) were accounted for by their predictors in the model. As indicated in Table 4.20, the predictors of home literacy environment (e.g. mother's education and economic status of the family) accounted for 55% variance in home literacy environment. It means that mother's education level and economic status of the family are strong predictors of whether or not the literacy context provided to the children at their homes was supportive of their literacy development. Thirty-eight percent variance in reading comprehension

skills of the children was accounted for by home literacy environment at age three, word reading at age seven, language skills at age five and verbal working memory at age six.

Table 4.20

Squared multiple correlations (R^2) of endogenous variables in the full model

Endogenous Variables	*Full Model*
Home Literacy Environment (a3)	.55***
Receptive vocabulary (a4)	.40***
Language skills (a5)	.76***
Verbal Working Memory (a5)	.09
Word reading (a7)	.28***
Reading Comprehension (a7)	.38***

Note. ***p<.001.

Chapter 5: Discussion

Based on the emergent literacy theory, the current study longitudinally examines the association of home literacy environment with reading comprehension. The mediating effects of receptive vocabulary, other foundational language skills, visuospatial and verbal working memory, and reading recognition on the association of home literacy environment with reading comprehension are also examined. Emergent literacy theory holds that the literacy development of children begins at very early ages, even at birth (Clay, 1966). It points out that the components of literacy development which are writing, reading, speaking and listening develop simultaneously. Moreover, emergent literacy theory emphasizes the importance of rich home-based literacy activities. Children acquire literacy (e.g. language, reading and writing) through the interactions with competent adults or older people (e.g. father, siblings, grandmother, grandfather and babysitter) around them but most importantly their mothers. Therefore, an enriched and stimulating home literacy environment and literacy related activities with adults have a positive effect on children's literacy development.

5.1 Summary of findings

The present study showed that home literacy environment in early childhood was associated with children's reading comprehension at school ages through vocabulary knowledge, language skills, which included both vocabulary knowledge and other foundational language skills (e.g. phonological awareness), and reading recognition. A supportive home literacy environment had direct associations with children's vocabulary knowledge and other indicators of language skills and in turn, was associated with high reading recognition and ultimately high reading

comprehension. Moreover, an enriched home literacy environment was also directly associated with children's reading comprehension.

A finding of the current study was that home literacy environment in early childhood was associated with children's receptive vocabulary knowledge. The results validated the findings of previous studies (Mol, Bus, de Jong, & Smeets, 2008; Kim et al., 2015; Farver et al., 2013; Niklas & Schneider, 2013). Children who were exposed to a supportive literacy environment (e.g. through book reading) had more growth in their vocabulary knowledge than children exposed to less stimulating literacy environment (Bingham, 2007; Walley, Metsala & Garlock, 2003; Farrant & Zubrick, 2012; Prevoo et al., 2014).

The current study also examined the association of home literacy environment with language skills. Results showed that home literacy environment contributed to children's language skills conceptualized as a combination of listening comprehension, syllabification, sentence repetition and receptive vocabulary knowledge. Home-based literacy activities allowed the children to practice their listening comprehension skills (Sénéchal & LeFevre, 2002) and to acquire different words (Raikes et al., 2006). Sonnenschein & Munsterman (2002) also indicated that the frequency of home-based reading with the mothers was a significant predictor of early language skills.

Availability of books at home and shared-book reading are referred to as informal literacy activities (Sénéchal et al., 1998). These informal literacy activities are likely to have direct associations with children's listening comprehension skills and receptive vocabulary knowledge. During a book reading activity, children encounter new vocabulary (Wasik & Bond, 2001) and learn the meanings of new words from the explanations of adults (Coyne, McCoach & Kapp, 2007). Similar to previous studies (Bus et al., 1995; Whitehurst et al., 1994), the current study also

pointed out the importance of reading aloud to children in preschool years for their listening and reading comprehension, and language skills. As a result, literacy activities with the mothers are important for children's outcomes in listening comprehension and vocabulary knowledge, and ultimately, reading comprehension.

This study found that home literacy environment in early childhood was negatively associated with verbal working memory conceptualized as a combination of listening comprehension, syllabification and sentence repetition skills. Additional analyses showed that the mother's verbal working memory, warmth, responsivity and inductive reasoning in childrearing were also important predictors of children's verbal working memory. Among the children who came from a poor literacy environment, those who had a high level of verbal working memory were more likely to be exposed to maternal warmth, responsivity and inductive reasoning in childrearing than the children who had a low level of verbal working memory. Moreover, among the children who came from a poor literacy environment, the mothers of the children with a high level of verbal working memory had better verbal working memory skill than the mothers of the children with a low level of verbal working memory. Farah et al. (2008) found that environmental stimulation (e.g. stimulating verbally and cognitively via toys and activities) was associated with language development while parental nurturance (e.g. warmth and parental care) was related to memory development. Strong evidence about the importance of maternal nurturance for the development of the hippocampus, which is related to working memory, was also found in both animal and human studies (Liu, Diorio, Day, Francis & Meaney, 2000; Luby, Belden, Harms, Tillman & Barch, 2016). Early child maltreatment such as emotional neglect was associated with a deficit in verbal working memory (Bremner et al., 1995; Irigaray et al., 2013).

"The Simple View of Reading" declared that reading comprehension was based on two basic skills: word decoding and listening comprehension (Gough & Tunmer, 1986). When decoding or word recognition skill was automatized, the influence of listening comprehension on reading comprehension increased (Gough, Hoover & Peterson, 1996). This study pointed out that receptive vocabulary contributed to children's language skills with four indicators which were listening comprehension, phonological awareness, receptive vocabulary and expressive language skills and in turn, strong language skills were associated with successful reading recognition and reading comprehension at school ages. A moderate association of vocabulary with both decoding and reading comprehension was also supported by previous studies (Scarborough, 2001; Sénéchal, Quellette & Rodney, 2006). Previous studies also showed that listening comprehension was a necessary ability to be successful in comprehending written language (Gough & Tunmer, 1986; Hogan, Adlof & Alonzo, 2014). Similar to the findings of this study, Verhoeven and Van Leeuwe (2008), and de Jong and van der Leij (2002) found that a rich vocabulary and high competence in word decoding and listening comprehension had direct associations with reading comprehension.

The present study showed that verbal working memory (including listening comprehension, phonological awareness and sentence repetition) was not associated with either reading recognition or reading comprehension. The reason was that the children did not require to memorize anything in these tasks. Word reading assessment required the children only to read the list of the words. Reading comprehension assessment did not also require to memorize the stories the children read because both the questions and the printed stories were available to them at all times. A previous study reported that there was no an association of verbal working memory with reading comprehension (Goff et al., 2005). However, the same study also emphasized that word reading and language skills were important predictors of reading comprehension, similar to the

present study. Reading comprehension was significantly predicted by language skills and word reading, but not by verbal working memory.

The results of mediation analysis mostly supported our expectations. The results showed that receptive vocabulary, other indicators of language skills and reading recognition mediated the association of home literacy environment in early childhood with reading comprehension at school ages. There was an indirect association of home literacy environment with reading comprehension through receptive vocabulary, other indicators of language skills and reading recognition, even after controlling for earlier receptive vocabulary and working memory skills of children. The standardized indirect effect of home literacy environment on reading comprehension through receptive vocabulary, indicators of language skills and reading recognition was significant, but small (*d*=.02). Another study also pointed out that home literacy environment had an indirect effect on reading comprehension through print exposure and explained 22% variance in reading comprehension (Boerma, Mol & Jolles, 2017).

This study also showed that home literacy environment had a direct effect on reading comprehension. The standardized direct effect of home literacy environment on reading comprehension was moderate (*d*=.16). The association of home literacy environment with reading comprehension was partially mediated by receptive vocabulary, indicators of language skills and reading recognition. Consequently, the current study significantly supported most of our expectations except the hypothesis about verbal working memory skill. The total effect size of the association of home literacy environment with reading comprehension was large and positive (*d*=.30).

This study also found that mother's education and economic status of the families had direct associations with the home literacy environment of children in early childhood. Previous

studies also showed similar associations of mother's education and economic well-being with home literacy environment (Evans, 2004; Leppänen, Niemi, Aunola & Nurmi, 2004; Linver, Brooks-Gunn & Kohen, 2002; Silinkas et al., 2010; Sirin, 2005). The mothers of high economic status most probably provided more children's books and other printed resources (e.g. adults' books, newspapers or magazines) to their children than the mothers of low economic status. Those of high economic status might spend more time reading a book with their children or to engage in literacy-related activities than the mothers of low economic status. Previous studies showed similarly that mothers with high education level provided a stimulating literacy and print environment to their children (Dubow, Boxer and Huesmann, 2009; Brannon & Dauksas, 2012; King, 1995).

The study also showed that mother's education and economic well-being were not significantly associated with the child's language constructs, word reading and reading comprehension after controlling earlier ages. At early ages, the child was mostly interacted with the mother, so mother's education and income as an indicator of the availability of stimulating and enriched environment in literacy were significant for the child's language outcomes (Schady, 2011). However, at school ages, the effects of peer and school environment on language outcomes were significant. The child's word reading and reading comprehension skills were no longer associated with the mother's education and income at school ages.

5.2 Contributions

This study longitudinally examined the association of home literacy environment in early childhood and reading comprehension at school ages to understand how literacy developed. Family characteristics (e.g. mother's education and economic status), parenting inputs related to literacy development (e.g. home literacy environment), cognitive (e.g. working memory) and verbal

abilities (e.g. receptive vocabulary and other language skills) were simultaneously analyzed. It was a comprehensive study because substantial number of factors which had potential to influence the development of reading comprehension skill were examined in this study.

Previous studies found supportive evidence for the positive association between home literacy environment and literacy development of children (Storch & Whitehurst, 2001; Sénéchal & LeFevre, 2014; Yeo et al., 2014; Kim et al., 2015). However, most of those studies were conducted with Western sample such as Dutch, English, American or Spanish (Sonnenschein & Munsterman, 2002; Liebeskind, Piotrowski, Lapierre & Linebarger, 2014; Sénéchal & LeFevre, 2014; Brown, Byrnes, Raban & Watson, 2012). There were a few studies conducted with non-Western sample such as Arabs (Korat et al., 2013; Aram et al., 2013). However, to our knowledge, literature did not include a study which was comprehensively examined the effect of home literacy environment on reading recognition and reading comprehension skills of Turkish children. This was a population with much lower average literacy levels among mothers than other frequently studied populations. Indeed, we found that in some instances, maternal responsiveness and warmth was just as closely associated with verbal development as literacy activities with the child. For this reason, this study made a unique contribution to the literature.

5.3 Limitations

Some limitations of the present study should be taken into consideration. In the current study, home literacy environment was conceptualized with three indicators such as shared-book reading, availability of books at home and parental teaching of pre-literacy skills. However, some previous studies defined home literacy environment in a comprehensive way. For example, Griffin and Morrison (1997) measured home literacy environment with television viewing, library visits, parental book reading, shared-book reading, magazine and newspaper subscriptions. Martini &

Sénéchal (2012) also included parental teaching of alphabet letters, printing and reading words, parental expectations for their children's early literacy skills and children's interest in reading as the components of home literacy environment. In the current study, the measurement of home literacy environment was limited. Nevertheless, the results of the current study were aligned with the previous studies using comprehensive measures of home literacy environment.

The questionnaire of Home Observation for Measurement of the Environment (HOME-TR) measured shared-book reading with only one question (e.g. "How frequently do you or the other members of the family read books to your child?"). Mothers only answered this specific question to report the frequency of shared-book reading with their children. However, it might increase the probability of social desirability response bias among the mothers. Therefore, some studies had also given a "children's book title checklist" which included children's book titles and fillers to decrease this bias (Sénéchal et al., 1996; Evans et al., 2000). Mothers were asked to indicate which items were the titles of real children's books. Mothers who really engaged in frequently shared-book reading with their children were supposed to recognize the titles of real children's books.

In the current study, shared-book reading was measured as a quantity by asking the frequency of reading aloud with children, but the quality of interactions during this activity was important for the development of reading comprehension skill. Landry et al. (2012) emphasized that interactive reading and encouraging the child to participate actively in reading activity are necessary for effective learning. In an intervention study conducted by Landry et al. (2012), when mothers interactively engaged in the literacy activities by expanding talk about the text with the examples, the literacy activity supported to increase children's language skills. Therefore, the

quality of mother-child interaction during shared-book reading could be analyzed via a video-recording, in addition to the question asking the frequency of shared-book reading.

Another limitation of this study was related to the availability of books at home. In the HOME-TR scale, the availability of books at home was measured based on the observations of the interviewers. The interviewers reported the availability of books at home with those two items "The child has at least three child books at home." and "There are at least 10 books to read other family members except the child" by choosing "yes" or "no" options. However, most of the studies directly asked for parents to report how many books there were at home (Raz & Bryant, 1990; Karlsen, Lyster & Lervåg, 2017).

5.4 Future studies and suggestions

The current study validated the positive association of home literacy environment in early childhood with children's receptive vocabulary and language skills, and then reading recognition and reading comprehension at school ages among Turkish children, even after controlled earlier receptive vocabulary and working memory skills. However, future studies may conduct new research by taking into consideration of the limitations pointed out in the current study. They may conceptualize or measure home literacy environment in a comprehensive way, including most factors which may affect the development of children's literacy development, such as parenting attitudes and behaviors toward reading, the number of books or magazine at home, library visits, the frequency of buying newspaper in a week, playing games related to literacy, parental teaching of reading and writing and shared-book reading etc.

Moreover, this study emphasized the importance of literacy activities at early ages for reading achievement. Therefore, some interventions or policy implications with collaborations

among local authorities, government, psychologists and educators may be put into practice to increase the interactions between mother and child during literacy activities. Those intervention studies also increase the awareness of the mothers about the importance of literacy activities at home for their children's literacy development.

REFERENCES

Aber, J. L., Jones, S. M. & Cohen, J. (2000). The impact of poverty on the mental health and development of very young children, in: C. H. Zeanah Jr. (Ed.) *Handbook of infant mental health (2nd ed.)* (New York, Guilford Press), 113–128.

Aikens, N. L., & Barbarin, O. (2008). Socioeconomic Differences in Reading Trajectories: The Contribution of Family, Neighborhood, and School Contexts. *Journal of Educational Psychology*, 100(2), 235-251. doi:10.1037/0022-0663.100.2.235

Aram, D., Korat, O., Saiegh-Haddad, E., Arafat, S. H., Khoury, R., & Elhija, J. A. (2013). Early literacy among Arabic-speaking kindergartners: The role of socioeconomic status, home literacy environment and maternal mediation of writing. *Cognitive Development*, 28(3), 193-208. doi:10.1016/j.cogdev.2012.10.003

Arrington, C. N., Kulesz, P. A., Francis, D. J., Fletcher, J. M., & Barnes, M. A. (2014). The contribution of attentional control and working memory to reading comprehension and decoding. *Scientific Studies of Reading*, 18(5), 325-346. doi:10.1080/10888438.2014.902461

Babayiğit, S., & Stainthorp, R. (2007). Preliterate phonological awareness and early literacy skills in Turkish. *Journal of Research in Reading*, 30(4), 394-413. doi:10.1111/j.1467-9817.2007.00350.x

Babayiğit, S., & Stainthorp, R. (2014). Correlates of early reading comprehension skills: a componential analysis. *Educational Psychology*, 34(2), 185-207. doi:10.1080/01443410.2013.785045

Baker, C. E. (2013). Fathers' and mothers' home literacy involvement and children's cognitive and social emotional development: Implications for family literacy programs. *Applied Developmental Science*, 17(4), 184-197. doi:10.1080/10888691.2013.836034

Baroody, A. E., & Diamond, K. E. (2012). Links among home literacy environment, literacy interest, and emergent literacy skills in preschoolers at risk for reading difficulties. *Topics in Early Childhood Special Education*, 32(2), 78–87. doi:10.1177/0271121410392803.

Baydar, N., & Bekar, O. (2007). *HOME observation and interview scales*. Unpublished manuscript. Retrieved from http://portal.ku.edu.tr/~ECDET/index.htm.

Baydar, N., Küntay, A. & Akcinar, B., (2012). *One Minute Reading Test*, Unpublished Manuscript, Department of Psychology, Koc University, Istanbul.

Baydar, N., Küntay, A. & İmer, N., (2012). *Okuduğunu Anlama ve Boşluk Doldurma Testi*, Yayınlanmamış Çalışma, Psikoloji Bölümü, Koç Üniversitesi, İstanbul.

Baydar, N., Küntay, A., Goksen, F., Yagmurlu B. & Cemalcilar, Z. (2010). *The Syllable Segmentation Task*, Unpublished Manuscript, Department of Psychology, Koc University, Istanbul.

Baydar, N., Küntay, A., Goksen, F., Yagmurlu, B. & Cemalcilar, Z. (2007). [The Study of Early Childhood Developmental Ecologies in Turkey-Measures used in the ECDET]. Retrieved from http://portal.ku.edu.tr/~ECDET/index.htm

Baydar, N., Küntay, A., Goksen, F., Yagmurlu, B. & Cemalcilar, Z. (2009). *The Sentence Repetition Test*, Unpublished Manuscript, Department of Psychology, Koc University, Istanbul.

Baydar, N., Küntay, A., Gökşen, F., Yağmurlu, B. & Cemalcılar, Z. (2008). [Türkiye'de Erken Çocukluk Gelişim Ekolojileri (TEÇGE) Çalışması -1. Tur Verileri]. Erişim: http://portal.ku.edu.tr/~tecge/index.htm.

Baydar, N., Yagmurlu, B., Cankaya, D., Küntay, A. C., Aydemir, N., Goksen, F., & Cemalcilar, Z. (2014). "It Takes a Village" to Support the Vocabulary Development of Children With Multiple Risk Factors. *Developmental Psychology*, 50(4), 1014-1025. doi:10.1037/a0034785

Baydık, B. (2003). Filizlenen Okuryazarlık ve Desteklenmesi, *Özel Eğitim Dergisi*, 4 (2), 77-89. Retrieved from http://dergiler.ankara.edu.tr/dergiler/39/1954/20463.pdf

Begeny, J. C., Krouse, H. E., Ross, S. G., & Mitchell, R. C. (2009). Increasing elementary-aged students' reading fluency with small-group interventions: A comparison of repeated reading, listening passage preview, and listening only strategies. *Journal of Behavioral Education*, 18(3), 211-228. doi:10.1007/s1

Bennett, K. K., Weigel, D. J., & Martin, S. S. (2002). Children's acquisition of early literacy skills: examining family contributions. *Early Childhood Research Quarterly*, 17(3), 295.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588-606. doi:10.1037/0033-2909.88.3.588

Berch, D. B., Krikorian, R., & Huha, E. M. (1998). The Corsi block-tapping task: methodological and theoretical considerations. *Brain and Cognition*, 38(3), 317-338.

Bergen, E. V., Zuijen, T. V., Bishop, D., & Jong, P. D. (2017). Why Are Home Literacy Environment and Children's Reading Skills Associated? What Parental Skills Reveal. *Reading Research Quarterly*, 52(2), 147-160. doi:10.1002/rrq.160

Berument, S. K. & Guven, A. G. (2010) Turkish Expressive and Receptive Language Test: Receptive vocabulary sub-scale (TIFALDI-RT). *Turkish Psychological Association*, Turkey, Ankara (2010).

Betjemann, R. S., Willcutt, E. G., Olson, R. K., Keenan, J. M., De Fries, J. C., & Wadsworth, S. J. (2008). Word reading and reading comprehension: Stability, overlap and independence. *Reading and Writing*, 21, 539–558. doi:10.1007/s11145-007-9076-8

Białecka-Pikul, M., Kosno, M., & Byczewska-Konieczny, K. (2016). Where was it? Working memory as a predictor of passive vocabulary development in the third year of life. *Polish Psychological Bulletin*, 47(1), 92-102. doi:10.1515/ppb-2016-0010

Bingham, G. E. (2007). Maternal literacy beliefs and the quality of mother-child book-reading interactions: Associations with children's early literacy development. *Early Education and Development*, 18(1), 23-49. doi:10.1080/10409280701274428

Boerma, I. E., Mol, S. E., & Jolles, J. (2017). The Role of Home Literacy Environment, Mentalizing, Expressive Verbal Ability, and Print Exposure in Third and Fourth Graders' Reading Comprehension. *Scientific Studies of Reading*, 21(3), 179-193. doi:10.1080/10888438.2016.1277727

Bracken, S. S., & Fischel, J. E. (2008). Family reading behavior and early literacy skills in preschool children from low-income backgrounds. *Early Education and Development*, 19(1), 45-67. doi:10.1080/10409280701838835

Bradley, R. & Caldwell, B. (1984a). *Home observation for measurement of the environment. Little Rock,* AR: University of Arkansas at Little Rock.

Bradley, R. H. (1981). The HOME Inventory: A review of findings from the Little Rock Longitudinal Study. *Infant Mental Health Journal*, 2(3), 198-205. doi:10.1002/1097-0355(198123)2:3<198::AID-IMHJ2280020308>3.0.CO;2-P

Bradley, R. H., & Caldwell, B. M. (1979). Home observation for measurement of the environment: a revision of the preschool scale. *American Journal of Mental Deficiency*, 84(3), 235-244.

Brannon, D. & Dauksas, L. (2012). Studying the Impact of Dialogic Training on Mothers with Lower Education Levels. *National Teacher Education Journal*, 5(4), 9-19.

Bremner, J. D., Randall, P., Scott, T. M., Capelli, S., Delaney, R., McCarthy, G., & Charney, D. S. (1995). Deficits in short-term memory in adult survivors of childhood abuse. *Psychiatric Research*, 59(1-2), 97-107.

Brown, P. M., Byrnes, L. J., Raban, B., & Watson, L. (2012). Young learners: The home literacy environments of Australian four-year-olds. *Journal of Research in Childhood Education*, 26(4), 450-460. doi:10.1080/02568543.2012.712086

Burgess, S. R. (2002). The influence of speech perception, oral language ability, the home literacy environment, and pre-reading knowledge on the growth of phonological sensitivity: A one-year longitudinal investigation. *Reading and Writing*, 15(7-8), 709-737. doi:10.1023/A:1020954606695

Burgess, S. R., Hecht, S. A., & Lonigan, C. J. (2002). Relations of the home literacy environment (HLE) to the development of reading-related abilities: A one-year longitudinal study. *Reading Research Quarterly*, 37(4), 408-426. doi:10.1598/RRQ.37.4.4

Bus, A. G., van IJzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research*, 65(1), 1-21. doi:10.2307/1170476

Cain, K. (2010). *Reading development and difficulties*. Chichester: Blackwell.

Cain, K., Oakhill, J., & Bryant, P. (2004a). Children's Reading Comprehension Ability: Concurrent Prediction by Working Memory, Verbal Ability, and Component Skills. *Journal of Educational Psychology*, 96(1), 31-42. doi:10.1037/0022-0663.96.1.31

Carroll, C. J. (2013). *The Effects of Parental Literacy Involvement and Child Reading Interest on the Development of Emergent Literacy Skills*. University of Wisconsin Milwaukee: Theses and Dissertations. Retrieved from http://dc.uwm.edu/cgi/viewcontent.cgi?article=1235&context=etd

Carver, R. P. (2003). The highly lawful relationships among pseudo-word decoding, word identification, spelling, listening, and reading. *Scientific Studies of Reading*, 7, 127–154.

Catts, H. W., Hogan, T. P. & Adlof, S. M. (2005). Developmental changes in reading and reading disabilities. In: Catts, H. W., Kamhi, A. G., editors. *The connections between language and reading disabilities*. Mahwah, NJ: Erlbaum; pp. 25–40.

Chaves-Sousa, S., Santos, S., Viana, F. L., Vale, A. P., Cadime, I., Prieto, G., & Ribeiro, I. (2017). Development of a word reading test: Identifying students at-risk for reading problems. *Learning and Individual Differences*, 56159-166. doi:10.1016/j.lindif.2016.11.008

Chiu, M. M., & McBride-Chang, C. (2006). Gender, Context, and Reading: A Comparison of Students in 43 Countries. *Scientific Studies of Reading*, 10(4), 331-362. doi:10.1207/s1532799xssr1004_1

Chiu, M. M., McBride-Chang, C., & Lin, D. (2012). Ecological, psychological, and cognitive components of reading difficulties: Testing the component model of reading in fourth graders across 38 countries. *Journal of Learning Disabilities*, 45(5), 391-405. doi:10.1177/0022219411431241

Clarke, P. J., Snowling, M. J., Truelove, E., & Hulme, C. (2010). Ameliorating Children's Reading-Comprehension Difficulties: A Randomized Controlled Trial. *Psychological Science* (0956-7976), 21(8), 1106-1116. doi:10.1177/0956797610375449

Clay, M. M. (1966). *Emergent reading behavior*. Unpublished doctoral dissertation. University of Auckland, New Zealand.

Clay, M. M. (2001). *Change over time in children's literacy development*. Portsmouth, NH: Heinemann.

Coltheart, M. (1979). When can children learn to read, and when should they be taught? In Waller, T.G., and McKinnon, G.E. (Eds.), *Reading Research: Advances in Theory and Practice*, Volume 1. New York: Academic Press.

Connor, C., Morrison, F., & Slominski, L. (2006). Preschool instruction and children's emergent literacy growth. *Journal of Educational Psychology*, 98, 665-689.

Corsi, P. M. (1972). Human memory and the medial temporal region of the brain. *Dissertation Abstracts International*, 34 (02), 891B. (University Microfilms No. AAI05–77717).

Coyne, M. D., McCoach, D. B., & Kapp, S. (2007). Vocabulary intervention for kindergarten students: Comparing extended instruction to embedded instruction and incidental exposure. *Learning Disability Quarterly*, 30, 74–88.

Crawford, P. A. (1995). Early literacy: Emerging perspectives. *Journal of Research in Childhood Education*, 10, 71-86.

Cutting, L. E., & Scarborough, H. S. (2006). Prediction of Reading Comprehension: Relative Contributions of Word Recognition, Language Proficiency, and Other Cognitive Skills Can Depend on How Comprehension Is Measured. *Scientific Studies of Reading*, 10(3), 277-299. doi:10.1207/s1532799xssr1003_5

Davis-Kean, P. E. (2005). The influence of parent education and family income on child achievement: the indirect role of parental expectations and the home environment. *Journal of Family Psychology*: JFP: *Journal of The Division of Family Psychology of The American Psychological Association* (Division 43), 19(2), 294-304.

Davis-Kean, P. E., & Sexton, H. R. (2009). Race differences in parental influences on child development. *Merrill-Palmer Quarterly*, 55, 285–318. doi:10.1353/mpq.0.0023

Deckner, D. F., Adamson, L. B., & Bakeman, R. (2006). Child and maternal contributions to shared reading: Effects on language and literacy development. *Applied Developmental Psychology*, 27, 31-41.

De Jong, P. F., & Leseman, P. M. (2001). Lasting Effects of Home Literacy on Reading Achievement in School. *Journal of School Psychology*, 39(5), 389-414.

De Jong, P. F., & van der Leij, A. (2002). Effects of Phonological Abilities and Linguistic Comprehension on the Development of Reading. *Scientific Studies of Reading*, 6(1), 51-77.

DeTemple, J., & Snow, C. E. (2003). Learning words from books. In A. Van Kleeck, S. A. Stahl, & E. B. Bauer (Eds.), *On reading books to children: Parents and teachers* (pp. 16–36). Mahwah, NJ: Erlbaum.

Dieterich, S. E., Assel, M. A., Swank, P., Smith, K. E., & Landry, S. H. (2006). The impact of early maternal verbal scaffolding and child language abilities on later decoding and reading comprehension skills. *Journal of School Psychology*, 43(6), 481-494. doi:10.1016/j.jsp.2005.10.003

Dubow, E. F., Boxer, P., & Huesmann, L. R. (2009). Long-term effects of parents' education on children's educational and occupational success: Mediation by family interactions, child aggression, and teenage aspirations. *Merrill-Palmer Quarterly*, 55(3), 224-249. doi:10.1353/mpq.0.0030

Durgunoğlu, A. Y., & Öney, B. (1999). A cross-linguistic comparison of phonological awareness and word recognition. *Reading and Writing*, 11(4), 281-299. doi:10.1023/A:1008093232622

Elwér, S., Keenan, J. M., Olson, R. K., Byrne, B., & Samuelsson, S. (2013). Longitudinal stability and predictors of poor oral comprehenders and poor decoders. *Journal of Experimental Child Psychology*, 115(3), 497-516. doi:10.1016/j.jecp.2012.12.001

Engle, R. W. (2002). Working memory capacity as executive attention. *Current Directions in Psychological Science*, 11, 19–23. doi:10.1111/1467-8721.00160

Evans, G. W. (2004). The Environment of Childhood Poverty. *American Psychologist*, 59(2), 77-92. doi.org/10.1037/0003-066X.59.2.77

Evans, M. A., & Shaw, D. (2008). Home grown for reading: Parental contributions to young children's emergent literacy and word recognition. *Canadian Psychology,* 49(2), 89-95. doi:10.1037/0708-5591.49.2.89

Evans, M. A., Shaw, D., & Bell, M. (2000). Home literacy activities and their influence on early literacy skills. *Canadian Journal of Experimental Psychology,* 54(2), 65-75. doi:10.1037/h0087330

Farah, M. J., Betancourt, L., Shera, D. M., Savage, J. H., Giannetta, J. M., Brodsky, N. L., & ... Hurt, H. (2008). Environmental stimulation, parental nurturance and cognitive development in humans. *Developmental Science*, 11(5), 793-801. doi:10.1111/j.1467-7687.2008.00688.x

Farrant, B. M., & Zubrick, S. R. (2012). Early vocabulary development: The importance of joint attention and parent-child book reading. *First Language*, 32(3), 343-364. doi:10.1177/0142723711422626

Farrell, L., Davidson, M., Hunter, M. & Osenga, T. (2010). The Simple View of Reading. *The Centre for Development & Learning*. Retrieved from http://www.cdl.org/articles/the-simple-view-of-reading/.

Farver, J. A. M., Xu, Y., Lonigan, C. J., & Eppe, S. (2013). The home literacy environment and Latino head start children's emergent literacy skills. *Developmental Psychology*, 49, 775–791. doi:10.1037/a0028766.

Foorman, B. R., Herrera, S., Petscher, Y., Mitchell, A., & Truckenmiller, A. (2015). The structure of oral language and reading and their relation to comprehension in Kindergarten through Grade 2. *Reading and Writing*, 28(5), 655-681. doi:10.1007/s11145-015-9544-5

Foster, M. A., Lambert, R., Abbott-Shim, M., McCarty, F., & Franze, S. (2005). A model of home learning environment and social risk factors in relation to children's emergent literacy and social outcomes. *Early Childhood Research Quarterly*, 20(1), 13-36. doi:10.1016/j.ecresq.2005.01.006

Foy, J. G., & Mann, V. (2003). Home literacy environment and phonological awareness in preschool children: Differential effects for rhyme and phoneme awareness. *Applied Psycholinguistics*, 24(1), 59-88. doi:10.1017/S0142716403000043

Frijters, J. C., Barron, R. W., & Brunello, M. (2000). Direct and mediated influences of home literacy and literacy interest on prereaders' oral vocabulary and early written language skill. *Journal of Educational Psychology*, 92(3), 466-477. doi:10.1037/0022-0663.92.3.466

Garson, G. D. (2015). *Missing Values Analysis and Data Imputation*. Asheboro, NC: Statistical Associates Publishers.

Gentaz, E., Sprenger-Charolles, L., Theurel, A. (2015) Differences in the Predictors of Reading Comprehension in First Graders from Low Socio-Economic Status Families with Either Good or Poor Decoding Skills. *PLoS ONE* 10(3): e0119581. https://doi.org/10.1371/journal.pone.0119581

Gesell, A. (1940). *The first five years of life: A guide to the study of the preschool child*. New York:

Goff, D. A., Pratt, C., & Ong, B. (2005). The relations between children's reading comprehension, working memory, language skills and components of reading decoding in a normal sample. *Reading and Writing*, 18(7-9), 583-616. doi:10.1007/s11145-004-7109-0

Gonzalez, J. E., Acosta, S., Davis, H., Pollard-Durodola, S., Saenz, L., Soares, D., & Zhu, L. (2017). Latino maternal literacy beliefs and practices mediating socioeconomic status and maternal education effects in predicting child receptive vocabulary. *Early Education and Development*, 28(1), 78-95. doi:10.1080/10409289.2016.1185885

Gough, P. B. & Tunmer, W. E., 1986. Decoding, reading and reading disability. *RASE: Remedial and Special Education*, 7, 6-10.

Gough, P. B., Hoover, W. A., & Peterson, C. L. (1996). Some observations on a simple view of reading. In C. Cornoldi & J. Oakhill (Eds.), *Reading comprehension difficulties: Processes and intervention*, (1 – 13), Mahwah, NJ: Lawrence Erlbaum Associates.

Griffin, E. A., & Morrison, F. J. (1997). The unique contribution of home literacy environment to differences in early literacy skills. *Early Child Development and Care*, 127-128233-243. doi:10.1080/0300443971270119

Guerrero, A. D., Fuller, B., Chu, L., Kim, A., Franke, T., Bridges, M., & Kuo, A. (2013). Early growth of Mexican-American children: Lagging in pre-literacy skills but not social development. *Maternal and Child Health Journal*, 17, 1701–1711. doi:10.1007./s10995-012-1184-7

Han, J., & Neuharth-Pritchett, S. (2014). Parents' Interactions with Preschoolers during Shared Book Reading: Three Strategies for Promoting Quality Interactions. *Childhood Education*, 90(1), 54-60. doi:10.1080/00094056.2014.872516

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: P. H. Brookes.

Hart, B., & Risley, T.R., 2003. "The Early Catastrophe: The 30 Million Word Gap by Age 3." *American Educator*, 27 (1): 4–9.

Hartas, D. (2011). Families' social backgrounds matter: socio-economic factors, home learning and young children's language, literacy and social outcomes. *British Educational Research Journal*, 37(6), 893-914. doi:10.1080/01411926.2010.506945

Hill, M. A. & King, E. (1995). Women's Education and Economic Well-being. *Feminist Economics*, 1(2), 21-46.

Hoff, E., Laursen, B., & Tardif, T. (2002). Socioeconomic status and parenting. In M. Bornstein (Ed.), Handbook of parenting: Vol. 2. *Biology and ecology of parenting* (2nd ed., pp. 231–252). Mahwah, NJ: Lawrence Erlbaum.

Hoff, E., & Naigles, L. (2002). How children use input in acquiring a lexicon. *Child Development*, 73, 418–433.

Hogan, T. P., Adlof, S. M., & Alonzo, C. N. (2014). On the importance of listening comprehension. *International Journal of Speech-Language Pathology*, 16(3), 199-207. doi:10.3109/17549507.2014.904441

Hood, M., Conlon, E., & Andrews, G. (2008). Preschool Home Literacy Practices and Children's Literacy Development: A Longitudinal Analysis. *Journal of Educational Psychology*, 100(2), 252-271. doi:10.1037/0022-0663.100.2.252

Hoover, W. & Gough, P. (1990). The simple view of reading. *Reading and Writing: An Interdisciplinary Journal*, 2, 127–160.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1-55.

Irigaray, T. Q., Pacheco, J. B., Grassi-Oliveira, R., Fonseca, R. P., de Carvalho Leite, J. C., & Kristensen, C. H. (2013). Child maltreatment and later cognitive functioning: A systematic review. *Psicologia: Reflexão E Crítica*, 26(2), 376-387. doi:10.1590/S0102-79722013000200018

Jacobson, L. A., Ryan, M., Martin, R. B., Ewen, J., Mostofsky, S. H., Denckla, M. B., et al. (2011). Working memory influences processing speed and reading fluency in ADHD. *Child Neuropsychology*, 17, 209–224.

Johnson, A. D., Martin, A., Brooks-Gunn, J., & Petrill, S. A. (2008). Order in the House!: Associations among Household Chaos, the Home Literacy Environment, Maternal Reading Ability, and Children's Early Reading. *Merrill-Palmer Quarterly*, 54(4), 445-472.

Jordan, G., Snow, C., & Porche, M. (2000). Project EASE: The Effect of a Family Literacy Project on Kindergarten Students' Early Literacy Skills. *Reading Research Quarterly*, 35(4), 524-546. Retrieved from http://www.jstor.org/stable/748097.

Justice, L. M., Weber, S. E., Ezell, H. K., & Bakeman, R. (2002). A Sequential Analysis of Children's Responsiveness to Parental Print References during Shared Book-Reading Interactions. *American Journal of Speech-Language Pathology*, 11(1), 30.

Kalia, V., & Reese, E. (2009). Relations between Indian children's home literacy environment and their English oral language and literacy skills. *Scientific Studies of Reading*, 13(2), 122-145. doi:10.1080/10888430902769517

Kamhi, A. (2007). Knowledge deficits: the true crisis in education. *ASHA Leader*, 12(7), 28-29.

Karlsen, J., Lyster, S. H., & Lervåg, A. (2017). Vocabulary development in Norwegian L_1 and L_2 learners in the kindergarten–school transition. *Journal of Child Language*, 44(2), 402-426. doi:10.1017/S0305000916000106

Keenan, J. M., Betjemann, R. S., & Olson, R. K., (2008). Reading comprehension tests vary in the skills they assess: Differential dependence on decoding and oral comprehension. *Scientific Studies of Reading*, 12(3): 281–300. doi: 10.1080/10888430802132279.

Kim, S., Im, H., & Kwon, K. (2015). The Role of Home Literacy Environment in Toddlerhood in Development of Vocabulary and Decoding Skills. *Child & Youth Care Forum*, 44(6), 835-852. doi:10.1007/s10566-015-9309-y

Kim, Y. (2009). The relationship between home literacy practices and developmental trajectories of emergent literacy and conventional literacy skills for Korean children. *Reading and Writing: An Interdisciplinary Journal*, 22, 57–84. doi:10.1007/s11145-007-9103-9

Klebanov, P. K., Brooks-Gunn, J., & Duncan, G. J. (1994). Does Neighborhood and Family Poverty Affect Mothers' Parenting, Mental Health, and Social Support?. *Journal of Marriage & Family*, 56(2), 441-455.

Korat, O., Arafat, S. H., Aram, D., & Klein, P. (2013). Book reading mediation, SES, home literacy environment, and children's literacy: Evidence from Arabic-speaking families. *First Language*, 33(2), 132-154. doi:10.1177/0142723712455283

Landry, S. H., Smith, K. E., Swank, P. R., Zucker, T., Crawford, A. D., & Solari, E. F. (2012). The effects of a responsive parenting intervention on parent–child interactions during shared book reading. *Developmental Psychology*, 48(4), 969-986. doi:10.1037/a0026400

Lawrence, V., & Shipley, E. F. (1996). Parental speech to middle and working class children from two racial groups in three setting. *Applied Psycholinguistics*, 17, 233–256. doi:10.1017/S0142716400007657.

Leppänen, U., Niemi, P., Aunola, K., & Nurmi, J. (2004). Development of reading skills among preschool and primary school pupils. *Reading Research Quarterly*, 39(1), 72-93.

Leseman, P. M., & de Jong, P. F. (1998). Home literacy: Opportunity, instruction, cooperation, and social-emotional quality predicting early reading achievement. *Reading Research Quarterly*, 33(3), 294-318. doi:10.1598/RRQ.33.3.3

Li, L., & Tan, C. L. (2016). Home literacy environment and its influence on Singaporean children's Chinese oral and written language abilities. *Early Childhood Education Journal*, 44(4), 381-387. doi:10.1007/s10643-015-0723-4

Li, X., & Zhang, M. (2008). Reconciling DIBELS and OSELA: What every childhood educator should know. *Journal of Research in Childhood Education*, 23(1), 41-51. doi:10.1080/02568540809594645

Liebeskind, K. G., Piotrowski, J. T., Lapierre, M. A., & Linebarger, D. L. (2014). The home literacy environment: Exploring how media and parent–child interactions are associated with children's language production. *Journal of Early Childhood Literacy*, 14(4), 482-509. doi:10.1177/1468798413512850

Linver, M. R., Brooks-Gunn, J., & Kohen, D. E. (2002). Family processes as pathways from income to young children's development. *Developmental Psychology*, 38, 719–734. doi:10.1037/0012-1649.38.5.719

Liu, D., Diorio, J., Day, J. C., Francis, D. D., & Meaney, M. J. (2000). Maternal care, hippocampal synaptogenesis and cognitive development in rats. *Nature Neuroscience*, 3(8), 799.

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., Schatschneider, C. & Westberg, L. (2008). *Developing Early Literacy: Report of the National Early Literacy Panel*. Washington, DC: National Institute for Literacy.

Identification of children's skills and abilities linked to later outcomes in reading, writing, and spelling; pp. 55–106.

Luby, J. L., Belden, A., Harms, M. P., Tillman, R., & Barch, D. M. (2016). Preschool is a sensitive period for the influence of maternal support on the trajectory of hippocampal development. *Proceedings of the National Academy of Sciences of the United States of America*, 113(20), 5742-5747. doi:10.1073/pnas.1601443113

Manolitsis, G., Georgiou, G. K., & Tziraki, N. (2013). Examining the effects of home literacy and numeracy environment on early reading and math acquisition. *Early Childhood Research Quarterly*, 28(4), 692-703. doi:10.1016/j.ecresq.2013.05.004

Martini, F., & Sénéchal, M. (2012). Learning literacy skills at home: Parent teaching, expectations, and child interest. *Canadian Journal of Behavioural Science*, 44(3), 210-221. doi:10.1037/a0026758

Mason, J. M., & Sinha, S. (1992). *Emerging Literacy in Early Childhood Years: Applying A Vygotskian Model of Learning and Development* (Technical Report No. 561) Retrieved from https://www.ideals.illinois.edu/bitstream/handle/2142/17977/ctrstreadtechrepv01992i00561_opt.pdf

Mol, S. E., & Bus, A. G. (2011). To read or not to read: A meta-analysis of print exposure from infancy to early adulthood. *Psychological Bulletin*, 137(2), 267-296. doi:10.1037/a0021890

Mol, S. E., Bus, A. G., de Jong, M. T., & Smeets, D. H. (2008). Added value of dialogic parent-child book readings: A meta-analysis. *Early Education and Development*, 19(1), 7-26. doi:10.1080/10409280701838603

Montag, J. L., Jones, M. N., & Smith, L. B. (2015). The words children hear: Picture books and the statistics for language learning. *Psychological Science*, 26(9), 1489–1496. doi:10.1177/0956797615594361

Morgan, P. L., Farkas, G., & Hibel, J. (2008). Matthew effects for whom?. *Learning Disability Quarterly*, 31(4), 187-198.

Muter, V., Hulme, C., Snowling, M. J., & Stevenson, J. (2004). Phonemes, Rimes, Vocabulary, and Grammatical Skills as Foundations of Early Reading Development: Evidence from a Longitudinal Study. *Developmental Psychology*, 40(5), 665-681. doi:10.1037/0012-1649.40.5.665

Niklas, F., & Schneider, W. (2013). Home literacy environment and the beginning of reading and spelling. *Contemporary Educational Psychology*, 38, 40–50. doi:10.1016/j.cedpsych.2012.10.001

Niklas, F., & Schneider, W. (2015). With a little help: Improving kindergarten children's vocabulary by enhancing the home literacy environment. *Reading and Writing*, 28(4), 491-508. doi:10.1007/s11145-014-9534-z

Oakhill, J., Cain, K. & Bryant, P. E. (2003). The dissociation of word reading and text comprehension: Evidence from component skills. *Language and Cognitive Processes*, 18, 443–468.

Park, H. (2008). Home literacy environments and children's reading performance: A comparative study of 25 countries. *Educational Research and Evaluation*, 14(6), 489-505. doi:10.1080/13803610802576734

Payne, A. C., Whitehurst, G. J., & Angell, A. L. (1994). The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Childhood Research Quarterly*, 9(3-4), 427-440. doi:10.1016/0885-2006(94)90018-3

Poe, M. D., Burchinal, M. R., & Roberts, J. E. (2004). Early language and the development of children's reading skills. *Journal of School Psychology*, 42, 315–332. doi:10.1016/j.jsp.2004.06.001.

Prevoo, M. J. L., Malda, M., Mesman, J., Emmen, R. A. G., Yeniad, N., van Ijzendoorn, M. H. & Linting, M. (2014). Predicting ethnic minority children's vocabulary from socioeconomic status, maternal language and home reading input: Different pathways for host and ethnic language. *Journal of Child Language*, 41, 963-984.

Raikes, H., Pan, B. A., Luze, G., Tamis-LeMonda, C. S., Grooks-Gunn, J., Constantine, J., et al. (2006). Mother-child book reading in low-income families: Correlates and outcomes during the first three years of life. *Child Development*, 77, 924 –953.

Ransdell, S. (2012). There's Still No Free Lunch: Poverty as a Composite of SES Predicts School-Level Reading Comprehension. *American Behavioral Scientist*, 56(7), 908-925. doi:10.1177/0002764211408878

Rapp, D. N., & Van den Broek, P. (2005). Dynamic text comprehension: An integrative view of reading. *Current Directions in Psychological Science*, 14, 276-279. doi:10.1111/j.0963-7214.2005.00380.x

Rashid, F. L., Morris, R. D., & Sevcik, R. A. (2005). Relationship between Home Literacy Environment and Reading Achievement in Children with Reading Disabilities. *Journal of Learning Disabilities*, 38(1), 2-11.

Raz, I. S., & Bryant, P. (1990). Social background, phonological awareness and children's reading. *British Journal of Developmental Psychology*, 8, 209-225.

Ribeiro, I., Cadime, I., Freitas, T. & Viana, F. L. (2016). Beyond word recognition, fluency, and vocabulary: The influence of reasoning on reading comprehension. *Australian Journal of Psychology*, 68, 107–115.

Roberts, J., Jurgens, J., & Burchinal, M. (2005). The role of home literacy practices in preschool children's language and emergent literacy skills. *Journal of Speech, Language and Hearing Research: JSLHR*, 48(2), 345-359.

Roberts, K. L. (2013). Comprehension strategy instruction during parent–child shared reading: An intervention study. *Literacy Research and Instruction*, 52(2), 106-129. doi:10.1080/19388071.2012.754521

Rowe, M. L. (2008). Child-directed speech: Relation to socioeconomic status, knowledge of child development and child vocabulary skill. *Journal of Child Language*, 35(1), 185-205. doi:10.1017/S0305000907008343

Scarborough, H. S., & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review*, 14, 245–302. doi:10.1006/drev.1994.1010

Scarborough, H.S. (2001).Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In S.B. Neuman & D.K. Dickinson (Eds.), *Handbook of early literacy research* (pp. 97–110).New York: Guilford Press.

Schady, N. (2011). Parents' Education, Mothers' Vocabulary, and Cognitive Development in Early Childhood: Longitudinal Evidence From Ecuador. American Journal Of Public Health, 101(12), 2299-2307. doi:10.2105/AJPH.2011.300253

Scheele, A. F., Leseman, P. M., & Mayo, A. Y. (2010). The home language environment of monolingual and bilingual children and their language proficiency. *Applied Psycholinguistics*, 31(1), 117-140. doi:10.1017/S0142716409990191

Schick, A. R. (2014). Home-school literacy experiences of Latino preschoolers: Does continuity predict positive child outcomes?. *Journal of Applied Developmental Psychology*, 35(4), 370-380. doi:10.1016/j.appdev.2014.05.006

Schmitt, S. A., Simpson, A. M., & Friend, M. (2011). A Longitudinal Assessment of the Home Literacy Environment and Early Language. *Infant & Child Development*, 20(6), 409-431. doi:10.1002/icd.733

Schulz, L. E., Bonawitz, E. B., & Griffiths, T. L. (2007). Can being scared cause tummy aches? Naive theories, ambiguous evidence, and preschoolers' causal inferences. *Developmental Psychology*, 43(5), 1124-1139. doi:10.1037/0012-1649.43.5.1124

Seigneuric, A. & Ehrlich, M. (2005). Contribution of working memory capacity to children's reading comprehension: A longitudinal investigation. *Reading and Writing*, 18, 617–656.

Seigneuric, A., Ehrlich, M., Oakhill, J. V. & Yuill, N. M. (2000).Working memory resources and children's reading comprehension. *Reading and Writing: An Interdisciplinary Journal*, 13, 81–103.

Sénéchal, M., & LeFevre, J. (2002). Parental involvement in the development of children's reading skill: A 5-year longitudinal study. *Child Development*, 73, 445–460. doi:10.1111/1467-8624.00417

Sénéchal, M., & LeFevre, J. (2014). Continuity and change in the home literacy environment as predictors of growth in vocabulary and reading. *Child Development*, 85(4), 1552-1568. doi:10.1111/cdev.12222

Sénéchal, M., & Young, L. (2008). The effect of family literacy interventions on children's acquisition of reading from kindergarten to grade 3: A meta-analytic review. *Review of Educational Research*, 78(4), 880-907. doi:10.3102/0034654308320319

Sénéchal, M., LeFevre, J. A., Hudson, E., & Lawson, E. P. (1996). Knowledge of storybooks as a predictor of young children's vocabulary. *Journal of Educational Psychology*, 88(3), 520.

Sénéchal, M., LeFevre, J., Thomas, E. M., & Daley, K. E. (1998). Differential effects of home literacy experiences on the development of oral and written language. *Reading Research Quarterly*, 33(1), 96-116. doi:10.1598/RRQ.33.1.5

Sénéchal, M., Ouellette, G., & Rodney, D. (2006). The misunderstood giant: On the predictive role of early vocabulary to future reading. In S.B. Neuman & D. Dickinson (Eds.), *Handbook of early literacy research:* Vol. 2 (pp. 173–182).New York: Guilford Press.

Shipstead, Z., & Yonehiro, J. (2016). The domain-specific and domain-general relationships of visuospatial working memory to reasoning ability. *Psychonomic Bulletin & Review*, 23(5), 1504-1512. doi:10.3758/s13423-016-1021-x

Silinkas, G., Kiuru, N., Tolvanen, A., Niemi, P., Lerkkanen, M., & Nurmi, J. (2013). Maternal teaching of reading and children's reading skills in Grade 1: Patterns and predictors of positive and negative associations. *Learning and Individual Differences*, 2754-66. doi:10.1016/j.lindif.2013.06.011

Silinkas, G., Lerkkanen, M., Tolvanen, A., Niemi, P., Poikkeus, A., & Nurmi, J. (2012). The frequency of parents' reading-related activities at home and children's reading skills during kindergarten and grade 1. *Journal of Applied Developmental Psychology*, 33(6), 302-310. doi:10.1016/j.appdev.2012.07.004

Silinskas, G., Parrila, R., Lerkkanen, M., Poikkeus, A., Niemi, P., & Nurmi, J. (2010). Mothers' reading-related activities at home and learning to read during kindergarten. *European Journal of Psychology of Education*, 25(2), 243-264. doi:10.1007/s10212-010-0014-9

Sirin, S. R. (2005). Socioeconomic Status and Academic Achievement: A Meta-Analytic Review of Research. *Review of Educational Research*, 75(3), 417-453.

Smith, J. R., Brooks-Gunn, J., & Klebanov, P. K. (1997). Consequences of living in poverty for young children's cognitive and verbal ability and early school achievement. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 132–189). New York: Russell Sage Foundation

Smolkin, L. B. & Yalden, D. B. (1992). 'O' is for 'mouse': first encounters with the alphabet book, *Language Arts*, 69, 432–441.

Sonnenschein, S., & Munsterman, K. (2002). The influence of home-based reading interactions on 5-year-olds' reading motivations and early literacy development. *Early Childhood Research Quarterly*, 17(3), 318.

Sparks, A., & Reese, E. (2013). From reminiscing to reading: Home contributions to children's developing language and literacy in low-income families. *First Language*, 33(1), 89-109. doi:10.1177/0142723711433583

Storch, S. A., & Whitehurst, G. J. (2001). The Role of Family and Home in the Literacy Development of Children from Low-Income Backgrounds. *New Directions for Child & Adolescent Development*, 2001(92), 53-72.

Storch, S. A., & Whitehurst, G. J. (2002). Oral language and code-related precursors to reading: Evidence from a longitudinal structural model. *Developmental Psychology*, 38(6), 934-947. doi:10.1037/0012-1649.38.6.934

Swanson, H. L. (1999). Reading comprehension and working memory in learning-disabled readers: Is the phonological loop more important than the executive system? *Journal of Experimental Child Psychology*, 72, 1–31.

Swanson, H. L. (2011). Dynamic testing, working memory, and reading comprehension growth in children with reading disabilities. *Journal of Learning Disabilities*, 44, 358–371.

Swanson, H. L., & Berninger, V. (1995). The role of working memory in skilled and less skilled readers' comprehension. *Intelligence*, 21, 83–108.

Swanson, H. L., & Jerman, O. (2007). The influence of working memory growth on reading growth in subgroups of children with reading disabilities. *Journal of Experimental Child Psychology*, 96, 249–283.

Tamis-LeMonda, C. S., & Rodriguez, E. T. (2009). Parents' Role in Fostering Young Children's Learning and Language Development. *Encyclopedia on Early Childhood Development*. Retrieved from http://www.child-encyclopedia.com/language-development-and-literacy/according-experts/parents-role-fostering-young-childrens-learning.

Taylan, Aksu-Koç, & Bekman, 2002. *Türkiye'de Okul Öncesi Eğitimi: Hizmete Duyulan İhtiyaçların Saptanması ve Çocuğun Dil Yetisi Düzeyinin Değerlendirilmesi Araştırma Raporu.* Retrieved from http://www.acev.org/arastirmalarimiz.php?id=24&lang=tr&page=6.

Teale, W. (1994). Emergent literacy. *In Encyclopedia of English studies and language arts: A project of the National Council of Teachers of English* (Vol. 1, pp. 424-426). New York: Scholastic

Teale, W. H. & Yokota, J. (2000). Beginning Reading and Writing: Perspectives on Instruction. In D. S. Strickland & L. M. Morrow (Eds.), *Beginning Reading and Writing* (pp. 3-19) Retrieved from http://books.google.com

Twitchell, P., Morford, J. P., & Hauser, P. C. (2015). Effects of SES on literacy development of deaf signing bilinguals. *American Annals of the Deaf,* 159(5), 433-446.

Umek, L., Podlesek, A. & Fekonja, U. (2005). Assessing the home literacy environment: Relationships to child language comprehension and expression. *European Journal of Psychological Assessment,* 21(4), 271-281.

van Steensel, R. (2006). Relations between socio-cultural factors, the home literacy environment and children's literacy development in the first years of primary education. *Journal of Research in Reading*, 29, 367–382. doi:10.1111/j.1467-9817.2006.00301.x.

Vellutino, F. R., Tunmer, W. E., Jaccard, J. J., & Chen, R. (2007). Components of reading ability: Multivariate evidence for a convergent skills model of reading development. *Scientific Studies of Reading*, 11(1):3–32. doi:10.1080/10888430709336632.

Verhoeven, L., & Van Leeuwe, J. (2008). Prediction of the development of reading comprehension: a longitudinal study. *Applied Cognitive Psychology*, 22(3), 407-423. doi:10.1002/acp.1414

Walley, A. C., Metsala, J. L., & Garlock, V. M. (2003). Spoken vocabulary growth: Its role in the development of phoneme awareness and early reading ability. *Reading and Writing*, 16(1-2), 5-20. doi:10.1023/A:1021789804977

Wasik, B., & Bond, M. A. (2001). Beyond the pages of a book: Interactive book reading and language development in preschool classrooms. *Developmental Psychology*, 93, 243–250.

Weigel, D. J., Martin, S. S., & Bennett, K. K. (2006a). Contributions of the home literacy environment to preschool-aged children's emerging literacy and language skills. *Early Child Development and Care*, 176, 357–378. doi:10.1080/03004430500063747

Westerveld, M. F., Gillon, G. T., van Bysterveldt, A. K., & Boyd, L. (2015). The emergent literacy skills of four-year-old children receiving free kindergarten early childhood education in New Zealand. *International Journal of Early Years Education*, 23(4), 339-351. doi:10.1080/09669760.2015.1033617

Whitehurst, G. J. (1996a, April). *A structural equation model of the role of home literacy environment in the development of emergent literacy skills in children from low-income back-grounds.* Paper presented at the annual convention of the American Educational Research Association, New York.

Whitehurst, G. J., Epstein, J. N., Angell, A. L., Payne, A. C., Crone, D. A., & Fischel, J. E. (1994). Outcomes of an emergent literacy intervention in Head Start. *Journal of Educational Psychology*, 86(4), 542-555. doi:10.1037/0022-0663.86.4.542

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development*, 69, 848–872. http://dx.doi.org/10.1111/j.1467-8624.1998.tb06247.x

Willard, J. A., Agache, A., Jäkel, J., Glück, C. W., & Leyendecker, B. (2015). Family factors predicting vocabulary in Turkish as a heritage language. *Applied Psycholinguistics*, 36(4), 875-898. doi:10.1017/S0142716413000544

Wilkinson, G. & Robertson, G. (2006). *Wide range achievement test* - Fourth Edition. Psychological Assessment Resources, Lutz, FL.

Woodcock, R.N. (2011). *Woodcock reading mastery tests* - Third Edition. Pearson Assessments, San Antonio, TX.

Woolley, G. (2011). *Reading comprehension: Assisting children with learning difficulties*. New York, NY: Springer.

Yarosz, D. J., & Barnett, W. S. (2001). Who reads to young children?: Identifying predictors of family reading activities. *Reading Psychology*, 22(1), 67-81. doi:10.1080/02702710151130235

Yeo, L. S., Ong, W. W., & Ng, C. M. (2014). The home literacy environment and preschool children's reading skills and interest. *Early Education and Development*, 25(6), 791-814. doi:10.1080/10409289.2014.862147

Yeung, S. S., & King, R. B. (2016). Home literacy environment and English language and literacy skills among Chinese young children who learn English as a second language. *Reading Psychology*, 37(1), 92-120. doi:10.1080/02702711.2015.1009591

Yuill, N. M. & Oakhill, J. V. (1991) *Children's problems in text comprehension: an experimental investigation* (Cambridge, Cambridge University Press).