Do Hours Spent Viewing Television at Ages 3 and 4 Predict Vocabulary and Executive Functioning at Age 5?

A. Nayena Blankson *Spelman College*
Marion O'Brien, Esther M. Leerkes, Susan D. Calkins, and Stuart Marcovitch *University of North Carolina at Greensboro*

We examined the impact of television viewing at ages 3 and 4 on vocabulary and at age 5 on executive functioning in the context of home learning environment and parental scaffolding. Children ($N = 263$) were seen in the lab when they were 3 years old and then again at ages 4 and 5. Parents completed measures assessing child television viewing and the home environment at ages 3 and 4, and mother–child interaction was observed during a problem-solving task. At age 5, children completed measures of vocabulary and executive functioning. Results indicated that although the amount of television viewing was negatively related to vocabulary and executive functioning, this association was no longer significant once background variables, home learning environment, and parental scaffolding were taken into consideration. Parental scaffolding emerged as a primary predictor of vocabulary above demographic covariates. Implications of the research are discussed in terms of recommendations for parents regarding television viewing by preschool children.

In 2001, the American Academy of Pediatrics (AAP, 2001) recommended that children under 2 years of age should not be exposed to any television, and that

A. Nayena Blankson and Stuart Marcovitch, Department of Psychology; Marion O'Brien, Esther M. Leerkes, and Susan D. Calkins, Department of Human Development and Family Studies.

This research was supported by grant 5R01HD050806 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Eunice Kennedy Shriver National Institute of Child Health and Human Development or the National Institutes of Health. The authors thank the New York University Faculty Resource Network for provision of research resources to the first author.

Address correspondence to A. Nayena Blankson, Department of Psychology, Spelman College, 350 Spelman Lane, SW, Box 259, Atlanta, GA 30314. Phone: 404-270-5658. Fax: 404-270-5632. E-mail: ablanks1@spelman.edu.

Merrill-Palmer Quarterly, April 2015, Vol. 61, No. 2, pp. 264–289.

television viewing by children over 2 years of age should be limited to 1–2 hours a day of "quality programming" (p. 424). In spite of these recommendations, children continue to be exposed to television both directly and indirectly. In a recent national study, it was determined that the average 8-month to 8-year-old US child is exposed to 232 minutes (approximately 4 hours) of background television per day (Lapierre, Piotrowski, & Linebarger, 2012). Approximately 75% of children under age 6 view television daily for approximately 1½ hours (Rideout, Hamel, & Kaiser Family Foundation, 2006). Thus, television continues to be pervasive in the lives of children, and concern remains that effects may be harmful, particularly because some research findings have suggested that there are negative child outcomes associated with television viewing (e.g., Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Linebarger & Walker, 2005; Wright et al., 2001; Zimmerman & Christakis, 2005), including some television programs that are targeted directly at children (child-directed programs) (Linebarger & Walker, 2005).

Children between the ages of 3 and 6 years have been found to view more hours of television than their younger and older counterparts (Christakis, Ebel, Rivara, & Zimmerman, 2004; Rideout et al., 2006), and about half of the television viewing time among preschoolers is unsupervised by parents (Roberts, Foehr, Rideout, & Brodie, 1999). Whereas some parents have expressed concern about the television viewing habits of this age group (Christakis, Ebel, et al., 2004, Rideout et al., 2006), other parents view television as having potential educational value for their child's cognitive development (Rideout et al., 2006). The impact of television may differ at different points in the life span (Anderson & Hanson, 2010), and there may be time points when television viewing may have stronger effects than at other time points. That is, there may be a *sensitive period* for the effects of television viewing on child cognitive outcomes.

Vocabulary and executive functioning are two outcomes that have been more widely examined in the television-viewing literature. Executive functioning skills have sometimes been described under the umbrella term *self-regulation*. Self-regulation has received increased attention in recent years, particularly because of the important role that it plays in early childhood outcomes such as school readiness (Blair & Diamond, 2008). Conceptually, self-regulation includes different components that, although related, tap into different aspects of development. These components include physiological (e.g., Hastings et al., 2008; Porges, 2007), behavioral (e.g., Putnam & Rothbart, 2006), and cognitive regulation (e.g., Blair & Peters, 2003), with cognitive regulation often referred to in the literature as cognitive control or executive functioning (Blankson et al., 2013). Because the primary aim of the present research is an examination of cognitive outcomes

associated with television viewing, we focus on executive functioning skills, with the acknowledgment that physiological as well as behavioral outcomes associated with television viewing are also important for investigation.

Executive functioning can be defined as a set of related skills that involve working memory, cognitive inhibitory control, and attentional focusing and flexibility. *Working memory* refers to the ability to hold multiple pieces of information in mind and manipulate this information, whereas *cognitive inhibitory control* refers to the ability to suppress dominant information in favor of subdominant information, and *attentional focusing and flexibility* refer to the ability to focus and shift attention in response to change (Carlson, Moses, & Claxton, 2004; Diamond, Barnett, Thomas, & Munro, 2007; National Institute of Child Health and Human Development Early Child Care Research Network [NICHD ECCRN], 2005). Although there is evidence that various executive functions are correlated but distinct (Friedman et al., 2006; Miyake et al., 2000), a unitary factor has been found to best represent executive functioning in the preschool years (Mungas et al., 2013; Shing, Lindenberger, Diamond, Li, & Davidson, 2010; Wiebe, Espy, & Charak, 2008; Wiebe et al., 2011). In the present investigation, we examine working memory and cognitive inhibitory control separately and as a composite.

Both vocabulary and executive functioning are especially relevant for investigation in the preschool years because they are among the strongest predictors of early academic achievement (Blair & Razza, 2007; Diamond et al., 2007; Walker, Greenwood, Hart, & Carta, 1994). Increased understanding of factors that support or hinder the development of early vocabulary and executive functioning skills has important implications for early childhood educational practices and policies.

From a social learning perspective (Bandura, 1965), it is reasonable to assume that children can learn from watching television, and, indeed, there is some evidence that children learn from viewing television (e.g., Krcmar, Grela, & Lin, 2007; Rice, Huston, Truglio, & Wright, 1990). Whereas past theorists tended to favor either a behaviorist (nurture) or nativist (nature) approach to understanding language development, current perspectives favor an interactionist perspective, where vocabulary acquisition is thought to be the result of a combination of the child's own innate characteristics and environmental influences. Television viewing, to the extent that it provides a means for children to interact or engage with their environment, may be positively associated with vocabulary acquisition. In support of this, Wright et al. (2001) found that viewing child-directed television programs, such as *Sesame Street*, at ages 2 and 3 was associated with better receptive vocabulary at age 3. Research studies conducted by Rice and colleagues using samples of preschoolers (e.g., Rice et al., 1990; Rice

& Woodsmall, 1988) have also shown increased vocabulary from viewing child-directed television programs in experimental as well as home settings. In particular, dialogue in child-directed programs has been likened to speech patterns in live interactions between children and their mothers (Rice & Haight, 1986), which may foster children's vocabulary development. Additionally, sustained attention to television may indicate deep cognitive processing because children who display sustained attention to television are less likely to be distracted by external competing stimuli (Anderson, Choi, & Lorch, 1987; Anderson & Hanson, 2010), suggesting that television viewing may also foster development of executive functioning skills.

On the other side of the debate are theories and research that indicate negative or nonsignificant associations between television viewing and child outcomes. For example, in the same study in which a positive association was found between television viewing and receptive vocabulary, Wright et al. (2001) also found that children who viewed more general education programs at ages 2–5 had lower receptive vocabulary scores at ages 4–7. An examination of the vocabulary demands of television programs (Webb & Rodgers, 2009) concluded that children must already have in place a good store of vocabulary for incidental word learning to take place through television viewing. In other words, a television program must be comprehensible for children to learn vocabulary.

Research has also shown negative and nonsignificant associations of television viewing with executive functioning (e.g., Christakis, Zimmerman, et al., 2004; Zimmerman & Christakis, 2005; but see Foster & Watkins, 2010). For example, in a study by Barr, Lauricella, Zack, and Calvert (2010), 4-year-olds who lived in homes in which there were greater levels of adult television programming (but not child-directed programming) were rated by their parents as having less executive functioning skills than their counterparts who lived in homes with lower levels of television viewing. Research by Lillard and colleagues (Greenwood & Lillard, 2012; Lillard & Peterson, 2011) suggests that the link between executive functioning and television viewing may be more immediate than long term (but see Anderson, Levin, & Lorch, 1977), whereas Schmidt, Pempek, Krikorian, Lund, and Anderson (2009) found that 1-, 2-, and 3-year-old children did not display fewer bouts of sustained attention during toy play when a television was on versus when the television was off, although the children's focused attention span was shorter when the television was on versus when the television was off.

The brief review of the literature indicates that the links between television viewing and child cognitive outcomes have been mixed, leading

to potentially conflicting information for parents on best practices with their children. In general, it may be difficult for children to learn from viewing television (Krcmar et al., 2007; Naigles & Mayeux, 2001), indicating that the number of hours a child spends viewing television may be negatively or not significantly associated with vocabulary and executive functioning. However, it is important to consider context when examining outcomes associated with television viewing because the effects of television viewing may differ in different contexts (Foster & Watkins, 2010).

Two contextual factors that have not been extensively studied are the role of the home learning environment and parent cognitive support. Conceptually, home learning environment encompasses several characteristics, including the extent to which toys and learning materials are available in the home environment, and the extent to which parents directly teach their child concepts and take their child to places and events that provide enrichment (Bradley & Corwyn, 2005; Bradley, Corwyn, Burchinal, McAdoo, & García Coll, 2001; Griffin & Morrison, 1997). Relatedly, parental scaffolding includes the extent to which parents provide cognitive support (providing information about a task, generating concrete strategies, breaking a task into manageable steps) during tasks that are beyond the child's ability level (Neitzel & Stright, 2003; Rogoff, 1990). Home learning environment and parental scaffolding have both been found to be related to vocabulary and executive functioning skills: Children who are reared in better-quality home learning environments tend to have higher levels of vocabulary (Bradley & Corwyn, 2005; Bradley et al., 2001; Griffin & Morrison, 1997) and better executive functioning skills (NICHD ECCRN, 2005).

According to displacement theory (Himmelweit, Oppenheim, & Vince, 1958), television viewing may displace other activities that may be more conducive to positive child outcomes (Neuman, 1988), such as engagement with cognitively stimulating toys and materials in the home. In support of this theory, Krikorian, Pempek, Murphy, Schmidt, and Anderson (2009) found that the quality and quantity of parent–child interactions decreased when there was background television on compared to when the television was off. In a separate study, 1-, 2, and 3-year-olds were found to engage in less play with toys when a television was on versus when the television was off (Schmidt et al., 2009). These findings suggest that children who view or are exposed to more hours of television may not engage in or be exposed to more cognitively beneficial activities or resources in their environment, such as home learning environment and parental scaffolding behaviors.

The recommendations by the AAP (2001) were based on the theory of displacement, and the recommendations suggest that television viewing plays a very strong role in child outcomes. However, it may be that

home learning environment and parental scaffolding play a stronger role in vocabulary development and executive functioning than does television viewing alone, which is important to bring to our current understanding to help provide parents with more research-based recommendations. From a Piagetian (1960) and Vygotskian (1978) perspective, direct engagement with the environment is more conducive to cognitive development than is simple observation of the environment. As such, direct engagement with the environment may play a stronger role in cognitive development than does indirect engagement provided by television viewing. That is, television viewing may not matter as much once we take into consideration supportive home and family environments. However, whereas research has examined direct associations between television viewing and vocabulary/executive functioning, only a few studies have examined television viewing in conjunction with home learning environment (e.g., Linebarger & Walker, 2005; Wright et al., 2001), and, to date, no studies have examined parental scaffolding behaviors in the preschool years although scaffolding has been investigated in the infancy years (e.g., Barr, Zack, Garcia, & Muentener, 2008). The present study was meant to fill these gaps in the literature.

Research on the impact of television viewing in the infancy years has shown that there is a *video deficit* (referred to more recently as the *transfer deficit* to encompass learning from television, as well as books and touchscreens; Barr, 2013). That is, it is challenging for infants to transfer learning from videos into real-world contexts. In general, most learning from television has been found to take place beginning around age 3 (Anderson & Hanson, 2010), highlighting the importance of investigating effects of television viewing during the preschool years. The present research adds to the extant literature by examining television viewing at ages 3 and 4 as a predictor of vocabulary and executive functioning at age 5, in the context of home learning environment and parenting.

We examined three research questions: (a) Do children whose home and family environments are rich in cognitive support view less television than other children? We hypothesized that there would be a negative association between television viewing and home and family cognitive support. That is, children reared in homes with more cognitively stimulating materials or with parents who provide more scaffolding will view fewer hours of television per week than their counterparts reared in homes with less cognitively stimulating materials or with parents who provide less cognitive scaffolding. (b) Do hours of television viewed at ages 3 and 4 predict vocabulary and executive functioning at age 5 over and above the level of home and family cognitive support? This question has

rarely been asked, yet the recommendations by the AAP imply that the impact of television viewing might supersede home and family cognitive support. We expected that television viewing would not be related to child outcomes once home and family cognitive support was taken into consideration. (c) Lastly, is there a significant interaction between television viewing and home and family cognitive support such that television viewing is more strongly related to vocabulary and executive functioning when home and family cognitive support is relatively low or relatively high? Television viewing might have stronger or weaker effects among children who receive greater or less amounts of scaffolding, or who are reared in home environments of better or poorer quality (Fetler, 1984). These questions were examined by using a sample of children studied from age 3 to age 5, who were seen in 2005 and 2007. The results of the present research will shed light on the extent to which television viewing is associated with child outcomes in the preschool years, can guide future policy development in this area, and may help to alleviate some of the fears and concerns that parents of preschoolers continue to have regarding the effects of television viewing.

Method

Participants

The sample consisted of 263 preschool children and their mothers who participated in three waves of data collection in a study examining emotional and cognitive contributions to early school success, beginning when the children were 3 years old. Of the 263 original participants, 244 returned 1 year later for Wave 2, and 228 returned for Wave 3. There were no significant differences in child gender or family income-to-needs ratio between those who continued in the study and those who dropped out. Families who dropped out were more likely to be non–European American, $\chi^2\,(1, N = 263) = 3.89, p < .05$.

At Wave 1, children were 3½ years old on average ($SD = 2.41$, range 37–47 months); mothers were 33 years old on average ($SD = 5.91$). Approximately 51% of mothers had a 4-year college degree, 74% were married and living with their partner, and 79% were employed. Average income-to-needs ratio was 2.89 ($SD = 1.73$); 37% of the sample had an income-to-needs ratio below 2, 53% between 2 and 5, and 10% greater than 5. Of the children, 52% were girls, and 58% were European American, 35% African American, and 7% other ethnicities, including children of mixed ethnicity.

Procedure

Participating families were recruited from preschools and child-care centers. When children were 3, and again at ages 4 and 5, they participated with their mothers in a lab session during which they were videotaped while completing tasks assessing emotion and cognition. The session included a snack during playtime with the mother. Mothers provided written consent and completed questionnaires during each session. Families received monetary compensation for each yearly visit, and children selected a toy at each visit as thanks for their participation.

Measures

Covariates. Socioeconomic status and child race have been found to be related to television viewing (e.g., Rideout et al., 2006), as well as vocabulary and executive functioning (e.g., Noble, Norman, & Farah, 2005), and were therefore considered as potential covariates. Mothers reported their child's race and their child's highest level of education, as well as family income at the 3-year laboratory visit. Income-to-needs ratio and maternal education correlated significantly, $r(261) = .53$, $p < .01$. These variables were standardized and averaged to create a single socioeconomic status variable, with higher scores indicating higher socioeconomic status. The socioeconomic status variable and child race were included as potential covariates.

Home learning environment. At ages 3 and 4, home learning environment was measured by using items from the Watching Television, Reading, and Computers at Home measure (TVRC) and the Toys and Activities Questionnaire (TAQ). The TVRC, which is comprised of 11 items, was adapted for the study from the home literacy environment items by Griffin and Morrison (1997). Example items include "number of books owned by child" and "someone reads to child at home." For the present analysis, the TVRC score excluded the items regarding media (TV, DVD, and computer) use at home. The TAQ, which is comprised of 20 items, was adapted for the NICHD Study of Early Child Care from the Home Observation for Measurement of the Environment (Caldwell & Bradley, 1984). Example items include "In your home, does your child have toys that help him/her learn colors?" and "Do you encourage your child to read a few words in his/her books?" Together, the TVRC and TAQ measure the extent to which toys and learning materials are available in the home environment, the child engages with the toys and learning materials, and parents directly teach their child concepts and take their child to places and events that

provide enrichment. In prior work, TVRC scores predicted kindergarteners' literacy skills (Griffin & Morrison, 1997), and the interview version of a subset of TAQ items predicted children's verbal skills (Bradley et al., 2001). The scores have been found to load on a common factor representing home learning environment (Leerkes, Blankson, O'Brien, Calkins, & Marcovitch, 2011). A home learning environment composite was formed by standardizing and summing scores from the TVRC and TAQ separately at ages 3 and 4.

Parental scaffolding. Mother–child interaction was observed throughout a problem-solving task during the 3- and 4-year laboratory visits. The average duration of the task was 6 minutes ($SD = 2.12$) at age 3 and 7 minutes ($SD = 2.78$) at age 4. During the treasure game (3-year visit), created for this study, the child moved a bear along a path on a game board from the start position to a treasure chest located on an island at the other end. Steps along the path were marked by colors that matched a die that the child rolled to determine where to move the bear. Before reaching the treasure chest, the bear had to be moved to two other locations in the correct order (i.e., retrieve a key to unlock the boat and take the boat across the river to the treasure). Mothers were instructed to help the child retrieve the treasure in the fastest way possible. The task ended when the child reached the treasure or the mother and child stopped engaging in the task. The task was videotaped and later rated by two trained coders. At the 4-year visit, the task was a game requiring multiple steps to get a bear to a birthday party. Procedures for the game were similar to those used in the treasure game. The examiner explained the game to the mother and child and then left the room. The task was videotaped and later coded by a trained coder.

The frequency and quality with which mothers engaged in cognitive scaffolding behaviors were rated to capture: (a) metacognitive information, (b) cognitive information, and (c) mental state language. *Metacognitive information* and *cognitive information* were rated by using a 5-point coding system adapted from the work of Neitzel and Stright (2003). *Metacognitive information* reflects the extent to which the mother provided a complete and understandable overview of the game, including explanations of how to complete the game and why those steps were needed, as opposed to merely focusing on individual steps. *Cognitive information* reflects the degree to which the mother provided the child with appropriate information about the task at hand, including information on how to roll the die, how to match the color on the die to a color on the game board, and reminders of individual steps in the task; descriptions of how components of the task are used in real life; or any other information that provided an opportunity for the child to learn something or to gain understanding about the

task. In prior work, ratings of this type predicted children's kindergarten reasoning abilities and self-regulation in the classroom (Neitzel & Stright; Stright, Herr, & Neitzel, 2009).

Mental state language involving cognitive terms was coded by using procedures outlined by Jenkins, Turrell, Kogushi, Lollis, and Ross (2003). Counted were 11 cognitive-state terms reflecting the mother, child, or a third party's thoughts, memories, knowledge, mental state, or mental strategies. Nine of these terms were used by Jenkins et al. (think, know, believe, wonder, remember, forget, guess, pretend, understand, and expect), and two new terms (confused and figure out) were added for this study. Instances in which the mother used these words repetitively in succession or simply repeated comments made by her child were not coded. Examples of the types of comments that were common include "What do you think we should do next?" and "Do you remember how we unlock the door at home?" Given variation in session length, the frequency score was divided by task duration such that the resulting scores reflect the rate per minute that mothers used cognitive mental state language. In prior work, the frequency of parents' use of mental state language predicted their children's subsequent mental state language use and false-belief understanding (Jenkins et al; Ruffman, Slade, & Crowe, 2002).

Interrater reliability, calculated based on 25% of the interactions that were double coded, were all above .72, all ps $< .01$. A cognitive support score was computed by standardizing and summing scores on cognitive information, metacognitive information, and mental state language separately for age 3 and age 4.

Television viewing. This was measured at ages 3 and 4 with the TVRC questionnaire. A question on the TVRC asks how many hours per day the child watches television on Monday through Friday, on Saturday, and on Sunday. Total *hours per week* was calculated by multiplying the hours per day for Monday through Friday by 5 and adding the hours per day for Saturday, as well as the hours per day for Sunday.

Vocabulary. This was measured at age 5 by using the Peabody Picture Vocabulary Test, 3rd edition (PPVT-III; Dunn & Dunn, 1997). The PPVT is a standardized measure of receptive vocabulary. Items are arranged in 17 sets of 12 items. For each item, the child was asked to point to one of four drawings named by the examiner. Items were administered by complete sets until the child missed eight in a set and the testing stopped. A raw score was computed as the total number correct. The possible range of scores was 0–204.

Executive functioning. This was measured at age 5 with two tasks, the Animal Stroop task (Stroop) and the Kaufman Assessment Battery

for Children (K-ABC; Kaufman & Kaufman, 1983) number recall test. The Stroop was developed from the classic task (Stroop, 1935), which is widely used to index cognitive inhibitory control. Children were presented with a deck of cards with funny animals where the animal head is different from the animal body (combinations of cows, pigs, sheep, and ducks). Children were asked to name the body of the mismatched animal, not the head. Following two practice trials, 16 test cards were administered. Children were administered the test trials only if they answered at least one question correctly in two practice trials. The possible range of scores was 0–16, with higher scores indicating stronger cognitive inhibitory control.

The number recall test was administered to children to assess working memory capacity. The examiner recited a series of numbers, and children were asked to repeat them in the same sequence. Number sequences increased in size until children missed three sequences in a row. Each sequence was scored as correct (1) or incorrect (0). The raw score was computed as the difference between the ceiling item and the total number of errors. Forward digit span is a measure of working memory to the extent that children must actively maintain storage of end-string numerals while at the same time verbally producing earlier-appearing numerals, and has been described as a simple working memory task (Garon, Bryson, & Smith, 2008).

Scores from the Stroop and number recall test were examined separately and as a composite. The composite was formed by standardizing and summing scores from the two tests, which was consistent with research indicating that a unitary factor best represents executive functioning in the preschool years (Wiebe et al., 2008).

Results

Descriptive Analyses

Correlations between the potential covariates and primary variables were examined. Criteria for inclusion as a covariate were significant associations with both a predictor and the focal outcome variable. Socioeconomic status met the criteria for inclusion as a covariate in the analyses of all outcomes, whereas child race met the criteria for inclusion in the analyses of vocabulary.

The means and standard deviations for the raw and composite study variables are displayed in Table 1. On average, children viewed 9.67 hours ($SD = 8.50$) of television per week at age 3 and 10.44 hours ($SD = 7.49$)

Table 1. Descriptive statistics for raw and composite study variables (*N*s range 225–263)

	3 Years				4 Years				5 Years			
Variable	*M*	*SD*	Min.	Max.	*M*	*SD*	Min.	Max.	*M*	*SD*	Min.	Max.
Socioeconomic status	0.00	0.88	−1.96	2.29	—	—	—	—	—	—	—	—
Income-to-needs ratio	2.89	1.73	0.10	8.20	—	—	—	—	—	—	—	—
Maternal education[a]	4.41	1.74	1.00	7.00	—	—	—	—	—	—	—	—
Non–European American	0.42	.49	0.00	1.00	—	—	—	—	—	—	—	—
Home learning environment	0.00	1.63	−7.05	2.72	.00	1.64	−7.45	3.09	—	—	—	—
TVRC	7.75	3.06	0.00	15.00	7.95	3.11	.00	15.00	—	—	—	—
TAQ	21.14	1.85	11.00	23.00	21.70	1.57	14.00	23.00	—	—	—	—
Parental scaffolding	0.00	0.72	−2.21	2.07	0.00	0.75	−1.86	1.88	—	—	—	—
Metacognitive information	3.46	1.31	1.00	5.00	3.55	1.16	1.00	5.00	—	—	—	—
Cognitive information	3.45	0.65	1.00	5.00	3.61	0.90	1.00	5.00	—	—	—	—
Mental state language	0.54	0.56	0.00	3.35	32.43	27.70	0.00	142.40	—	—	—	—
Television viewing	9.68	8.50	0.00	56.00	10.44	7.49	0.00	39.00	—	—	—	—
Vocabulary	—	—	—	—	—	—	—	—	80.18	14.48	28.00	121.00
Executive functioning	—	—	—	—	—	—	—	—	0.00	1.56	−5.88	3.16
Stroop	—	—	—	—	—	—	—	—	11.04	3.76	0.00	16.00
Number recall	—	—	—	—	—	—	—	—	7.00	2.18	0.00	12.00

Note. TVRC = watching television, reading, and computers at home; TAQ = Toys and Activities Questionnaire.

[a] Maternal education was measured on a scale of 1 (*some high school*) to 7 (*graduate degree*).

at age 4. Zero-order correlations among the study variables are displayed in Table 2. At age 3, television viewing was negatively associated with vocabulary and the executive functioning composite, as well as the number recall test at age 5. Home learning environment was positively associated with each of these outcome variables. Parental scaffolding was positively associated with all four outcome variables. At age 4, television viewing was negatively associated with vocabulary and the executive functioning composite. Age 4 home learning environment and parental scaffolding were positively associated with all four outcomes.

Substantive Analyses

Age 3. With regard to the hypothesis that there would be a negative association between television viewing and home and family cognitive support, simple correlations were examined. As shown in Table 2, television viewing at age 3 is negatively related to both home environment and scaffolding. Children reared in more stimulating environments or with parents who provide greater levels of scaffolding behaviors tend to view fewer hours of television at age 3.

Next, hierarchical multiple regression analyses were conducted to examine whether television viewing at age 3 would predict vocabulary and executive functioning at age 5, independent of home learning environment and parental scaffolding (research question 2), and whether the association between television viewing and child outcomes would differ across different levels of home environment and scaffolding (research question 3). Analyses were conducted in three steps to determine incremental variance associated with the different sets of predictors. Step 1 included the covariates, age 3 home learning environment, and age 3 parental scaffolding. Age 3 television viewing was entered in Step 2. Step 3 included the interactions between age 3 television viewing and home environment and television viewing and scaffolding.

Results of the analyses are presented in Table 3. As can be seen, television viewing at age 3 did not predict vocabulary, the composite executive functioning variable, or the individual executive functioning variables at age 5. However, parental scaffolding at age 3 was found to predict age 5 vocabulary, as well as the executive functioning composite. No interactions were significant.

Age 4. Regarding Hypothesis 1, as shown in Table 2, 4-year television viewing is negatively related to age 4 home learning environment and age 4 parental scaffolding. Next, we conducted hierarchical regression analyses to determine whether television viewing at age 4 affects vocabulary and executive functioning at age 5. Step 1 of the hierarchical regression

Table 2. Correlations for major study variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Socioeconomic status	—										
2. Non–European American	−.25**	—									
3. Home learning environment, 3 years	.38**	−.21**	—								
4. Parental scaffolding, 3 years	.41**	−.34**	.33**	—							
5. Television viewing, 3 years	−.35**	.33**	−.19**	−.26**	—						
6. Home learning environment, 4 years	.38**	−.31**	.72**	.30**	−.19**	—					
7. Parental scaffolding, 4 years	.37**	−.39**	.34**	.56**	−.29**	.33**	—				
8. Television viewing, 4 years	−.28**	.26**	−.22**	−.15*	.53**	−.27**	−.24**	—			
9. Vocabulary, 5 years	.36**	−.29**	.28**	.35**	−.28**	.31**	.37**	−.20**	—		
10. Executive functioning, 5 years	.18**	−.02	.17*	.23**	−.19**	.19**	.20**	−.13*	.56**	—	
11. Stroop, 5 years	.05	.01	.11	.14*	−.12	.14*	.14*	−.11	.41**	.78**	—
12. Number recall, 5 years	.24**	−.04	.15*	.22**	−.18**	.16*	.17*	−.10	.46**	.78**	.22**

Note. ** $p \leq .01$ (two tailed). * $p \leq .05$ (two tailed).

analysis included the covariates, age 4 home learning environment, and age 4 parental scaffolding. Age 4 television viewing was entered in Step 2. Step 3 included the interactions between age 4 television viewing and home environment and television viewing and scaffolding.

Results of the analyses are presented in Table 4. Similar to results for age 3, television viewing at age 4 did not predict vocabulary, the composite executive functioning variable, or the individual executive functioning variables at age 5. Parental scaffolding at age 4 predicted age 5 vocabulary, but did not predict executive functioning at age 5. No interactions were significant.

Discussion

Since the advent of television, the effects of television viewing on child outcomes have been debated, and the debate lingers (Courage & Setliff, 2009). Moreover, parents continue to express anxiety about children's viewing habits (Christakis, Ebel, et al., 2004), and the AAP (2001) discourages

Table 3. 3-Year television viewing, home, and parenting

a. Predicting vocabulary

	Vocabulary				
Variable	*B*	*SE*	β	ΔR^2	$F\Delta$
Step 1: $df = 4,213$				.19	12.10**
Socioeconomic status	3.61	1.17	.22**		
Non–European American	−4.60	1.90	−.16*		
Home learning environment	.27	.64	.03		
Parental scaffolding	3.73	1.44	.19*		
Step 2: $df = 5,212$				.01	3.67
Television viewing	−.25	.13	−.13		
Step 3: $df = 7,210$				.00	.25
Television viewing × Home	−.02	.09	−.02		
Television viewing × Scaffolding	−.09	.15	−.06		

Note. ** $p \leq .01$ (two tailed). * $p \leq .05$ (two tailed).

b. Predicting executive functioning

Variable	Executive functioning					Stroop					Number recall				
	B	*SE*	β	ΔR^2	*F*Δ	*B*	*SE*	β	ΔR^2	*F*Δ	*B*	*SE*	β	ΔR^2	*F*Δ
	Step 1: *df* = 3,214					Step 1: *df* = 3,214					Step 1: *df* = 3,215				
				.06	4.54**				.02	1.76				.06**	4.76
Socioeconomic status	.18	.14	.10			−.04	.34	−.01			.40	.19	.16*		
Home learning environment	.06	.08	.06			.21	.19	.09			.02	.11	.02		
Parental scaffolding	.33	.17	.15*			.56	.41	.11			.40	.23	.13		
	Step 2: *df* = 4,213					Step 2: *df* = 4,213					Step 2: *df* = 4,214				
				.01	2.93				.01	1.17				.01	2.42
Television viewing	−.03	.02	−.12			−.04	.04	−.08			−.03	.02	−.11		
	Step 3: *df* = 6,211					Step 3: *df* = 6,211					Step 3: *df* = 6,212				
				.00	.30				.01	.69				.00	.05
Television viewing × Home	.00	.01	.03			.02	.03	.08			−.004	.01	−.03		
Television viewing × Scaffolding	−.01	.02	−.08			−.05	.04	−.12			−.002	.02	−.01		

Note. ** $p \leq .01$ (two tailed). * $p \leq .05$ (two tailed).

television viewing by young children. Because children are making rapid gains in vocabulary and executive functioning skills during the preschool years, it is important to examine the impact of television viewing during this period. Moreover, it may be that there is a *sensitive period* for the effects of television viewing on child outcomes. The present examination of television viewing at ages and 3 and 4 adds to our understanding on the time points at which television viewing may or may not predict child cognitive outcomes.

Additionally, although television viewing is among several potential socialization factors that can influence the development of vocabulary and executive functioning in the preschool years, two additional and perhaps more powerful sources of influence than television viewing may be the home learning environment and parental scaffolding. It may not be television viewing itself that influences cognitive outcomes, but, instead, television viewing might be only one of a number of factors that may contribute to observed cognitive outcomes in children. In the present study,

Table 4. 4-Year television viewing, home, and parenting

a. Predicting vocabulary

	Vocabulary				
Variable	*B*	*SE*	β	ΔR^2	$F\Delta$
Step 1: $df = 4,218$				.20	13.38**
Socioeconomic status	3.64	1.11	.22**		
Non–European American	–3.52	1.92	–.12		
Home learning environment	.66	.60	.08		
Parental scaffolding	3.59	1.29	.19**		
Step 2: $df = 5,217$				.001	.20
Television viewing	–.06	.12	–.03		
Step 3: $df = 7,215$				.001	.17
Television viewing × Home	.01	.06	.03		
Television viewing × Scaffolding	.07	.17	.05		

Note. ** $p \leq .01$ (two tailed). * $p \leq .05$ (two tailed).

b. Predicting executive functioning

Variable	Executive functioning					Stroop					Number recall				
	B	*SE*	β	ΔR^2	*F*Δ	*B*	*SE*	β	ΔR^2	*F*Δ	*B*	*SE*	β	ΔR^2	*F*Δ
	Step 1: *df* = 3,219					Step 1: *df* = 3,219					Step 1: *df* = 3,220				
				.06	4.42**				.03	2.11				.06	4.77**
Socioeconomic status	.20	.13	.11			−.12	.32	−.03			.50	.18	.20**		
Home learning environment	.09	.07	.09			.26	.17	.11			.05	.10	.04		
Parental scaffolding	.22	.15	.11			.51	.36	.11			.17	.21	.06		
	Step 2: *df* = 4,218					Step 2: *df* = 4,218					Step 2: *df* = 4,219				
				.002	.57				.004	.90				.000	.04
Television viewing	−.01	.01	−.05			−.03	.04	−.07			−.004	.02	−.01		
	Step 3: *df* = 6,216					Step 3: *df* = 6,216					Step 3: *df* = 6,217				
				.02	2.55				.01	1.09				.02	2.72
Television viewing × Home	.01	.01	.23			.03	.02	.18			.02	.01	.19		
Television viewing × Scaffolding	.004	.02	.02			−.03	.05	−.08			.03	.03	.12		

Note. ** $p \leq .01$ (two tailed). * $p \leq .05$ (two tailed).

we investigated the impact of television viewing at ages 3 and 4 on vocabulary and on executive functioning at age 5, in concert with home learning environment and parental scaffolding.

In support of the first hypothesis, results of the present research indicated that children reared in home environments that are more cognitively enriching tend to view fewer hours of television. Thus, it seems that when appropriate toys and materials are available in the home, 3- and 4-year-olds may tend to engage with these materials more often than viewing television. Parents who can provide their children with more cognitively stimulating environments may also discourage television viewing. Relatedly, it was also found that parents who engaged in more scaffolding behaviors had children who viewed fewer hours of television. In support of the second hypothesis, when television viewing was considered simultaneously with home and family cognitive support, television viewing at ages 3 and 4 was no longer associated with vocabulary and executive functioning at age 5. Finally, there were no significant interactions between home and family cognitive support and television viewing.

Overall, results indicated that only parental scaffolding was associated with vocabulary and executive functioning after accounting for the demographics. This finding held true particularly for parental scaffolding at age 3. Thus, results of the present research indicate that direct stimulation from parents may matter more in the development of vocabulary and executive functioning than does television viewing or the basic provision of cognitively stimulating materials in the home.

Several restrictions of the present research should be noted. Foremost, children in the present sample viewed television for an average of 10 hours a week, which falls in line with AAP recommendations. Thus, parents in the present sample may be closely following the AAP-specified guidelines, which may limit generalizability of the results.

A further restriction is that we did not have data on the content of the television programs viewed by children in the present study. The association between television viewing and child outcomes may depend on the content of the programs viewed by children (Anderson, Huston, Schmitt, Linebarger, & Wright, 2001; Wright et al., 2001). The observed negative association between television viewing and child cognitive outcomes in the present study may suggest that the children in our sample viewed primarily general or adult-directed programming rather than child-directed television, given some findings of a negative correlation between general television viewing and cognitive outcomes and a positive correlation

between child-directed television programs and child cognitive outcomes (Barr et al., 2010; Wright et al., 2001). However, different child-directed television programs have been found to relate differentially to child cognitive outcomes, with some programs (e.g., *Arthur*) linked with positive outcomes and other programs (e.g., *Teletubbies*) linked with negative outcomes (Linebarger & Walker, 2005). Moreover, it is important to note that few parents may limit their children to only one specific program; Among children who do watch television, they are watching programs of varying content ranging from child-directed programs to adult entertainment programs (Rideout et al., 2006). Thus, examination of the cumulative impact of the number of hours children spend watching television is also valuable to our understanding. Nevertheless, content does matter. Future research would benefit from examining the extent to which different programs affect cognitive development over and above the home environment and parental scaffolding.

Additionally, that television viewing was unrelated to vocabulary and executive functioning after we took into account home and family cognitive support and the background variables indicates that when considering vocabulary and executive functioning, one cause for concern should be on the parenting practices that can help shape these cognitive outcomes, with less concern about television viewing itself. That there was no significant interaction between television viewing and home and family cognitive support indicates that parental scaffolding behaviors matter across the board for all children, independent of television viewing, particularly with regard to vocabulary development.

Although background demographic variables have been considered in past research on television viewing, few studies have investigated home learning environment and parental scaffolding. The findings of the present research illustrate that future research studies should take parental scaffolding into account in exploring the impact of television viewing on child cognitive outcomes. Results of this research have important implications also for policy recommendations regarding television viewing in the preschool years. The findings are consistent with Vygotsky's (1978) theory that social experiences between children and parents play a role in the child's cognitive development, and, in this case, those direct experiences matter more than television viewing. Currently, there is strong emphasis on television viewing. In the future, more emphasis should be placed on encouraging parents to devote more time and resources to providing direct cognitive support to their children.

References

American Academy of Pediatrics Committee on Public Education. (2001). Children, adolescents, and television. *Pediatrics*, *107*, 423–426. doi:10.1542/peds.107.2.423. Available at http://pediatrics.aappublications.org/content/107/2/423.full

Anderson, D. R., Choi, H. P., & Lorch, E. P. (1987). Attentional inertia reduces distractibility during young children's TV viewing. *Child Development*, *58*, 798–806. doi:10.2307/1130217

Anderson, D. R., & Hanson, K. G. (2010). From blooming, buzzing confusion to media literacy: The early development of television viewing. *Developmental Review*, *30*, 239–255. doi:10.1016/j.dr.2010.03.004

Anderson, D. R., Huston, A. C., Schmitt, K. L., Linebarger, D. L., & Wright, J. C. (2001). Early childhood television viewing and adolescent behavior: The recontact study [Monograph]. *Monographs for the Society for Research in Child Development*, *66*, 1–147.

Anderson, D. R., Levin, S. R., & Lorch, E. P. (1977). The effects of TV program pacing on the behavior of preschool children. *AV* [Audio-visual] *Communication Review*, *25*, 159–166. doi:10.1007/BF02769779

Bandura, A. (1965). Influence of models' reinforcement contingencies on the acquisition of imitative responses. *Journal of Personality and Social Psychology*, *1*, 559–595. doi:10.1037/h0022070

Barr, R. (2013). Memory constraints on infant learning from picture books, television, and touchscreens. *Child Development Perspectives*, *7*, 205–210. dio:10.1111/cdep.12041

Barr, R., Lauricella, A., Zack, E., & Calvert, S. L. (2010). Infant and early childhood exposure to adult-directed and child-directed television programming: Relations with cognitive skills at age 4. *Merrill-Palmer Quarterly*, *56*, 21–48. doi:10.1353/mpq.0.0038

Barr, R., Zack, E., Garcia, A., & Muentener, P. (2008). Infants' attention and responsiveness to television increases with prior exposure and parent interaction. *Infancy*, *13*, 30–56. doi:10.1080/15250000701779378

Blair, C., & Diamond, A. (2008). Biological processes in prevention and intervention: The promotion of self-regulation as a means of preventing school failure. *Development and Psychopathology*, *20*, 899–911. doi:10.1017/S0954579408000436

Blair, C., & Peters, R. (2003). Physiological and neurocognitive correlates of adaptive behavior in preschool among children in Head Start. *Developmental Neuropsychology*, *24*, 479–497. doi:10.1207/S15326942DN2401_04

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development*, *78*, 647–663. doi:10.1111/j.1467-8624.2007.01019.x

Blankson, A. N., O'Brien, M., Leerkes, E. M, Marcovitch, S., Calkins, S. D., & Weaver, J. M. (2013). Developmental dynamics of emotion and cognition processes in preschoolers. *Child Development*, *84*, 346–360. doi:10.1111/j.1467-8624.2012.01841.x

Bradley, R. H., & Corwyn, R. F. (2005). Productive activity and the prevention of behavior problems. *Developmental Psychology*, *41*, 89–98. doi:10.1037/0012-1649.41.1.89

Bradley, R. H., Corwyn, R. F., Burchinal, M., McAdoo, H. P., & García Coll, C. (2001). The home environments of children in the United States Part II: Relations with behavioral development through age thirteen. *Child Development*, *72*, 1868–1886. doi:10.1111/1467-8624.t01-1-00383

Caldwell, B. M., & Bradley, R. H. (1984). *Home Observation for Measurement of the Environment (HOME)—revised edition*. Little Rock, AR: Center for Child Development & Education.

Carlson, S. M., Moses, L. J., & Claxton, L. J. (2004). Individual differences in executive functioning and theory of mind: An investigation of inhibitory control and planning ability. *Journal of Experimental Child Psychology*, *87*, 299–319. doi:10.1016/j.jecp.2004.01.002

Christakis, D. A., Ebel, B. E., Rivara, F. P., & Zimmerman, F. J. (2004). Television, video, and computer game usage in children under 11 years of age. *Journal of Pediatrics*, *145*, 652–656. doi:10.1016/j.jpeds.2004.06.078

Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional problems in children. *Pediatrics*, *113*, 708–713. doi:10.1542/peds.113.4.708

Courage, M. L., & Setliff, A. E. (2009). Debating the impact of television and video material on very young children: Attention, learning, and the developing brain. *Child Development Perspectives*, *3*, 72–78. doi:10.1111/j.1750-8606.2008.00080.x

Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2007). Preschool program improves cognitive control. *Science*, *318*, 1387–1388. doi:10.1126/science.1151148

Dunn, L. M., & Dunn, L. (1997). *Peabody Picture Vocabulary Test* (3rd ed.). [Test materials]. Circle Pines, MN: American Guidance Service.

Fetler, M. (1984). Television viewing and school achievement. *Journal of Communication*, *34*, 104–118. doi:10.1111/j.1460-2466.1984.tb02163.x

Foster, E. M., & Watkins, S. (2010). The value of reanalysis: TV viewing and attention problems. *Child Development*, *81*, 368–375. doi:10.1111/j.1467-8624.2009.01400.x

Friedman, N. P., Miyake, A., Corley, R. P., Young, S. E., DeFries, J. C., & Hewitt, J. K. (2006). Not all executive functions are related to intelligence. *Psychological Science*, *17*, 172–179. doi:10.1111/j.1467-9280.2006.01681.x

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin*, *134*, 31–60. doi:10.1037/0033-2909.134.1.31

Greenwood, R., & Lillard, A. (2012). Television and young children's executive function. *Pediatrics for Parents*, *28*, 21–22.

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, 127–128*, 233–243.

Hastings, P. D., Sullivan, C., McShane, K. E., Coplan, R. J., Utendale, W. T., & Vyncke, J. D. (2008). Parental socialization, vagal regulation, and preschoolers' anxious difficulties: Direct mothers and moderated fathers. *Child Development*, *79*, 45–64.

Himmelweit, H. T., Oppenheim, A. N., & Vince, P. (1958). *Television and the child: An empirical study of the effect of television on the young*. London: Oxford University Press

Jenkins, J. M., Turrell, S. L., Kogushi, Y., Lollis, S., & Ross, H. S. (2003). A longitudinal investigation of the dynamics of mental state talk in families. *Child Development*, *74*, 905–920. doi:10.1111/1467-8624.00575

Kaufman, A. S., & Kaufman, N. L. (1983). *Kaufman Assessment Battery for Children (K-ABC)*. Circle Pines, MN: American Guidance Service.

Krcmar, M., Grela, B., & Lin, K. (2007). Can toddlers learn language from television? An experimental approach. *Media Psychology*, *10*, 41–63. doi:10.108/15213260701300931

Krikorian, H. L., Pempek, T. A., Murphy, L. A., Schmidt, M. E., & Anderson, D. R. (2009). The impact of background television on parent–child interaction. *Child Development*, *80*, 1350–1359. doi:10.1111/j.1467-8624.2009.01337.x

Lapierre, M. A., Piotrowski, J. T., & Linebarger, D. L. (2012). Background television in the homes of US children. *Pediatrics*, *130*, 839–846. doi:10.1542/peds.2011-2581

Leerkes, E. M., Blankson, A. N., O'Brien, M., Calkins, S. D., & Marcovitch, S. (2011). The relation of maternal emotional and cognitive support during problem solving to pre-academic skills in preschoolers. *Infant and Child Development*, *20*, 353-370. doi:10.1002/icd.727

Lillard, A. S., & Peterson, J. (2011). The immediate impact of different types of television on young children's executive function. *Pediatrics*, *128*, 664–649. doi:10.1542/peds.2010-1919

Linebarger, D. L., & Walker, D. (2005). Infants' and toddlers' television viewing and language outcomes. *American Behavioral Scientist*, *48*, 624–645. doi:10.1177/0002764204271505

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their

contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology*, *41*, 49–100. doi:10.1006/cogp.1999.0734

Mungas, D., Widaman, K., Zelazo, P. D., Tulsky, D., Heaton, R. K., Slotkin, J., . . . Gershon, R. C. (2013). NIH toolbox cognitive battery (CB): Factor structure for 3 to 15 year olds. *Monographs of the Society for Research in Child Development*, *78*, 103–118. doi:10.1111/mono.12037

Naigles, L., & Mayeux, L. (2001). Television as incidental language teacher. In D. G. Singer & J. L. Singer (Eds.), *Handbook of children and the media* (pp. 135–153). Thousand Oaks, CA: Sage.

National Institute of Child Health and Human Development Early Child Care Research Network. (2005). Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. *Developmental Psychology*, *41*, 99–114. doi:10.1037/0012-1649.41.1.99

Neitzel, C., & Stright, A. D. (2003). Relations between mothers' scaffolding and children's academic self-regulation: Establishing a foundation of self-regulatory competence. *Journal of Family Psychology*, *17*, 147–159. doi:10.1037/0893-3200.17.1.147

Neuman, S. B. (1988). The displacement effect: Assessing the relation between television viewing and reading performance. *Reading Research Quarterly*, *23*, 414–440. doi:10.2307/747641

National Institute of Child Health and Human Development Early Child Care Research Network (NICHD ECCRN). (2005). Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. *Developmental Psychology*, *41*, 99–114. doi:10.1037/0012-1649.41.1.99

Noble, K. G., Norman, M. F., & Farah, M. J. (2005). Neurocognitive correlates of socioeconomic status in kindergarten children. *Developmental Science*, *8*, 74–87.

Piaget, J. (1960). *Psychology of intelligence*. Paterson, NJ: Littlefield, Adams.

Porges, S. W. (2007). The polyvagal perspective. *Biological Psychology*, *74*, 116–143. doi:10.1016/j.biopsycho.2006.06.009

Putnam, S. P., & Rothbart, M. K. (2006). Development of short and very short forms of the Children's Behavior Questionnaire. *Journal of Personality Assessment*, *87*, 103–113. doi:10.1207/s15327752jpa8701_09

Rice, M. L., & Haight, P. L. (1986). "Motherese" of Mr. Rogers: A description of the dialogue of educational television programs. *Journal of Speech and Hearing Disorders*, *51*, 282–287.

Rice, M. L., Huston, A. C., Truglio, R., & Wright, J. C. (1990). Words from Sesame Street: Learning vocabulary while viewing. *Developmental Psychology*, *26*, 421–428. doi:10.1037/0012-1649.26.3.421

Rice, M. L., & Woodsmall, L. (1988). Lessons from television: Children's word learning when viewing. *Child Development*, *59*, 420–429. doi:10.2307/1130321

Rideout, V., Hamel, E., & Kaiser Family Foundation. (2006). *Zero to six: Electronic media in the lives of infants, toddlers, and preschoolers*. Menlo Park, CA: Kaiser Family Foundation.

Roberts, D. F., Foehr, U. G., Rideout, V. J., & Brodie, M. (1999). *Kids and media at the new millennium*. Menlo Park, CA: Henry J. Kaiser Family Foundation.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.

Ruffman, T., Slade, L., & Crowe, E. (2002). The relation between children's and mothers' mental state language and theory-of-mind understanding. *Child Development*, *73*, 734–751. doi:10.1111/1467-8624.00435

Schmidt, M. E., Pempek, T. A., Krikorian, H. L., Lund, A. F., & Anderson, D. R. (2009). The effects of background television on the toy play behavior of very young children. *Child Development*, *79*, 1137–1151. doi:10.1111/j.1467-8624.2008.01180.x

Shing, Y. L., Lindenberger, U., Diamond, A., Li, S. C., & Davidson, M. C. (2010). Memory maintenance and inhibitory control differentiate from early childhood to adolescence. *Developmental Neuropsychology*, *35*, 679–697. doi:10.1080/87565641.2010.508546

Stright, A. D., Herr, M. Y., & Neitzel, C. (2009). Maternal scaffolding of children's problem solving and children's adjustment in kindergarten: Hmong families in the United States. *Journal of Educational Psychology*, *101*, 207–218. doi:10.1037/a0013154

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, *18*, 643–662. doi:10.1037/h0054651

Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.

Walker, D., Greenwood, C., Hart, B., & Carta, J. (1994). Prediction of school outcomes based on early language production and socioeconomic factors. *Child Development*, *65*, 606–621. doi:10.2307/1131404

Webb, S., & Rodgers, M. P. H. (2009). Vocabulary demands of television programs. *Language Learning*, *59*, 335–366. doi:10.1111/j.1467-9922.2009.00509.x

Wiebe, S. A., Espy, K. A., & Charak, D. (2008). Using confirmatory factor analysis to understand executive control in preschool children: I. Latent structure. *Developmental Psychology*, *44*, 575–587. doi:10.1037/0012-1649.44.2.575

Wiebe, S. A., Sheffield, T., Nelson, J. M., Clark, C. A. C., Chevalier, N., & Espy, K. (2011). The structure of executive function in 3-year-olds. *Journal of Experimental Child Psychology*, *108*, 436–452. doi:10.1016/j.jecp.2010.08.008

Wright, J. C., Huston, A. C., Murphy, K. C., St. Peters, M., Piñon, M., Scantlin, R., & Kotler, J. (2001). The relations of early television viewing to school readiness and vocabulary of children from low-income families: The Early Window Project. *Child Development*, *72*, 1347–1366. doi:10.1111/1467-8624.t01-1-00352

Zimmerman, F. J., & Christakis, D. A. (2005). Children's television viewing and cognitive outcomes. A longitudinal analysis of national data. *Archives of Pediatrics & Adolescent Medicine*, *159*, 619–625. doi:10.1001/archpedi.159.7.619