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Exploring the Impact of Television Watching on Vocabulary Skills in Toddlers

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Abstract With the rising incidence of television consumption in children, the aim of the present study was to investigate the impact of such habits on vocabulary skills in young children. Very little research has targeted a key cognitive skill—vocabulary—during the toddler years, which represent a critical developmental period. We recruited toddlers, aged two to three, from British child care centers. Parents indicated the television watching habits of their children in different genres (educational, cartoons, baby DVDs, adult entertainment) in order to investigate potential differential effects. We also included other key variables linked to vocabulary acquisition: short-term memory (verbal and visuo-spatial) and reading habits (fiction and educational books). The findings indicated that television did not impact vocabulary scores, either positively or negatively. Instead, reading educational books and short-term memory skills predicted vocabulary performance.

Keywords Television · Baby DVDs · Reading habits · Receptive vocabulary · Short-term memory

Introduction

Television is becoming an increasingly prevalent habit of a child's daily routine. Not only are children's television consumption rates rising, the age at which they begin watching television is decreasing. The average child starts watching television at nine months, and 40 % of children are watching television as early as three months. By two years old, 90 % of children have begun watching television in some capacity (Zimmerman et al. 2007) Children's growing consumption of television and other media has led to an increasing research interest in how television impacts various aspects of a child's life. For example, research has found that early television watching from ages one to three years old can have a detrimental effect on children's attention at age seven (Christakis et al. 2004).

Vocabulary development is one cognitive skill in relation to television consumption that has sparked research interest, and is of interest in the present study. There are many other factors that influence the development of vocabulary. One crucial factor is the socio-economic background of the child, as children from more economically advantaged backgrounds tend to have greater opportunities for vocabulary learning (Hart and Risley 1995). The home environment plays an important role and, through parental interaction, children are introduced to a wide vocabulary and their vocabulary skills develop as a result of these interactions (Becker 1977). Informal instruction in language learning is critical and, without it, television often ends up as a teacher (Biemiller 2003).

Short-term memory also contributes to vocabulary acquisition. There is considerable developmental research establishing a clear link between verbal short-term memory and vocabulary knowledge, both concurrently and longitudinally (see Kaushanskaya et al. 2011, for a review). It has been suggested that the same mechanisms that underpin the storage/rehearsal of verbal information in short-term memory are also important in vocabulary acquisition (Gupta and MacWhinney 1997). In order to learn a new

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word or sequence of words, a person must temporarily retain the information in short-term memory before it can be transferred and stored in long-term memory for future use. However, to date, the research in this area has focused on verbal short-term memory and, to our knowledge, there has not been an investigation of the role of visuo-spatial short-term memory in vocabulary learning (however, see Hick et al. 2005, for a discussion on visuo-spatial short-term memory and vocabulary development in Down Syndrome and language impairment). Theoretical models of memory suggest there are different mechanisms that underpin performance in verbal and visuo-spatial short-term memory tests (Alloway et al. 2006), and so there may be differential associations between these two short-term memory skills and vocabulary.

Reading is a key factor in vocabulary acquisition and this relationship is bi-directional. On the one hand, reading can be an effective tool for vocabulary learning, as continuous exposure to new words can build a large vocabulary set (Biemiller 2003). On the other hand, vocabulary plays a critical role in a child's reading achievement (Dickinson et al. 2006; Kibby 1995), as it allows them to build on their knowledge to develop reading and comprehension skills (Burns et al. 1999). The size of a kindergartner's vocabulary was an effective predictor of their reading comprehension in the elementary years (Biemiller 2005; also Senechal et al. 1998; Storch and Whitehurst 2002).

In light of the increasing time children spend watching television during key developmental periods, the question of the impact of television watching on vocabulary is an important one. Based on research so far, we know that the relationship between television viewing and school achievement is moderate ($r = -.05$), according to a meta-analysis (Williams et al. 1982). Longitudinal studies have reported a negative relationship between television watching and achievement tests, but this relationship was non-significant when family background was included as a variable (Gortmaker et al. 1990). The genre and content of television shows appear to mediate its impact on vocabulary. For example, viewing *educational* television programming was positively correlated with higher performance on vocabulary assessments and other cognitive tasks such as problem-solving (Anderson et al. 2000), while watching *non-educational* programming was associated with low vocabulary scores (Wright et al. 2001).

In a longitudinal study examining television watching habits and school readiness, children—ages two to seven—were split into three groups: educational programs (e.g., *Sesame Street*), animated programs (e.g., cartoons), and adult programs (e.g., news channel) (Wright et al. 2001). Educational programs had a positive impact on younger children's academic skills, especially at ages two and three. These children gained higher scores in tests of letter-word skills, number skills, receptive vocabulary, and school readiness. These skills were stable, suggesting a lasting effect of the viewing material despite less time devoted to the television programs as they grew older. Children who viewed educational programs also spent more time reading, compared to the other two groups (Wright and Huston 1995).

The relationship between television genre and academic performance can be reciprocal—viewing habits affect learning outcomes, but their cognitive skill set may in turn influence program choices. For example, in the same longitudinal study, Wright et al. (2001) reported that children with poor academic performance at age three sought out more adult programs rather than educational ones. This in turn, provided fewer learning opportunities, and watching adult programs predicted poor performance on academic tests, as well as low school readiness scores. Those who viewed cartoons also exhibited lowered school readiness scores from ages two to five.

Content is also key and vocabulary acquisition may be constrained by watching programs that fail to introduce novel words in a meaningful way to children (Krcmar et al. 2007; Linebarger and Walker 2005; Rice et al. 1990; Zimmerman and Christakis 2005). Indeed, improvements in reading performance in first to fourth graders have been linked to educational programs that directly highlight novel word learning (e.g., *The Electric Company*; Ball and Bogatz 1973; see also Linebarger and Walker 2005, for similar findings with *Dora the Explorer* and *Blue's Clues;* Neapolitan and Huston 1994, for similar findings with *Sesame Street).* However, not all educational content has been linked with enhanced language growth. Baby DVDs are one example, as they are geared towards earlier learning in infants; however, current research does not support the view that such programming promotes learning (Christakis 2009). Despite the lack of conclusive evidence, such products make claims to teach babies and young children to read and talk earlier than the typically developing children (Garrison and Christakis 2005).

The present study extends previous research in several ways. First, we were interested in the impact of television watching on vocabulary skills. While previous research has focused on reading skills or academic attainment, vocabulary is an important skill as it is a key building block to learning and is linked to reading proficiency (Senechal et al. 1998). We also included different genres in order to investigate potential differential effects. For example, educational programs typically include age-appropriate materials that are communicated using linguistic techniques targeted to enhance learning (Huston and Wright 1994). In contrast, cartoons are designed as light entertainment, rather than communicating an educational

message, and often contain language and humor that is beyond the comprehension of many preschool children (Rice 1984).

The next key feature of the present study was the age group—we focused on toddlers, aged two to three. Most previous research has looked at older children (preschool), but toddlers represent a critical developmental period when television may contribute a shaping influence on important cognitive skills, particularly as children are not yet receiving formal instruction. Thus, the focus on young children in the present study allows for an exploration of the impact of early viewing habits on vocabulary skills. Another unique feature of the present study is the focus on British children as some cultural differences have been reported with respect to the impact of television watching on school performance (see Rosengren and Windahl 1989 for research on Swedish preschoolers). We also included other key variables linked to vocabulary acquisition: short-term memory (verbal and visuo-spatial) and reading habits (fiction and educational books).

Method

Participants

Children from a range of demographic backgrounds were recruited from five British child care centers ($n = 30$; $M = 3.37$, $SD = 4$ months, 57 % male). Parents reported that the children spent an average of 21.3 h per week at a child care ($SD = 7.7$ h; *range* = 9–40 h). Parents, as well as the child care managers, granted consent.

Materials

Questionnaire

Parents were given a questionnaire which included items pertaining to the child's television watching and reading habits on a daily basis: *never, 0–30 min, 30–60 min, 1–2 h,* and *2 h+*. They reported the amount of time that their children spent watching various types of television programs and DVDs, such as adult entertainment programs (e.g., the news, documentaries, reality shows, sports programming), children's educational programs (e.g., *Blue Peter*), cartoons (e.g., *SpongeBob Squarepants, Lion King)*, and baby educational DVDs (e.g., *Baby Einstein*) on a typical day.

Parents also reported the amount of time that their children spent reading or were read to by an adult. Genres included fiction (e.g., *Dr. Seuss books, If You Give a Mouse a Cookie, Boxcar Children* series), picture books (e.g., pop-up books, baby board books), factual (e.g., books about historical figures, *National Geographic* magazines), and educational (e.g., *DK Eyewitness* books). The questionnaire was coded on a scale of 0–3 (0 = *never,* .5 = *0–30 min*, 1 = *30–60 min*, 2 = *1–2 h*, and 3 = *2+ h*) and scores were summed for time spent watching or reading during weekdays and weekends.

Vocabulary

The children's receptive vocabulary skills were assessed using a standardized test, the *British Picture Vocabulary Scale* (BPVS; Dunn et al. 1997). Receptive vocabulary refers to words that the child recognizes or understands when they are presented aloud by the experimenter. The child points to one picture out of four possible choices that represent the spoken vocabulary word. Each set consists of 12 words and the sets increased in difficulty according to age. Testing continued until the child answered eight or more words incorrectly in a set. All children discontinued the test at set two which is aimed at 4- to 5-year-olds. Raw scores were converted to standard scores based on age-appropriate norms ($M = 100$, $SD = 15$).

Short-Term Memory

Digit Recall and Dot Matrix were selected from the Automated Working Memory Assessment (AWMA; Alloway 2007). In Digit Recall, children listened to a sequence of digits and then repeated the digits in the order of presentation. Trials started with one digit and progressed to two digits, and then three digits, and so on. In the Dot Matrix task, children saw a series of four by four matrices with a red dot positioned randomly in one of the matrix boxes. The dot remained onscreen for 2 s before disappearing. The children pointed to the location on the computer screen where they last recalled seeing the red dot. Trials started with one dot and progressed to two dots, and so on. Both tests automatically discontinue when it becomes too challenging. Raw scores are reported for both short-term memory tests.

Procedure

The children were tested in a one-on-one setting. The study took place in a quiet room with children seated at a table located in their nursery school. All children received stickers as a reward at the end of testing.

Results

Performance on the cognitive tests (short-term memory and vocabulary), as well as television watching and reading time are reported in Table 1. As a group, the children

Table 1 Descriptive statistics of cognitive tests and hours spent watching television and reading

	Minimum	Maximum	Mean	Std. Deviation
Vocabulary (BPVS)*	76	125	106.00	13.43
Short-term memory: digit recall	0	25	9.47	4.70
Short-term memory: dot matrix	2	13	7.47	3.23
TV: educational programs	0	1.00	.43	.45
TV: cartoons	0	2.00	.68	.50
TV: movies	0	1.50	.67	.53
TV: adult entertainment	0	1.00	.38	.41
TV: baby DVDs	0	1.00	.17	.38
Reading: fiction books	0	2.00	.83	.62
Reading: picture books	0	2.00	.97	.49
Reading: factual books	0	1.00	.53	.45
Reading: educational books	0	1.50	.75	.41

*Standard scores ($M = 100$, $SD = 15$); television watching and reading habits are represented on a scale of 0 (no time) to 3 (more than 2 h per week)

performed within average levels for vocabulary. Overall, children spent slightly more time reading than watching television. They also spent more time reading fictional and picture books than factual books, and watching more movies and cartoons than educational programs, adult entertainment, or baby DVDs.

We examined the relationship between reading and television watching habits, partialing out age and hours spent at a child care center (Table 2). Watching more educational television programs was significantly associated with reading fewer factual books ($r = -.43; p < .05$). There was also a trend between the amount of time spent reading fiction and picture books ($r = .34; p = .08$), as well as between reading fiction and watching movies ($r = .36; p = .06$).

In order to investigate the best predictors of vocabulary scores, we conducted a set of hierarchical regression analyses. In the first set of analysis, television watching was entered as the first step (educational, cartoons, movies, adult entertainment, and baby DVDs), reading habits (fiction, picture, factual, and educational books) were entered as the second step, and short-term memory scores (digit recall and dot matrix) as the final step. Television watching did not account for any significant proportions of variance in vocabulary scores. In step 2, only reading educational books predicted vocabulary scores, accounting for 15.8 % of the proportion of variance. In the final step, dot matrix scores were a significant predictor of vocabulary (13.9 % of additional variance) (Table 3).

In the second set of analyses, television watching was entered as the first step (educational, cartoons, movies, adult entertainment, and baby DVDs), short-term memory scores (digit recall and dot matrix) as the second step, and reading habits (fiction, picture, factual, and educational books) was entered as the final step. Short-term memory scores (only digit recall) accounted for a reasonably high proportion of variance (23.2 % in total) in vocabulary scores. However, television watching and reading habits did not account for any additional variance in vocabulary.

Discussion

The aim of this study was to investigate the potential impact of television watching habits on vocabulary skills at a critical developmental period. The findings extend existing knowledge on the impact of television watching in several ways. While there was not a clear negative effect of viewing habits, the data suggest that television watching did not have a positive effect on vocabulary skills. This pattern was true for educational programs, as well as baby

Table 2 Correlation matrix on the relationship between television watching and reading habits (with age and child care center hours partialed out)

Variables	1	2	3	4	5	6	7	8	9
1. TV: educational programs	1								
2. TV: cartoons	.23	1							
3. TV: movies	.20	.23	1						
4. TV: adult Entertainment	.32	−.20	.02	1					
5. TV: baby DVDs	.01	.28	.34	.08	1				
6. Reading: fiction books	.17	.22	.36	−.19	.09	1			
7. Reading: picture books	−.17	−.06	.25	.32	.11	.34	1		
8. Reading: factual books	−.43*	.16	−.07	−.13	.27	.04	.27	1	
9. Reading: educational books	.26	.13	.03	.23	.16	−.07	.13	−.14	1

Table 3 Hierarchical regression analyses predicting vocabulary scores

	Independent	*R2*	*ΔR2*	*df*	*ΔF*	*B*	*t*
Step 1	Television: NS						
Step 2	Reading: educational books	.158	.158	1,28	5.26*	.39	2.40*
Step 3	Short-term memory: Dot Matrix	.297	.139	1,27	5.35*	.37	2.31
Step 1	Television: NS						
Step 2	Short-term memory: digit recall	.232	.232	1,28	8.47*	.48	2.91*
Step 3	Reading: NS						

* $p < .05$

DVDs. While previous research has reported benefits of educational programs for reading skills (e.g., Wright et al. 2001), it is possible that such programs target older children, and thus may use language and techniques that are not immediately comprehensible to toddlers. As a result, any potential learning benefits may not transfer to the younger audience recruited in the present study. Cartoons also did not benefit vocabulary skills, and this finding can be explained by the content and pacing of such programming. Singer (1980) suggested that the high rates of action and loud sound effects in cartoons may lead to levels of arousal that are incompatible with learning and language acquisition. Adult programs, such as news and sports, may be too difficult for toddlers to understand and they may not actively engage with the content, and thus, miss out on any potential benefits for language learning. In line with previous research on baby DVDs (Christakis 2009), the present study found no benefit of such programming on language skills.

There are a couple of possibilities for why television viewing did not contribute to vocabulary skills. One explanation is the displacement hypothesis that states that television viewing displaces time spent on more valuable learning-based activities, resulting in lowered academic performance in children from low-income backgrounds (Wright and Huston 1995). Related to the displacement hypothesis is the notion of a lack of engagement or the amount of interaction children have with adults. Although children may watch television with adults, adults are typically inattentive to child's needs during this time, and they will have fewer meaningful linguistic interactions to build vocabulary skills (St. Peters et al. 1991). A second hypothesis is the reduced mental effort exerted as a result of television viewing. Television typically places minimal intellectual demands on the child, which can lead to lower levels of persistence with and interest in more challenging intellectual pursuits (Koolstra and van der Voort 1996). With respect to leisure habits, more time spent watching educational programs was associated with less time reading factual books. This relationship could be explained by the idea that educational programs represent a trusted source for conveying learning content, and parents could view such programs as a substitute for reading.

Looking next at the factors that best predict vocabulary scores, the data indicate that short-term memory skills made a significant contribution. Digit recall contributed 23 % of the variance to vocabulary scores (after television watching habits were statistically accounted) and dot matrix predicted almost 14 % of vocabulary scores (after television watching and reading habits were statistically accounted). The finding that digit recall and dot matrix predicted vocabulary is noteworthy, as most research has reported on the link between nonword repetition and vocabulary learning (e.g., Gathercole and Baddeley 1990). The latter relationship makes intuitive sense given that both the nonword repetition task and vocabulary learning involve a similar mechanism. Every new word starts off as a "nonword" for the learner, and thus they would need to form a temporary representation of the word to facilitate long-term knowledge of the word. The finding that digit recall and dot matrix predicted vocabulary scores suggests that the commonality in the processing requirements of the task is not the only explanation for the link between verbal short-term memory tasks and vocabulary scores. Instead, the underlying storage mechanism associated with all short-term memory tasks may underpin vocabulary learning. This suggestion fits with the idea that young children (ages 2 through 6) can rapidly encode a new word even after a single exposure to it, a process known as "fast mapping" (Dollaghan 1985). In order to create a representation of the novel word and store it, short-term memory resources need to be recruited. The present findings of the contribution of memory to vocabulary fits with evidence students with working memory deficits also struggle in vocabulary, with older children showing greater decrements than younger children (Alloway et al. 2009). The relationship between memory and vocabulary may also be bi-directional, and deficits in one skill may accumulate over time, leading to continued impairments in the other skill.

Reading educational books predicted approximately 16 % of the variance in vocabulary scores, which fits with previous research on the bi-directionality of this relationship. It is important to note that only reading educational books contributed to vocabulary knowledge. While fictional and picture books may be enjoyable for your

children, they may not have a strong learning component to them. Such books may serve a similar function to cartoons in that they are created primarily for light entertainment, rather than to communicate an educational message.

One question has to do with why reading habits did not make a unique contribution to vocabulary after accounting for short-term memory. This pattern could be due to numerous variables, such as an inability to fully grasp the concepts discussed in these books or a lack of interest in the material. Research suggests that children are also more likely to grasp new vocabulary and concepts if the concepts are explained to them after exposure (Krcmar et al. 2007). It is possible that when the children were being read to or were reading factual books, they were just looking at the pictures and not paying full attention to the concepts because they couldn't understand them without further explanation.

While the present findings offer important insight to the growing body of research on the impact of television watching on cognitive skills, there are some limitations. Although this is one of the few studies to report findings on a non-American sample, future research would benefit from a larger sample, as well as looking more closely at family background as a potential mediator in the relationship between television watching and vocabulary (see Gortmaker et al. 1990). Longitudinal research can also offer a richer perspective on the longer-term impacts of television watching. For example, while the present study indicated no negative effect of television watching on vocabulary skills in toddlers, the effects may be cumulative and become evident over time (see Wright et al. 2001).

In conclusion, sweeping statements, such as "television watching is bad," do a disservice to parents and educators who are seeking ways to support learning, as the findings suggest that the television watching did not negatively impact vocabulary scores in toddlers. However, while some educational programs have been seen to enhance reading performance in older children (Ball and Bogatz 1973; Wright and Huston 1995; Wright et al. 2001), they did not provide any linguistic advantage to the young children in the present study. These findings can have an impact on the amount of media exposure parents allow for their young children, especially in light of the American Academy of Pediatrics guidelines discouraging television viewing in the first two years of life (see Christakis 2009). The present findings also indicate that various baby DVDs' claims to teach babies and young children to read and talk earlier than the typically developing children appear to be unfounded (also Garrison and Christakis 2005).

More worrying is the link between watching educational programs and reading fewer factual books. Given the importance of reading in vocabulary development (Biemiller 2003), it is important that a love for reading is encouraged. However, some parents may consider educational programs as a reasonable substitute for reading or for formal instruction for language skills, which can place children at an academic disadvantage, as they get older. In summary, the findings suggest that reading educational books and developing short-term memory skills (Alloway et al. 2013) can be useful suggestions to enhance vocabulary knowledge in young children.

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