INDIVIDUAL DIFFERENCES IN RURAL CHILDREN'S VIDEO WORD LEARNING

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ABSTRACT

The following study examined the possible relationship between young children's ability to learn words from videos and individual difference factors such as their previous experience with videos, location (i.e. rural vs. non-rural), household income, maternal education, and receptive language skills. Preschool-aged children between the ages of 3 and 5 years and their parent or guardian were recruited from two vastly different populations, one rural and one non-rural. The parent completed a demographic form including questions about education and income along with a survey detailing their child's regular exposure to screen media. Children subsequently completed two tasks: the Peabody Picture Vocabulary Test–III and a basic video word learning task. Findings indicate that children from the two populations were dramatically different on all individual difference factors but that both populations were similarly successful at video word learning and that none of the individual differences predicted performance on the video word learning task.

LIST OF ABBREVIATIONS AND SYMBOLS

β	Beta
DVD	Digital video disc
F	Fisher's *F* ratio
JD	Juris Doctor
M	Mean
n	Sample size
nd	No date
ns	Not significant
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
PhD	Doctor of Philosophy
PPVT-R	Peabody Picture Vocabulary Test-Revised
PPVT-III	Peabody Picture Vocabulary Test-III
r	Sample correlational coefficient
SES	Socio-economic status
t	t-test
TV	Television
χ^2	Chi-square statistic
>	Greater than
<	Less than
=	Equal to
%	Percentage

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CHAPTER 1

INTRODUCTION

Using television and videos as a vehicle for learning is not a new idea (e.g., Fisch, Truglio, & Cole, 1999; Shin, 2004; Ennemoser & Schneider, 2007), nor is it one that solely pertains to advancing the social and cognitive skills of school-aged children (e.g., Ball & Bogatz, 1970; Hayne, Herbert, & Simcock, 2003). In fact, many studies have examined whether various screen media might facilitate the growth of one of the most elemental of all developmental skills, that of language acquisition in young children (e.g., Linebarger & Walker, 2005; Krcmar, Grela, & Lin, 2007). Overall, the findings from previous research have provided a basic understanding of television's effect upon the development of social, cognitive, and language skills in young children (e.g., Ball & Bogatz, 1970; Linebarger & Walker, 2005; Zimmerman & Christakis, 2005). Even so, there are still many questions regarding television's capacity to facilitate learning in children that have not been adequately addressed, in particular, the impact that individual differences might have on findings. The current study examined the influence that individual differences such as screen media exposure, location, household income, maternal education and receptive language skills had upon young children's video word learning.

Developmental Impact of Screen Media upon Young Children

Despite the recommendation by the American Academy of Pediatrics (2001) to restrict television viewing in young children, screen media such as television and videos have become thoroughly entrenched features within the daily life of most toddlers. Findings from the Kaiser Foundation survey confirm this point, indicating that children under the age of two years spend

over two hours a day (2:05) using electronic screen media, including TVs, videos, and DVDs. When compared to the time spent engaged in other childhood activities such as outdoor play (2:01), and being read to or reading independently (39 minutes), the amount of time young children assign to electronic screen media is considerable (Rideout, Vandewater, & Wartella, 2003). Consequently, many have questioned the impact that screen media can have in a child's development.

This particular line of inquiry has prompted a broad body of research studies over the last three decades. Initially, some of the earliest studies were conducted by a team of professionals working for the producers of a highly touted children's program known as Sesame Street. The intent of these studies was twofold. First, formative research was conducted before and during production of individual episodes so as to provide the producers qualitative information that would facilitate in the continued production of not only successful but also engaging episodes for children in the future. Secondly, summative research took place after production in order to evaluate the success that the program had in terms of meeting established goals and to measure the impact that it had on young viewers (Fisch, Truglio, & Cole, 1999). These educational goals were derived from an intentional effort to prepare young, disadvantaged children for entry into kindergarten (Lovelace, 1990; Mielke, 1990), and included teaching classification and sorting skills as well as the recognition and labeling of letters and numerals (Ball & Bogatz, 1970).

In 1970, Ball and Bogatz examined the impact that the first year of Sesame Street had on 943 children. Their study divided these 3- to 5-year-olds into four groups: (a) children who rarely or never viewed the program, (b) children who viewed the program two to three times per week, (c) children who viewed the program four to five times per week, and finally, (d) children who viewed the program more than five times per week. After comparing their knowledge of

body parts, letters, forms, numbers, relation terms, sorting and classification skills before and after the first season of the program, the authors found that children who viewed Sesame Street more than five times a week exhibited greater gains in all eight areas than the children from the other three groups. Those children who watched to a lesser degree also displayed overall gains. While children who rarely or never watched the program experienced gains in the same eight areas, those gains were not as significant as the gains demonstrated by the children in the other three groups. Their final conclusion was that Sesame Street did, in fact, accomplish its established goals, and that it was a successful program when presented on the television (Ball & Bogatz, 1970).

Interestingly enough, an extension of this work was conducted by the team of Rice, Huston, Truglio, and Wright (1990). These researchers followed the footsteps of Ball and Bogatz 20 years later by re-examining the effects that Sesame Street had on children between the ages of three and five years. In a two year longitudinal study, the authors reported that the approach employed by the producers of Sesame Street to introduce new information prompted the development of vocabulary in preschool children. They concluded their report by suggesting that television/video may very well be an appropriate and proficient method in which to tutor and introduce new words to young children (Rice, Huston, Truglio, & Wright, 1990).

Paradoxically, there have been numerous studies since the Ball and Bogatz 1970 study finding contrary results (e.g. Koolstra, van der Voort & van der Kamp, 1997; Ennemoser & Schneider, 2007; Chonchaiya & Pruksananonda, 2008). These studies indicated that television did not facilitate cognitive development and, in fact, was an impediment for the acquisition of cognitive skills. One such study examined the effect that television viewing had upon children's academic achievement as well as their rate of impulsive behaviors. After an analysis of a variety

of measures including parent diaries, the Woodcock-Johnson Revised Test of Achievement, and several selected items from the Behavior Problems Index and the Positive Behavior Scale, the author concluded that significant negative correlations were observed from the total amount of time devoted to television viewing to scores on the Woodcock-Johnson Revised Test of Achievement. In addition, it was evident that as children viewed more television, they did, indeed exhibit more impulsive behaviors (Shin, 2004).

Another study of school aged children by Koolstra, van der Voort & van der Kamp (1997) found a negative relationship between television viewing to reading comprehension. Similar results were observed by Ennemoser and Schneider (2007). In their study of children's reading comprehension and reading literacy development these authors observed negative correlations between the amount of television children watched, and the development of the reading comprehension and literacy. It should be noted that the negative correlations found in these studies (i.e. Ennemoser & Schneider, 2007; Koolstra, van der Voort & van der Kamp, 1997) were that of "entertainment" television rather than "educational" television.

Clearly, the research at hand has yet to provide unmitigated evidence regarding the impact of screen media upon young children. Nevertheless, many researchers have reached a general consensus regarding the antecedent skills children must have in order to learn from the information presented to them on the screen. Based upon the results from several research studies (e.g., Anderson & Levin, 1976; Barr & Wyss, 2008; DeLoache, 1987; Howard & Roberts, 2002; Troseth, Saylor & Archer, 2006), it appears that young children between the ages of two-and-a-half and three years of age become more capable of extracting meaningful information from televised images. This capability is evidenced by a variety of factors, such as their appreciation of the dual nature of televised images (DeLoache, 1987), their ability to attend

to televised programs for a significant period of time (Anderson & Levin, 1976; Howard & Roberts, 2002), and the decrement of a video deficit effect (Anderson & Pempek, 2005; Barr & Wyss, 2008; Troseth, Saylor & Archer, 2006). Ironically, this capability coincides with an escalation in their viewing time (Rideout, Vandewater, & Wartella, 2003) as well as a significant upsurge in their acquisition of new words (Carey & Bartlett, 1978; Heibeck & Markman, 1987). Interestingly, many recent studies regarding the impact of screen media upon child development have focused upon its influence upon language development.

The Impact of Screen Media upon Word Learning

Currently, investigators appear to have divergent views regarding the beneficial capacity that television can have upon word learning. Some studies suggest that television has a positive effect upon language development (e.g., Rice & Woodsmall, 1988), while others have reported negative effects (e.g., Zimmerman, Christakis, & Meltzoff, 2007), or marginal effects (e.g., Schmidt et al., 2009). In one study that supported the view that television has an adverse effect upon language development, negative correlations were found between the numbers of words young children acquired to the length of time they viewed screen media (Zimmerman, Christakis, & Meltzoff, 2007). This finding was distinctively apparent for infants between 8 and 16 months of age, and was demonstrated by a diminution in language scores with each additional daily hour of television viewing. Interestingly, these results were not replicated by older children in the study.

Comparative findings were attained in another study of children between the ages of 15 to 48 months (Chonchaiya & Pruksananonda, 2008). In this investigation, the researchers compared the television viewing practices of language delayed children to those practices of children who had normal language skills. Based upon the results from a variety of measures, a

compelling relationship was found between language delays in young children when there was an “early onset” and “high frequency” of viewing television programs (p. 981). Moreover, those children who began watching television before turning one, and who watched more than two hours of television each day were at an escalated risk for developing language delays than those of their cohorts. It is important to reiterate that infants and toddlers have difficulty extracting information from screen media (see discussion on antecedent skills infants and toddlers must have to learn from screen media), and it does seem possible that other factors could have contributed to the negative correlations between the time children viewed television and the number of words they acquire (Zimmerman, Christakis, & Meltzoff, 2007) and the language delays presented from children who began viewing television at an early age and at a high frequency (Chonchaiya & Pruksananonda, 2008).

In contrast to the findings from studies by Zimmerman, Christakis, & Meltzoff, (2007) and Chonchaiya & Pruksananonda (2008), another study found that viewing screen media had little to no effect upon a child’s language development (Schmidt et al., 2009). In their longitudinal examination of the language and visual motor skills of 872 children three year old children, these researchers determined that there was nothing to substantiate the view that television viewing led to a delay in language acquisition for their young subjects. Furthermore, they concluded that the viewing of television throughout infancy was in no way related to the cognitive or language skills of the children in their study as they advanced to three years of age.

With respect to the previous findings regarding the impact television has upon word learning, it is clear that the prevailing opinions concerning its efficacy appear to be divided. Whereas some view heavy television as a detriment to language acquisition (e.g. Chonchaiya & Pruksananonda, 2008), others have concluded that it has little to no measurable effect upon a

child's attainment of new words (Schmidt et al., 2009). In spite of these conflicting positions, some have found that screen media can, in fact be effective mediums in which to introduce, and thereby *teach* new words to young children.

One such study examined the learning of novel words to corresponding novel objects by 15- to 24-month-old toddlers under five distinctive conditions: with an adult speaker on television, during short segments of a Teletubbies episode, through joint referencing interactions with an adult, through discrepant referencing interactions with an adult, and finally, through a televised presentation without the introduction of a corresponding word (Krcmar, Grela & Lin, 2007). Overall, the performance of the toddlers in the study indicated that the optimal condition for introducing new words to young children was through joint referencing interactions with an adult. And while the toddlers in the study demonstrated a marginal ability to learn new words through the adult video presentations, the researchers noted that this ability was obviously subjacent to their word learning when supported through joint referencing by adults. This particular finding was hardly extraordinary given what is widely known about the limitations children this age have extracting meaningful information from television. What was unanticipated, however, was the greater influence of the televised adult speaker upon word learning when it was compared to the Teletubbies segment condition as well as the discrepant referencing interactions

Despite the limitations exhibited by the young children in the previous study, other studies have evinced a more stable capacity to learn words through experimental videos by older, children. For instance, Rice and Woodsmall (1988) examined the word learning abilities of 3- to 5-year-olds when introduced 20 novel words through animated programs. Before their random assignment to experimental and control groups, these children presented normal receptive

language skills on the Peabody Picture Vocabulary Test – Revised (PPVT-R). Then the children participated in two individual viewing sessions with an experimenter in which they watched an animated program that had either 20 novel target words (experimental group) such as "gramophone" or "fabricate" or 20 corresponding target words (control group) such as "record" or "make". By comparing their subjects' comprehension of novel target words before and after their initial presentations in the animated program, the researchers found that children as young as three years old could indeed learn new words during the viewing experience. Moreover, their learning was not associated with their subsequent performance on the PPVT-R. Furthermore, as demonstrated by the advanced performance of the 5-year-olds, the capacity to learn words through television exposure appeared to become more refined and thereby effective as children aged.

Similar findings were observed in another study of the world learning ability of children aged two and three years old when novel words and corresponding novel objects were presented to them through video segments (Scofield, Williams, & Behrend, 2007). In this study, the researchers presented new words to 2- and 3-year-olds through video segments in an examination of their ability to learn words without the supportive cues that speakers often provide. In these video segments, the image of a single novel target object appeared on a computer screen. While the image was on the screen, the children heard a prerecorded voice identifying it by novel name three times. After its introduction, the novel image faded from the screen, only to reappear with three other distracter images. It is at this point that the children heard the prerecorded voice again, this time asking them to point to the target object. A comprehensive analysis of their responses clearly indicated that these 2-year-olds were able to successfully select the novel objects from distracters at a rate significantly greater than chance.

In addition, their performance demonstrated not only a 2-year-old's ability to learn words without the use of referential cues, but also his/her ability to learn words through videos.

These findings were extended in a follow-up study investigating the capacity of 2-year-olds to effectively disambiguate (i.e., to deduce the meaning of one word from their understanding of another word) and extend their learning of new words from video (Scofield & Williams, 2009). While the general findings from this study indicated that 2-year-olds were unable to correctly distinguish between novel and distracter images when the requests were ambiguous, the children were, however, able to not only learn new words from videos, but were also able to extend that knowledge to exemplars of the novel target images. Interestingly enough, in another study of video word learning in 2-year-olds, the young subjects did, in fact demonstrate an ability to disambiguate words from experimental videos (Allen & Scofield, 2010). In this study, children were given a video word learning task in which they were challenged to learn a new word, demonstrate that knowledge in a disambiguation task, and identify it by pointing and naming it upon request. Findings from this study revealed that these children were able to learn new words from video, use that knowledge to successfully complete disambiguation tasks, extend that knowledge to exemplars of target images, and use the newly learned word to name the novel object (Allen & Scofield, 2010).

In sum, the principal question at hand has considered the feasibility of screen media as a vehicle for teaching words to young children. While previous research has focused on topics such as the impact of screen media upon vocabulary size (i.e. Zimmerman, Christakis, & Meltzoff, 2007) and age or condition differences exhibited by children in video word learning studies (e.g., Allen & Scofield, 2010; Rice & Woodsmall,1988), many lines of inquiry remain unanswered. For instance, little is known about the potential impact of a child's screen media

exposure upon his/her capacity to extract new information, such as learning words, when presented via video. While one particular study found that infants who had previous experience watching a the video attended to it longer in subsequent viewing sessions than those infants who were viewing it for the first time, this study did not examine a child's ability to *learn* through videos (Barr, Zack, Garcia, & Muentener, 2008). And given this finding, one could reason that since previous experience viewing videos can augment the span of time a child attends to later viewings, and information is extracted throughout the viewing, that these children, consequently, could have a greater aptitude for learning through screen media.

In addition, a growing body of research has examined the influence that individual differences such as maternal education (e.g. Anand & Krosnick, 2008; Qi, Kaiser, Milan, & Hancock, 2006) and household income (e.g. Hoff, 2003; Lee, Bartolic, & Vandewater, 2009) might have on the television viewing practices and language development of young children. For instance, some have observed that family income does not play a role in a child's viewing of television (e.g., Lee et al., 2009). However, Pinion, Huston, and Wright (1989) found that when mothers worked outside the home, their children viewed less television due to time spent in daycares and preschools. Furthermore, possible correlations between parental educational level and the time children devoted to television viewing have also been investigated. Although Lee et al. (2009) found that there was no relationship between a mother's educational level and time her child spent viewing television, several other researchers arrived at contrary conclusions (Anand & Krosnick, 2008; Arterberry, Bornstein, Midgett, & Putnick, 2007; Certain & Kahn, 2002). Findings from these studies suggested negative correlations between a lower maternal education and their subjects' time viewing television. Whereas all of these findings suggest that individual demographic differences (e.g., household income and maternal education level) can affect

children's television viewing, they do not address whether these variables affect a child's ability to learn information, particularly new words from the viewing experience.

There is also compelling evidence indicating that household income and maternal education have a significant impact upon language development. In fact, some researchers have found positive correlations between SES and language development in young children (e.g., Farah et al., 2006; Hoff, 2003; Stanton-Chapman, Chapman, Kaiser, & Hancock, 2004), and others have revealed strong relationships between lower levels of maternal education and a decrement in children's language skills (e.g., Dollaghan et al.,1999; Qi, Kaiser, Milan, & Hancock, 2006). Whether these two factors would lead to variable performances by children on a video word learning task is a question addressed in the current study.

Also, it is important to note that the context in which word learning from screen media is quite different from that in which normal language development occurs. Ordinarily, children learn words with the support of referential cues such as pointing, eye gaze and joint referencing (Brooks & Meltzoff, 2005; Carpenter, Nagell, & Tomasello, 1998; Iverson, Capirsi & Caselli, 1994; Lempers, 1979). Clearly, these same cues are not always provided by screen media. Some previous studies of word learning via screen media have demonstrated that children can successfully learn new words without the aid of these referential cues (Allen & Scofield, 2010; Rice & Woodsmall, 1988; Scofield & Williams, 2009; Scofield, Williams, & Behrend, 2007), however, these studies have not addressed the possible variability that may be demonstrated with this type of word learning between children from different populations when presented with the same task via screen media.

Finally, previous research indicates the predictive utility of early language skills for later academic performance (e.g., Rescorla, 2005; Young et al. 2002), as well as language skills (e.g.,

Rescorla & Roberts, 1997; Rescorla & Schwartz, 1990; Tsao, Liu, & Kuhl, 2004). And Sénéchal, Thomas, and Monker (1995) found that children's vocabulary knowledge, as assessed by the PPVT-R, predicted their ability to learn novel words when listening to stories that were read aloud. Yet, the relationship between early language skills and their impact upon word learning through video is still unclear.

Based upon the current research regarding screen media and its efficacy as a vehicle for teaching young children, several things are clear. Discordant views regarding the nature and degree to which screen media impacts early learning abound, yet, a broad body of evidence indicates that screen media may, in fact, support some learning in young children. Moreover, many have found evidence supporting screen media's utility in teaching new words to children; however, these findings have yet to be studied in diverse populations. Also, these studies have not considered the influence that various individual differences such as screen media exposure, location, household income, maternal education and receptive language skills may have upon a child's ability to learn new words from video. Accordingly, it is evident that further investigations into potential relationships between word learning by screen media with the above mentioned factors is thereby warranted.

CHAPTER 2

METHOD

Overview

This study was devised to investigate the potential relationship between a child's capacity to learn words from videos with various demographic factors such as a child's environment, family structure, parental education level and family income, their receptive language skills as well as their screen media exposure.

Participants

Eighty-two preschool children (i.e., 30 3-year-olds, 35 4-year-olds, and 17 5-year-olds) and one parent/guardian of each child participated in this study. There were 19 boys and 22 girls from the rural group, with an average age of 4 years, 2 months. There were 21 boys and 20 girls in the non-rural group, with an average age of 4 years, 3 months. Participants were recruited from a rural and non-rural location[1]: Joyful News Head Start[2] in Aliceville, AL (rural), and the Children's Program at the Child Development Research Center[3] located on the campus of the University of Alabama (non-rural).

[1] The U.S. Census Bureau identifies a rural population as one located outside an urbanized area or urban cluster with less than 1000 people per square mile. Conversely, an urbanized area has a population density of 1000 people or more per square mile (United States Census 2000).

[2] Aliceville is rural town, with 538 people per square mile, and is located in Pickens County, Alabama. Aliceville is a poor community (55.1% living in poverty), with an estimated median household income of $14,389.00, which is less than half the median income ($40,489) of the state of Alabama (city-data.com. n.d.). Joyful News Head Start is a preschool in Aliceville, Alabama.

[3] Tuscaloosa, AL is a non-rural city, with 1,657 people per square mile (city-data.com. n.d.). The Children's Program at the Child Development Research Center in located in Tuscaloosa, AL. The program provides child care to 110 children from the Tuscaloosa area. The parents of many of these children are students, staff, and faculty at the University of Alabama.

Materials

The materials used in this study include: 1) animated videos depicting images of novel target objects and distracters, 2) real target objects and distracters, 3) novel words, 4) demographic information form 5) media questionnaire, and 6) the Peabody Picture Vocabulary Test III.

Images, Real Objects, and Words: Videos created with Microsoft Office PowerPoint 2007 introduced images of novel target objects such as a plastic t-joint and images of novel and familiar distracters. The experimenter also introduced real novel target objects similar to those introduced on the videos as well as real novel and familiar distracters. Finally, target objects (both images and real) were labeled with novel words such as koba, dax, hap, and kip. Novel images, real objects, and words were specifically selected to be unfamiliar to children.

Demographic Information form: A demographic information form was completed by the parent/guardian of the participating child. Through this process, an investigator was available to provide assistance to adult participants as they completed the form. For the rural population, the investigator was asked to read the questions aloud for several respondents in order for them to complete the form. This assistance was not necessary for the non-rural population. This form asked the parent to report details such as “What is the highest level of education that you have?”, or “What is your gross household income?” The information was collected to analyze demographic differences that may be present between children from a rural area in comparison to those from a non-rural area.

Media Questionnaire: The Questionnaire of Media Practices is an inquiry regarding the television watching practices within the home of the participants tested. Through this process, an investigator was available to provide assistance to adult participants as they completed the

questionnaire. For the rural population, the investigator was asked to read the questions aloud for several respondents in order for them to complete the questionnaire. This assistance was not necessary for the non-rural population. Questions such as "How much time does your child spend watching television?", or "When your child watches DVD's and videos with someone, what do they watch?" were asked on this questionnaire in order to document the use of televisions, computers and videos within the homes. Two items on this questionnaire were the focus of later analyses, one on the amount of TV watching and the other on the amount of video watching. Each of these items was scored on a scale of 0-3 with 0 corresponding to no TV/videos, 1 corresponding to less than 1 hour a day of TV/videos, 2 corresponding to 1-2 hours a day of TV/videos, and 3 corresponding to more than 2 hours a day of TV/videos.

Peabody Picture Vocabulary Test –III (PPVT-III): The PPVT-III is a standardized receptive vocabulary assessment in which respondents between the ages of 30 months and 90 years old hear a word and are asked to select the corresponding image from a "plate" that includes four black and white images. Twelve individual plates are contained in each set and respondents complete up to 17 different sets depending on performance. The measure has been found to be an appropriate evaluation of receptive language skills for respondents, including children, from diverse populations (Qi et al., 2006; Washington & Craig, 1999). According to the PPVT-III manual, test-retest reliability for this measure is high (median α=.95) (Dunn & Dunn, 1997). All participating children in the current study were given the measure.

Procedure

After providing their consent, participating adults completed the Questionnaire of Media Practices and the Demographic Information form. Once these questionnaires were completed, testing with the children began. Each participating child completed the PPVT-III and an

experimental word learning session.

In the experimental session, children completed two phases of the experiment: 1) a warm up phase, consisting of two trials, and a 2) test phase, consisting of four experimental trials and four control trials. In each trial, children completed two tasks: 1) video task, and 2) real task. Trials were blocked in pairs so that children were presented two experimental or two control trials at a time. The blocks were counterbalanced so that sometimes an experimental block was presented first, and at other times the control block was first.

Warm up phase: The purpose of this phase was to familiarize the children with the process incorporated in the experiment. In this phase, children completed two trials in which a familiar target object, such as a sock, appeared beside a familiar distracter object, such as scissors. These objects remained on the screen approximately 5 seconds before the distracter object disappeared. While the familiar target object remained on the screen, the child heard a prerecorded voice identifying the object by name (e.g., “This is a sock.”) The object remained on the screen for 5 more seconds before disappearing. Then, both objects re-appeared side by side on the screen. It is at this point that the child heard the prerecorded voice again, this time asking the child to point to the target object (e.g., “Can you point to the sock?”). After the child successful completed the first trial, a second trial followed. In the second trial, children were presented with two more familiar objects, and asked in a similar manner to identify the target object. Those children who correctly identified the familiar target object in both trials proceeded to the test phase.

Test phase: The test phase was conducted in order to demonstrate the child’s ability to learn novel words through videos. This phase followed a procedure analogous to the warm up phase, with children completing four experimental trials, and four control trials. In all eight trials,

children were presented with two distinct tasks: 1) to identify an image of a novel object presented on video, (video task), and 2) identify a replica of the same novel object when placed on the table before them, (real task).

Experimental trials: Each experimental trial began with the presentation of four objects to children on a video screen. One of these objects was a novel target object and three were distracter objects (one unfamiliar and two familiar). All four objects were arranged on the screen in two rows of two. These objects remained on the screen approximately 5 seconds before the distracter objects disappeared. While the novel target object remained on the screen, the child heard a prerecorded voice identifying the object by name three times (e.g., "Look, a koba! It's a koba! This is a koba!") The object remained on the screen for 5 more seconds before disappearing. The trial continued, with all four objects re-appearing on the screen, arranged in a like manner. When completing the *video task,* the children heard the prerecorded voice again, this time asking them to point to the target object on the screen (e.g., "Can you point to the koba?"). The objects remained on the screen approximately 5 more seconds before disappearing in order to initiate the next task. When completing the *real task,* the children were presented with replicas of the objects viewed on the screen as they were placed on the table in front of them. These objects remained in place for 5 seconds before the experimenter asked children to point to the target replica ("Can you point to the koba?"). The children's responses to both tasks were recorded, thereby concluding the first experimental trial. Three more experimental trials were completed as well as four control trials.

Control trials: In these trials, children were presented four objects, one unfamiliar target object, and three distracter objects,(two familiar and one unfamiliar), on a video screen. All four objects were arranged on the screen in two rows of two. These objects remained on the screen

approximately 5 seconds before three distracters objects disappeared. While the novel target object remained on the screen, the children heard a prerecorded voice identifying the object by name three times (e.g., “Look, a hap! It’s a hap! This is a hap!”) The object remained on the screen for 5 more seconds before disappearing. The trial continued, with all four objects re-appearing on the screen, arranged in a like manner. When completing the *video task*, the children heard the prerecorded voice again, this time asking them to point to the unfamiliar *distracter* object by using an unfamiliar word (e.g., “Can you point to the dax?”). The objects remained on the screen approximately 5 more seconds before disappearing in order to initiate the next task. When completing the *real task*, the children were presented with replicas of the objects viewed on the screen as they were placed on the table in front of them. These objects remained in place for 5 seconds before the experimenter asked children to point to the unfamiliar *distracter* replica by using an unfamiliar word (e.g., “Can you point to the dax?”). The children’s responses to both tasks were recorded, thereby concluding the first control trial. After completing three more control trials, the test phase was concluded.

Presentation orders were counterbalanced with half of the children completing the video task first, and half of them completing the real task first. In addition, the order of presentation for the experimental and control trials was counterbalanced as well, with half of the children completing the experimental trials first, and half completing the control trials first.

CHAPTER 3

RESULTS

In this study, three and four year old children were introduced a novel object and a novel word via video. Their success at learning the new word from this medium was measured by their rate of accurately pointing to target images on the screen as well as pointing to their real exemplars when presented before them. Through this process, children were able to demonstrate their abilities to learn new words from a video screen and to extend that knowledge to real world exemplars.

Analysis of children's performance on the video word learning task indicated that there was little variance between the two groups of children on the experimental trials with children from both groups successfully learning words from video (see Figure 1). In fact, rural children (i.e., 3.69/4) did not differ significantly from non-rural children (i.e., 3.90/4) on performance on the experimental video trials, $t(77)=1.48$, p=ns. Likewise, rural children (i.e., 3.82/4) did not differ significantly from non-rural children (i.e., 3.98/4) on performance on the experimental real trials, $t(77)=1.48$, p=ns. Together these results suggest that children are capable of learning words from video and extending those words to real world exemplars at a high rate.

In addition, both rural and non-rural children solved the video word learning task at above chance levels. In this case chance was calculated as the likelihood that a child who was guessing would select the correct object. Because there were always 4 possible choices, guessing would result in selection of the correct object on 25% of the trials (i.e., 1 out of 4). However, because 2 of the 4 objects in each selection array were familiar, it could be argued that children

were actually only selecting between the 2 unfamiliar objects. If so, then a child guessing would select the correct object on 50% of the trials (i.e., 2 out of 4). The current analysis, then, used the more conservative 50% chance value to assess children's selection of the correct object. Using this value, the analyses revealed both rural (i.e., $t(38)=13.21$, $p<.01$) and non-rural children (i.e., $t(39)=31.71$, $p<.01$) chose the correct object at above chance levels on the video trials, and both rural (i.e., $t(38)=18.90$, $p<.01$) and non-rural children (i.e., $t(39)=79.00$, $p<.01$) chose the correct object at above chance levels on the real trials.

It was also the case that both rural and non-rural children were more likely to select the correct object on the experimental trials of the video word learning task than on the control trials. Recall that the control trials were structured similarly to the experimental trials except that children were asked to select the object that matched a new, novel word rather than the target word. Solving the control trials correctly, then, actually required children to select the unfamiliar object that was not named. The control trials were included to ensure that children in the experimental trials were not simply selecting the correct object because it had been seen previously but instead were selecting the correct object because they believed it matched the target word. To assess performance across the experimental and control trials the current study compared children's selection of the target object on the experimental trials to children's erroneous selection of the target object on the control trials. Were children simply selecting the object that had been seen previously, they should have erroneously selected the target object on the control trials. The analyses revealed that both rural ($M=2.28$) (i.e., $t(38)=5.24$, $p<.01$) and non-rural children ($M=1.46$) (i.e., $t(38)=12.15$, $p<.01$) were more likely to correctly select the target object on the experimental video trials than to incorrectly select the target on the control video trials. Furthermore, both rural ($M=2.54$) (i.e., $t(38)=5.09$, $p<.01$) and non-rural children

(M=1.85) (i.e., $t(38)=10.21$, $p<.01$) were more likely to correctly select the target object on the experimental real trials than to incorrectly select the target on the control real trials.

Interestingly, rural children's performance on the control real trials was at above chance levels (i.e., $t(38)=2.60$, $p<.05$) suggesting that there was some tendency during these trials for rural children to select the object that had been seen previously. In addition, non-rural children's performance on the control video trials was at below chance levels (i.e., $t(39)=2.68$, $p<.05$) suggesting that there was some tendency during these trials for non-rural children to select away from the object that had been seen previously. Of course, this is an appropriate selection for non-rural children to make considering that the control trials are simply disambiguation trials, and it is quite common for children in this age range to solve a disambiguation trial by matching the novel word to the novel, unnamed object (see Merriman & Bowman, 1989).

Analysis of children's individual differences indicated that there was tremendous variance between the two groups of children on screen media exposure, location, household income, maternal education, and receptive language skills. For household income, the rural parents reported significantly less annual income than non-rural parents, $\chi^2(2, n=78) =62.02$, $p>.01$. This information was initially submitted in $5000.00 increments, beginning with an annual household income of $5,000.00 and increasing to an annual household income of more than $50,000.00. However, for this analysis, these $5,000.00 ranges of annual household income were collapsed into the following categories: under $25,000, between $25,000 and $50,000, or over $50,000. Accordingly, results of the chi-square analysis showed that a disproportionate number of rural households (i.e., 35 out of 38) were categorized as having a household income of under $25,000 compared to non-rural households (i.e., 2 out of 40). Results of this analysis also showed that a disproportionate number non-rural households (i.e., 31 out of 40) were categorized

as having a household income of over $50,000 compared to rural households (i.e., 0 out of 38) (see Table 1).

For maternal education, rural mothers reported having completed a significantly lower level of education than non-rural mothers, $\chi^2(1, n=81) = 60.13$, $p > .01$. This information was initially submitted according to mothers' completion of highest grade levels or years in college as well as their attainment of college degrees. As a consequence, the data covered a broad range of educational experiences (e.g. 8th grade to PhD and JD degrees). For this analysis, maternal education was collapsed into groups of mothers having completed a college degree (i.e., from a 4-year institution) or those who have not. Results of the chi-square analysis showed that a disproportionate number of rural mothers (i.e., 40 out of 40) were categorized as having not competed a college degree compared to non-rural mothers (i.e., 6 out of 41). Results of this analysis also showed that a disproportionate number of non-rural mothers (i.e., 35 out of 41) were categorized as having completed a college degree compared to rural mothers (i.e., 0 out of 40) (see Table 2). While information regarding paternal education levels was solicited, a disproportionate number of respondents from the rural group failed to provide this information (29.3%), and as a consequence, paternal education was not analyzed.

For receptive language, rural children (M=84) presented significantly lower standard scores on the PPVT-III than non-rural children (M=110), $t(77)=8.75$, $p < .01$. According to normative data, the overall mean standard score for the PPVT-III is 100 and the overall standard deviation is 15 meaning that the rural sample in the current study averaged a full standard deviation below the mean on receptive language and that the non-rural sample averaged nearly a full standard deviation above the mean. In fact, results of a chi-square analysis showed that a disproportionate number of rural children (i.e., 32 out of 38) scored below the 50th percentile on

the PPVT-III compared to non-rural children (i.e., 4 out of 41) while a disproportionate number non-rural children (i.e., 36 out of 41) scored above the 50th percentile on the PPVT-III compared to rural children (i.e., 5 out of 40), $\chi^2(2, n=79) = 45.17$, $p > .01$[4]. In addition, analysis by quartile indicated that rural children were much more likely to score below the 25th percentile and that non-rural children were much more likely to score above the 75th percentile than their counterparts, *ps*<.01 (see Table 3).

For screen media exposure, rural parents reported that their children watched significantly more television and videos than non-rural children, $t(80)=4.29$, $p<.01$. Scores on this measure were aggregated from responses on the two focal items from the questionnaire (i.e., one on TV watching and one on video watching). The aggregated scores ranged from 0 to 6 with 0 representing no regular exposure to television or videos and 6 representing more than 2 hours a day of both television and video exposure.

A regression analysis was used to examine whether performance on the video word learning task was predicted by location, maternal education, receptive language scores, or screen media exposure. When task performance on the experimental video trials was regressed on these factors, the full model proved non-significant, $F(5, 71)=1.52$, p=ns. In addition, none of the individual factors proved to significantly predict task performance: time viewing screen media (β=-.186, p=.15), location (β=-.229, p=.37), household income (β=.321, p=.16), maternal education (β=-.028, p=.90), and standard receptive language scores on the PPVT-III (β=.131, p=.444).

Correlational analyses were performed in order to determine whether or not any of the individual difference factors were related to each other and, ultimately, to performance on the video word learning task (see Table 4). These analyses indicated that household income is

[4] One child from each group scored at the 50th percentile.

positively correlated with maternal education (r=.80, p<.01), receptive language (r=.68, p<.01), and video word learning (r=.25, p<.01) and negatively correlated with screen media (r=-.41, p<.01). The analyses also indicated that maternal education was positively correlated with receptive language (r=.60, p<.01 and negatively correlated with screen media (r=-.38, p<.01) but uncorrelated with video word learning. The analyses further indicated that screen media was not correlated with receptive language and only marginally negatively correlated with video word learning (r=-.20, p=.078). In addition, the analyses indicated receptive language was not correlated with video word learning. Interestingly findings from correlational analyses conducted on the rural and non-rural groups separately suggest that none of these correlations were present in the rural group – even the correlation between household income and maternal education was not statistically significant (although the correlation coefficient, r=.28, suggests that there may be some relationship between the two variables in the rural group) – including that none of the factors were correlated with video word learning.

Finally, because a large portion of the rural sample scored below the 25th percentile on the PPVT-III (i.e. 63% of the rural children) and because nearly half of the non-rural sample scored above the 75th percentile (i.e. 46% of the non-rural children), it is possible that differences in video word learning could be observed between these groups. Recall that 24 of the 25 children who scored in the lowest 25th percentile were rural and that all of the children who scored in the highest 25th percentile were non-rural. However, an independent samples t-test indicated that performance on the video word learning task by the rural children with the lowest receptive language scores (M=3.61) did not differ from performance by the non-rural children with the highest receptive language scores (M=3.95), t(40)=1.53, p=ns.

CHAPTER 4

DISCUSSION

A broad body of research suggests that young children can learn words from television and videos, at least under some conditions (e.g., Allen & Scofield, 2010; Krcmar, Grela & Lin, 2007; Rice & Woodsmall 1988; Scofield & Williams, 2009; Scofield, Williams, & Behrend, 2007). While this research has contributed to the general understanding of word learning from screen media, it does not address the potential impact that a variety of individual difference factors might have on this process. The current study addressed this issue and was motivated by idea that rural children video word learning may be uniquely affected by household income, maternal education, and by limited access to some screen media sources like videos.

In this study, three and four year old children from two different populations, one rural and one non-rural, were presented with a video word learning task. In addition, children completed a measure of receptive language (i.e., the PPVT-III) and parents completed a demographic form (e.g., reporting household income and maternal education) and a media questionnaire outlining the child's screen media exposure. Results showed that the two populations differed dramatically on the individual difference measures but not on performance on the video word learning task. Furthermore, although video word learning was positively correlated with household income and weakly negatively correlated with screen media exposure, it was not predicted by any of the individual difference measures. The broad implications of these findings are discussed below.

Video Word Learning and Screen Media Exposure

One component of this study examined whether or not screen media exposure might prove to have an advantageous effect upon young children in the video word learning task. Some evidence suggests that increased exposure to screen media such as videos predicts lower vocabulary in infants but not toddlers (Zimmerman et al., 2007). In contrast, others have found that repeated exposure to educational programs such as Sesame Street and Blue's Clues stimulated greater program plot and content comprehension in young children (Crawley et al., 1999; Sell, Ray, & Lovelace, 1995). This latter set of findings suggests that children with more experience with screen media might be better at extracting meaningful information from screen media and thus perform better on tasks like the current video word learning task.

The current study did reveal differential screen media practices between both groups of children with parents reporting that rural children spent more daily time watching screen media (e.g., television and videos) than non-rural children. Perhaps this finding is unsurprising given rural mothers also reported lesser levels of education and, previous research has suggested an association between low levels of maternal education and elevated rates of television viewing in their children (Anand & Krosnick, 2008; Arterberry, Bornstein, Midgett, & Putnick, 2007; Certain & Kahn, 2002). Interestingly though, while the current study did show this negative correlation between maternal education and screen media exposure, the correlation fell to non-significant when analyzed in only the rural children.

However, it could still be the case that increased exposure to screen media supports increased learning from screen media. If so, then it would be reasonable to expect that the rural children in the current study might outperform the non-rural children on the video word learning task. This was not the case, though, as both groups of children performed comparably well.

Furthermore, findings from this study indicated that screen media exposure did not predict video word learning. In addition, correlational analysis further revealed that screen media exposure and video word learning shared only a weak negative relationship and that the relationship disappeared when the rural sample was analyzed alone. As a result, it does not appear that increased exposure to screen media has a positive effect on rural children's video word learning.

One possible explanation for this is that the specific content of the screen media that children are exposed to affects learning. Previous research has alluded to the variable effect that "educational" and "entertainment" screen media could have upon the degree to which children learn while viewing (Ennemoser & Schneider, 2007; Rideout, Vandewater, & Wartella, 2003). Consequently, rural children consistently exposed to educational media might be more likely to show a positive effect on video word learning, whereas those consistently exposed to entertainment media might be more likely to show a negative effect on video word learning. Another possible contributing variable for video word learning is the context in which children ordinarily view television and videos. Some have found that learning is enhanced for children when they view screen media with an adult (e.g., Barr & Wyss, 2008; Reiser, R., Tessmer, M., & Phelps, P., 1984; Zhao, J. & Hao, X., 2004). If this is the case, then differential experiences viewing screen media (i.e., co-viewing with an adult or not) could impact how children "learn" to learn from screen media. Although this would not necessarily be helpful in explaining the results of the current study considering that co-viewing usually increases learning of the co-viewed content and that children and parents did not co-view the images presented on the video word learning task. Also, while the current media questionnaire did inquire about co-viewing practices (e.g., who does the child watch TV with, etc.), these questions did not elicit a rate of co-viewing practice as opposed to viewing alone. Consequently, the significance of previous co-

viewing experiences on the word learning task is not known although it may not hold much promise as a viable explanation anyway.

Video Word Learning and Household Income

This study also investigated the effect that household income has upon video word learning. Previous research regarding the impact of household income, often included in measures of SES, has found negative correlations between children's household incomes and their performance on a variety of language measures such as the Preschool Language Scale–3 and the PPVT (Farah et al., 2006; Fish & Pinkerman, 2003; Hoff, 2003). In Hoff (2003) for example, greater growth of productive vocabularies of two year old children from high-SES homes was found when compared to the vocabulary growth of children from middle-SES homes over a 10-week span of time. Findings such as these might lead to the expectation that household income would significantly impact video word learning.

Vast differences in household incomes were reported by participating parents in this study. Annual incomes of *less than* 25,000 in were reported in 92% of the rural homes and incomes of *more than* 45,000 in were reported in 80% of the non-rural homes. Accordingly, it was anticipated that the rural children might not perform as well as the non-rural children on the video word learning task. Surprisingly enough, the performance of both groups of children did not support this assumption. It is evident, as indicated by these findings, that household income did not predict performance on the video word learning task. However, income and video word learning were significantly correlated suggesting that the two variables do share a relationship.

One possible explanation for the finding that income does not predict video word learning is that early intervention (i.e., Head Start preschool classes) was made available to the rural children because of their low household income. Normally, Head Start classrooms foster

language development, as well as social and cognitive skills, through interactions between children and teachers using curriculums that incorporate a variety of activities such as games, songs, and student directed exploration (Bierman et al., 2008). Considering that the current rural sample was recruited from a Head Start population, it is quite possible that the language rich preschool experiences of the rural children may have neutralized the deleterious impact that their low household income might have otherwise had on their performance on the video word learning task. One counter-point to this however is that rural children scored poorly on the receptive language measure. It is more difficult to imagine the rural group having been exposed to a "language rich" environment with receptive language scores more than one standard deviation below the mean and a majority scoring well below the median (i.e., 87% scored below the 50^{th} percentile). It appears that the preschool environment in which the rural children participated did not significantly augment their language skills making it unlikely that this environment positively impacted their task performance. Clearly, comparative investigations into the performance of low income children who do and do not participate in preschool programs on a video word learning task might help to resolve this issue.

Video Word Learning and Maternal Education

The potential relationship between maternal education and performance on the video word learning task was also examined in this study. In the past, some researchers have found associations between children's performances on language tests and maternal education (e.g., Dollaghan, et al., 1999; Qi et al., 2006). For instance, one study found that when children had mothers with college degrees, they had higher scores on the PPVT-R than those children with mothers having lesser levels of education (Dollaghan et al., 1999). And Qi et al. (2006) found that maternal education was one of the factors associated with low receptive language scores by

3- to 5-year old children on the PPVT-III. Consequently, a similar association between the levels of maternal education and performance on the video word learning task was expected considering that none of the rural mothers in the current study reported the completion of a 4-year college degree and 85% of the non-rural mothers having completed at least a Bachelor's level degree. It was conceivable that rural children might have more difficulty learning words from video than the non-rural children. However, the analysis revealed that maternal education did not predict video word learning and, furthermore, that the two variables were not significantly correlated in both the full sample and when analyzed within the rural sample alone. The findings suggest that maternal education is unrelated to video word learning.

Video Word Learning and Receptive Language

To date, there is substantial evidence suggesting an association between early language performance and later performance in language (Rescorla & Roberts, 1997; Tsao et al., 2004), academics (Young et al., 2002), word learning when being read to (Sénéchal, Thomas, & Monker, 1995) and other language related areas such as grammar, reading comprehension, and vocabulary (Rescorla, 2005). These studies indicate a pervasive effect that language delays have upon child development. For instance, Rescorla & Roberts (1997) found that children identified with expressive language impairments at 24 and 31 months of age continued to present significantly lower scores on a variety of language measures when re-evaluated at 3 years of age. In view of findings like these, it was predicted that the receptive language skills presented by children on the PPVT-III might be related to their performance on the video word learning task. Interestingly enough, the data did not support this prediction. In fact the broad differences between the language scores from both groups of children were not at all reflected in their ability to learn new words from video. These findings were not unprecedented. Previous research has

demonstrated that performance on a video word learning task is not necessarily predicted by measures for receptive language such as the PPVT-R (Rice & Woodsmall, 1988). Accordingly, findings from the current study indicate receptive language skills did not predict performance on the video word learning task, and, furthermore, the two measures were not correlated.

The finding was certainly surprising because children with lower receptive language scores were expected to have more difficulty solving the video word learning task, and rural children showed significantly poorer receptive language scores than the non-rural children. In addition, many rural children scored below the 50% percentile on the receptive language measure. One possibility is that rural children did not produce enough variability on the video word learning task to be sensitive to the correlational analyses. In fact, non-rural children did not produce a significant correlation between receptive language and video word learning, and they also showed very little variability on the task.

Nonetheless, this is a provocative finding as it demonstrates the comparable ability of the rural group to learn new words despite their lower receptive language scores when compared to those of their cohorts. This finding could call into question the use of the PPVT-III as a sole measure for receptive language for both groups of children. Although it is true that some have questioned the use of this test with disadvantaged and African-American children (e.g., Restrepo et al., 2006), many have found that this test is an appropriate measure for these children (e.g., Qi et al., 2006; Washington & Craig, 1999). Moreover, the PPVT-III has been used in a variety of research studies with preschool aged children from diverse populations (e.g., Bigelow & Dugas, 2008; Hubbs-Tait et al., 2009). Yet, it is clear that the performances on the PPVT-III from the rural as well as the non-rural children in this study are similar to the findings from studies that suggest that the PPVT-III over-identifies disadvantaged and African-American children for

language delays (e.g., Restrepo et al., 2006). To mitigate this effect, some have found it advantageous to supplement the findings from the PPVT-III with other language measures such as a dynamic approach for evaluating word mapping (Burton & Watkins, 2007). Future investigation into language skills as they relate to word learning through screen media may benefit from using other language measures in concert with the PPVT-III.

Overall, this study revealed that 3- and 4-year-old children are quite capable of learning new words through screen media regardless of screen media exposure, location, household income, maternal education, and receptive language skills. While these findings were generally unexpected, they are remarkable nonetheless. Whereas many have found that language development is affected by variables such as television viewing (e.g., Rice & Woodsmall, 1988; Schmidt et al., 2009; Zimmerman, Christakis, & Meltzoff, 2007), household income (e.g., Farah et al., 2006; Hoff, 2003; Stanton-Chapman et al., 2004), and maternal education (e.g., Dollaghan et al., 1999; Qi et al., 2006), the current study found that these variables did not affect video word learning per se. Maybe most remarkable is the idea that the learning mechanism seems to be intact (i.e., rural children were good at learning video words), and intact to a degree that is similar to non-rural peers, despite not being used nearly as frequently (i.e., as evidenced in rural children's receptive language scores being nearly 2 standard deviations below that of non-rural children's).

While an extension of these findings is limited by several factors such as an insufficient survey of co-viewing practices between children and adults, the possible neutralizing effect of early intervention upon the relationship between household income and performance on the video word learning task, and possible issues with the PPVT-III as a sole measure for receptive language skills in the rural sample, these results demonstrate the ability of the children to

successfully learn new words when introduced to them via computer screen, regardless of their diverse backgrounds, experiences and receptive language skills. In addition, a greater understanding of video word learning and the variables that may impact its efficacy for young children may be augmented by addressing the limitations noted above as well as implementing this same task with younger children in order to identify the developmental path of video word learning in rural children prior to entering the preschool years.

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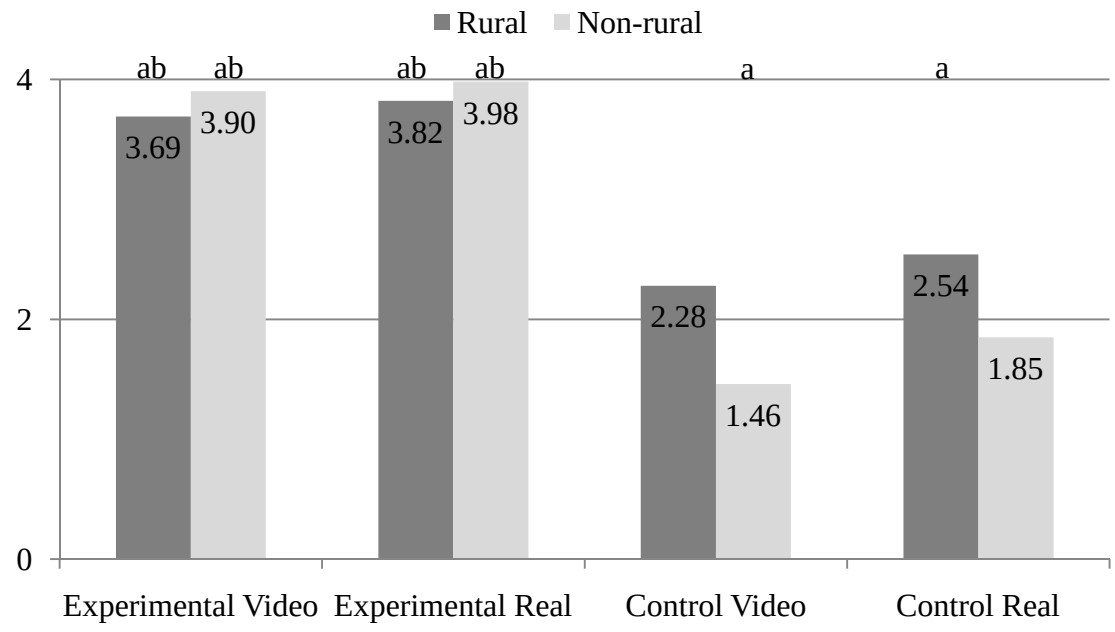
Figure 1: Rural and Non-rural Children's Selection of the Target Object on the Experimental and Control Trials (out of 4 Trials)



[a] Different from chance (i.e., 2 out of 4 or 50%), $p<.05$
[b] Different from the corresponding control trial, $p<.05$

Table 1: Rural and Non-rural Annual Household Income

Population	Under $25,000	$25,000-$50,000	Over $50,000
Rural	35 [a]	3	0
Non-rural	2	7	31 [a]

[a] $p<.01$

Table 2: Rural and Non-rural Maternal Education

Population	No College Degree	College Degree
Rural	40 [a]	0
Non-rural	6	35 [a]

[a] $p<.01$

Table 3: Rural and Non-rural Children's Receptive Language Standard Scores

Population	0-25th %	26-50th %	51-75th %	76-100th %
Rural	24[a]	9	5	0
Non-rural	1	4	17	19[a]

[a] $p<.01$

Table 4: Correlations Between Individual Difference Factors and Video Word Learning in the Rural and Non-rural Groups

Factor	Income	Education	Language	Media	Learning
Income	1.00	.80 [a]	.68 [a]	-.41 [a]	.25 [b]
Education		1.00	.60 [a]	-.38 [a]	.16
Language			1.00	-.18	.18
Media				1.00	-.20
Learning					1.00

[a] $p<.01$
[b] $p<.05$