Early Adolescent Literacy Influences, Reading Ability, and Preventative Health Behaviors

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This study investigated the impact of literacy influences and reading ability on preventative early adolescent health behaviors. The National Middle School Youth Risk Behavior Survey was utilized to explore the relationship between regular dental check-ups and sunscreen use among 244 7th and 8th grade students. Analysis of variance and Tukey post-hoc analyses indicated that as students' reading abilities and positive literacy influences declined, students reported significantly fewer regular dental check-ups and lower sunscreen use ($p < .05$), even after controlling for socioeconomic status. These results suggest adolescent literacy and reading ability are associated with select preventive health behaviors.

INTRODUCTION

The relationship between literacy and health status has been highlighted as a national and global priority. In 2003, the World Health Organization named health literacy as a global priority (Wilson, 2003). In the same year, the United Nations established a Literacy Decade with a focus on all children achieving literacy, acknowledging that some 113 million school-aged children lack access to schooling. The International Reading Association (IRA, 2007) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) signed a cooperative agreement to increase literacy worldwide in three key areas: (1) promote public policies and educational practices to advance reading; (2) build reading capacity through training of teachers; and (3) conducting and disseminating research through professional conferences and publications.

In the United States, the Secretary's Commission on Achieving Necessary Skills (SCANS, 1992) Report highlighted what skills were needed by young people to succeed in the world of work. Ongoing educational recommendations have included the focus on thinking skills and the basic literacies of reading, writing, speaking, listening, and computing.

Recent data indicate that U.S. youth are not keeping pace with current literacy demands (Haynes, 2011; Darwin & Fleischman, 2005). This is unfortunate, because evidence suggests that literacy predicts an individual's health status more strongly than age, income, employment status, education level, and racial or ethnic group (Partnership for Clear Health Communication, 2003). Further, the data underscore literacy-related disparities among racial and ethnic groups and among students from different socioeconomic levels. Since 1998, the gap between the scores of white and black students has remained wide in eighth and twelfth grade (U.S. Department of Education, 2011). In Reading Next: A Vision for Action and Research in Middle and High School Literacy, Biancarosa and Snow (2004) suggest that principals and teachers address the diverse literacy needs of adolescents through seven main strategies, one of which includes a school-wide literacy focus in all subject areas.

The purpose of this study was to examine the association between literacy influences and reading ability and preventive health behaviors of 7th and 8th grade students. Specifically, we investigated the effects of five literacy items on the dependent variables of self-reported dental check-ups and sunscreen use with the hypothesis that students who reported fewer literacy influences and lower reading ability would also report fewer dental check-ups and decreased sunscreen use. These specific behaviors were selected because dental carries are a common problem that begins at an early age (USDHHS, 2000) while sun exposure, particularly early in life, substantially increases the chance of developing all forms skin cancer later in life (English, Armstrong, Kricker et al, 1998; Weinstock, Colditz, Willet, et al., 1989; Rosso, Zanetti, Martinez, et al., 1996).

METHODS

Sample

For this study, a convenience sample of 244 middle school students in grades 7 and 8 were select-

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ed from two public school districts in a Midwestern state. Each school was given $250 to assist with the recruitment of students for this study. Participants were selected to participate for this study as part of a larger study to investigate the test-retest reliability of the Middle School Youth Risk Behavior Survey (MSYRBS) from the U.S. CDC (Zullig, Pun, Patton, & Ubbes, 2006). Classes that met during second period were eligible for classroom-level sampling selection to maximize student eligibility. As Table 1 shows, our demographics were similar to national distributions in gender and age, but not for race, or grade (U.S. Census Bureau, 2011). Seventh grade students were overrepresented, as were students who reported themselves of "white" race.

Table 1 Demographics of Students in Grades 7-8 in a Sample and National Distribution

Characteristic	Sample Distribution (%)	National Distribution (%)
Gender		
Male	45.3	50.2%
Female	54.7	49.8%
Grade		
7	80.9	50.1%
8	19.1	49.9%
Race		
White	93.5	75.8%
Other	6.5	24.2%
Age		
<11	1.7	2.8%
12 to 13	90.9	78.9%
>14	7.4	17.3%

Data Collection Procedures

All data collection procedures were approved by the referent university's review board for the rights of human subjects in research. Following similar methods from previous test-retest reliability studies described elsewhere (Brener, Collins, Kann, et al., 1995; Brener, Kann, & McManus, 2002), two questionnaire scantrons were coded with the same unique number ranging from 1 to 250. Each pair of identically numbered scantrons were then placed in a single large envelope along with the MSYRBS instrument and distributed to each student participant during the first survey administration (Time 1). Each student then removed and used one scantron. The student sealed the envelope containing only the second identically numbered scantron, then wrote his or her signature across the sealed flap. When survey administrators returned for the second survey administration (Time 2, 14 days later), each student received the envelope with his or her name signed across the seal, removed the second scantron, and destroyed the envelope.

Parent-notification forms were distributed at least 7 days in advance of survey administration; those parents who wanted their children to participate were required to sign and return the form (active consent). The survey was administered in each school's auditorium or cafeteria by trained data collectors, emphasizing anonymity, privacy, and confidentiality. During the first survey administration, data collectors reminded students that they would be returning to the school in two weeks to ask students to complete a similar questionnaire.

Instrumentation

The MSYRBS is a self-report survey. Four items requested demographic information, two items requested students to report their height and weight, while the remaining items queried students regarding health risk behaviors. For this study, five additional items were appended to the end of the MSYRBS questionnaire to assess student literacy. Those items were as follows: "How would you rate your ability to read this health survey?"; "How often to you find yourself reading books, newspapers, magazines, and other reading materials outside of school (do not include school work.)?"; "How do you feel about your ability to read?"; "How often did you see your parent or caregiver reading something in the past two days?"; and "Have you been to the public library or a bookstore in the last year?"

Independent Variables

The five student literacy items above served as the independent variables for the study. Their response options, frequency counts, and Kappa test-retest reliability coefficients are presented in Table 2. Qualitative values were assigned based on groupings described by Landis and Kochs (1977), e.g., items described as having "substantial" reliability have Kappa values > 61% and "moderate" reliability when Kappas are > 41%. As can be seen from Table 2, all literacy items were determined to display at least moderate reliability. Two items were determined to display substantial reliability.

Dependent Variables

The dependent variables for this study are standard MSYRBS items: self-reported regular dental check-ups and the use of sunscreen. The specific question for self-reported regular dental check-ups is, "When was the last time you saw a dentist for the check-up, exam, teeth cleaning, or other dental work?" For the use of sunscreen, the question is "How often do you wear sunscreen or sun block with an SPF of 15 or higher when you are outside for more than one hour on a sunny day?" The Kappa test-retest reliability coefficient for regular dental check-ups and the use of sunscreen was .59.0, and 59.5, respectively, in this study.

Dental check-ups. Response options for regular

Table 2 Literacy Items, Sample Responses, and Kappa Reliability Coefficient

Literacy Item	**Sample Response n=244 (%)**	**Kappa**
	N (%)	
How would you rate your ability to read this health survey?		46.6
It was easy for me to read.	218 (89.3)	
I had some difficulty reading.	26 (10.7)	
How often do you find yourself reading books, newspapers, magazines, and other reading materials outside of school?		51.5
Never/rarely	57 (23.4)	
Sometimes	96 (39.3)	
Most of the time/always	91 (37.3)	
How do you feel about your ability to read?		67.9
I love/like to read	147 (60.2)	
I will read if I am asked	54 (22.1)	
I do not like to read	25 (10.2)	
I have trouble reading/not sure	18 (7.4)	
How often did you see your parent or caregiver reading something in the past two days?		53.0
Every day	130 (53.3)	
1 day	41 (16.8)	
0 days/not sure	73 (29.9)	
Have you been to the public library or a bookstore in the last year?		63.8
Yes	195 (79.9)	
No/Not sure	49 (20.1)	

dental check-ups were "during the past 12 months", "between 12 and 24 months ago", "more than 24 months ago", "never", and "not sure". One hundred and seventy-four students (71.3%) reported visiting a dentist during the past 12 months, 16 (6.6%) reported between 12 and 24 months ago, 9 (3.7%) reported more than 24 months ago, 6 (2.5%) reported never, and 39 (16.0%) reported not being sure.

Use of sunscreen. Response options for sunscreen use were "never", "rarely", "sometimes", "most of the time", and "always". Fifty-one (20.9%) students reported never using sunscreen when outside for more than an hour on a sunny day; 60 (24.6%) reported rarely; 79 (32.4%) reported sometimes; 40 (16.4%) reported most of the time; and 14 (5.7%) student reported always.

Data Analysis

Literacy in relation to regular dental check-ups and sunscreen use among middle school students were examined through a series of one-way ANOVAs and Tukey Honest Significant Difference (HSD) tests when appropriate, with regular dental check-ups and sunscreen use serving as the dependent variables. Effect size (ES) was also calculated from the post-hoc comparisons to determine the magnitude of specific comparisons by dividing the mean difference by the pooled standard deviation. Effect size values indicate the magnitude of observed differences and, in a practical sense, show the size of differences between means. Effect sizes of .20, .50, and .80 indicate small, medium, and large effects, respectively (Cohen, 1988). Small effect sizes are generally not conceived as being practically important whereas medium and large effects are understood as being important. All analyses were conducted via PC-SAS.

For the purposes of this study, Time 1 survey administrations from each of the participating schools were combined for this analysis. Of the 402 students selected to participate in the study, 244 (61%) completed the questionnaire during the first survey administration. Because of varied response options among the five literacy-related items, some collapsing of data was necessary to increase responses for a particular theme (e.g., parental influences on reading).

For example, the response options for the question, "How would you rate your ability to read this health survey?" were collapsed from four categories into two: "It was easy to read" (referent) and "I had some difficulty reading". For the "difficulty reading" group, "It was hard to read", "I found it hard to read some of the sentences", "I was confused by some of the questions", and "Not sure" were combined. The response options for the question, "How often do you find yourself reading books, newspapers, magazines, and other reading materials outside of school?" were collapsed from five categories into three: "Never/rarely" (referent), "Sometimes", and "Most of the time/always". For the question, "How do you feel about your ability to read?", response options were collapsed from five into four categories: "I love/like to read" (referent), "I will read when asked", "I do not like reading", and "I have trouble reading/not sure". For the question, "How often did you see your parent or caregiver reading something in the past two days?", response options were divided from four categories into three: "Every day" (referent), "1 day", and "0 days/not sure". Finally, for the question, "Have you been to the public library or a bookstore in the last year?", response options were collapsed from three categories into two: "yes" (referent) and "no/not sure."

RESULTS

Preliminary analyses of variance (ANOVA) indicated that gender did not significantly affect regular dental check-ups ($F=0.19$, $p=0.67$) or the use of sunscreen ($F=1.38$, $p=0.53$). Therefore, adjustments for gender were not included in the model. However, ANOVA analyses indicated that socioeconomic status (SES), as measured by free or reduced priced lunch, significantly affected both regular dental check-ups ($F=10.14$, $p<.0001$) and the use of sunscreen ($F=3.73$, $p=0.03$). In both cases, post-hoc analyses revealed significantly fewer regular dental check-ups and decreased use of sunscreen from children who reported that they were eligible or not sure if they were eligible for free or reduced-priced lunch. As a result, subsequent analyses adjusted for SES.

Literacy-Related Variables

The following sections will focus on the two dependent variables (e.g., regular dental check-ups and sunscreen use), and the five literacy-related variables that were statistically significant: (1) students' ability to read the survey; (2) students' reading outside of school; (3) students' feelings about reading ability; (4) students seeing a parent or caregiver reading; and (5) students visiting a public library or bookstore during the last year.

Students' ability to read the survey. Significantly fewer regular dental check-ups were detected for students who reported 'Having some difficulty reading the survey' ($F(2,238) = 19.74$, $p < .0001$) ($M = 2.30$, $SD = 1.88$) when compared to students who reported the survey was 'Easy to read' ($M = 0.66$, $SD = 1.34$) ($ES = 1.09$). In addition, the use of sunscreen was significantly less for students who reported 'Having some difficulty reading the survey' ($F(2,238) = 4.96$, $p < .01$) ($M = 1.07$, $SD = 1.07$) when compared to students who reported the survey was 'Easy to read' ($M = 1.69$, $SD = 1.15$) ($ES=0.54$).

Students' reading outside of school. An overall significant difference was detected among students reading outside of school and their self-reported regular dental check-ups ($F(3,239) = 3.33$, $p < .05$). Students who reported increased reading outside of school also reported more regular dental check-ups. Post-hoc analyses revealed the mean difference occurred between students who reported reading 'Always/most of the time' ($M = 0.78$, $SD = 1.50$) and students who reported 'Never/rarely' reading outside

of school (M = 1.02, SD = 1.58) (ES = 0.17).

An overall significant difference was also detected among students reading outside of school and their self-reported use of sunscreen ($F(3,239) = 6.90$, $p < .001$). Students who reported increased reading outside of school also reported an increased use of sunscreen. Post-hoc analyses revealed the mean differences occurred between students who reported reading 'Always/most of the time' (M = 1.78, SD = 1.18) and students who reported 'Never/rarely' reading outside of school (M = 1.10, SD = 1.01) (ES = 0.59). In addition, significant mean differences were also detected between students who reported reading 'Sometimes' (M = 1.77, SD = 1.13) and students who reported 'Never/rarely' reading outside of school (ES = 0.58).

Students' feelings about reading ability. An overall significant difference was detected among students' feeling about their reading ability and their self-reported regular dental check-ups ($F(4,238) = 2.84$, $p < .05$). However, the F-value and overall significance were relatively small; post-hoc analyses detected significant differences between students who reported 'Love/like reading' (M = 0.81, SD = 1.42) and 'I do not like reading' (M = 1.24, SD = 1.69) (ES = 0.37). No significant differences were detected for sunscreen use and students feeling about reading ability.

Students seeing a parent or caregiver reading. An overall significant difference was detected among students seeing a parent or caregiver reading in the past two days and their own self-reported regular dental check-ups ($F(3,235) = 5.26$, $p < .001$). Post-hoc analyses detected significant mean differences between those students who reported seeing a parent or caregiver reading 'Every day' (M = 0.26, SD = 0.83) and '1 day of the past two days' (M = 0.96, SD = 1.60), with the former group reporting significantly greater mean dental check-ups on a regular basis (ES = 0.61). No significant differences were detected for sunscreen use and students feeling about reading ability.

Students visiting a public library or bookstore during the last year. Significantly fewer regular dental check-ups were detected for students who reported 'Not visiting/not sure' (M = 1.15, SD = 1.59) if they visited a public library or bookstore during the past year ($F(2,235) = 4.95$, $p<.01$) when compared to students who reported visiting a public library or bookstore during the past year (M = 0.77, SD = 1.48) (ES = 0.33). Furthermore, the use of sunscreen was significantly less for those who reported 'Not visiting/not sure' (M = 0.96, SD = 0.82) if they visited a public library or bookstore during the past year ($F(2,235) = 11.92$, $p < .0001$) when compared to students who reported visiting a public library or bookstore during the past year (M = 1.77, SD = 1.18) (ES = 0.69).

DISCUSSION

This preliminary study helps quantify the relationships between adolescent literacy, reading ability and preventative health behaviors including dental check-ups and sunscreen use. Results suggest effect size estimates that reflect small to large associations, even after controlling for socioeconomic status as measured by free or reduced priced lunch. Students who reported increased reading abilities also reported more regular dental check-ups and increased use of sunscreen. These findings provide the first quantitative examination of the relationship between literacy variables and health behaviors and suggest that this association starts as early as middle school, a time when behavioral patterns are becoming established.

Specifically, this study shows that as reading abilities and literacy influences declined, students reported significantly fewer dental check-ups on a regular basis. This is an important finding because dental carries are a common problem that begins at an early age (USDHHS, 2000) and can be studied internationally from a socio-behavioral perspective (Vadiakas et al., 2011) . In the United States, tooth decay affects more than 25% of children aged 2–5 and 50% of youth aged 12–15. Low-income children are the hardest hit: about half of those aged 6–19 years have untreated decay. If children and youth do not have adequate and regular dental check-ups, they may have distractions with general pain, poor appearance, and low health status, resulting in school absences and academic success (Kwan et al., 2005). Inadequate dental care has also been associated with higher risks for heart disease (Takahashi et al, 2006) and cancer (St. John et al., 2004).

Similar to the findings regarding reduced regular dental check-ups, as general literacy rates declined, students reported significantly less use of sunscreen. Several studies have investigated the use of sunscreen by children ranging from general knowledge and attitudes of children toward sun exposure (Wright et al., 2008; Johnson et al., 2001; Robinson et al., 1997), theoretical applications that explain and predict sunscreen use by children (Reynolds et al., 2012; Olson et al., 2008; Martin et al., 1999; Hillhouse et al., 1997), to the increased development of precancerous lesions among children who use less sunscreen (Berneburg & Surber, 2009; Gallagher, 2000). Johnson and colleagues (2001) interviewed 77 parents of children aged 1-16 years of age and discovered that fewer than half (50%) of parents reported regular sunscreen use for their children. Parents held several adverse attitudes toward sun protection including beliefs that sun exposure was healthy; that children with tans had a better appearance; and that sun exposure could be increased if children wore sunscreen. However, we are unable to locate any studies that specifically examine a child's reading ability and/or literacy influences on sunscreen use.

Parents are a common influence on preventive behavior of children and youth, namely dental visits and sunscreen use, including literacy-related behaviors. As demonstrated by Johnson et al. (2001), parental knowledge and attitudes toward specific

behaviors influence their children's behavior. Although speculative, it is possible that parents who model literacy-related behaviors also place higher value on preventive health behaviors for themselves and for their children. In the context of the current study, if value is placed on literacy-related behaviors by parents who model going to a library or bookstore and being observed reading by their children, positive influences may result. Social Cognitive Theory (Bandura, 1986) suggests that these modeling behaviors (both vicarious and direct) would likely have an influence on children's reading behaviors (e.g., enjoyment of reading and reading outside of school for pleasure). In addition, parents and educators who encourage children's increased perceptions of their reading ability may be more likely to provide (a) reading tasks and/or reading opportunities that afford feelings of accomplishment, (b) normative information and/or evaluative feedback when their child is performing above-average, and (c) an environment that reduces stress while their child in engaged in academic tasks.

Our findings suggest the relationship between preventive health behaviors and socioeconomic status may be more complicated than originally thought and that the relationship between health and students' self-reported reading ability deserves greater attention. DeNavias-Walt et al. (2004) reported that children from families who live at or near the Federal poverty line are known to have poorer health outcomes than those families with higher incomes. Although the link between access to health care and use of health care services are influenced by socioeconomic factors (National Center for Health Statistics, 2011), our analyses show a direct relationship between reduced literacy levels and self-reported preventive health behaviors among middle school students even after controlling for socioeconomic status.

Resource theory (Diener & Fujita, 1995) suggests that people with more material, social, or personal assets are better able to fulfill their needs relative to people with fewer assets. Thus, even after controlling for socioeconomic status in this study, the findings suggest that children whose parents do not model literacy-related skills may also have fewer economic, social, and personal resources than children whose parents model literacy-related skills.

Limitations

This preliminary study is subject to several limitations. This study did not attempt to measure reading skills directly, but asked participants about their reading skills and practices using five questions. On one question that asked students to rate their ability to read the survey, some of the students who reported difficulty reading, found it hard to read (n = 4); hard to read some sentences (n = 3); confused by some of the sentences (n = 12); and not sure if the they could rate their ability to read the survey (n = 6). Data for this question had to be collapsed because the cell sizes were so small. Further studies will need to control for these issues by doing more extensive pilot testing of the literacy-related questions.

Although schools require students to take reading achievement tests which are reported to state departments of education under the federal mandates of the No Child Left Behind Act of 2001 (U.S. Department of Education, 2013; Cawelti, 2006), the results of our study were not correlated with reading achievement scores. Future studies with a larger scope should investigate the relationship between these preventative health behaviors and reading ability with actual reading achievement measures. More research should also be conducted on the relationship between academic achievement (as measured by NCLB reading and math scores) and health behaviors (as measured by the YRBS) with the goal to advance literacy as a predictor of health behavior among school-aged children and youth. More research should also conceptualize how health literacy among adolescents can be determined given the curriculum limitations in schools and the changing health behaviors during puberty (Manganello, 2008).

In addition, study variables used for this study were added to the MSYRBS, which was determined to display adequate reliability (Zullig, Pun, Patton, & Ubbes, 2006). Although this study calculated that the MSYRBS was written at a 7th grade reading level, Doak, Doak, and Root (1985) have noted that reading level and grade level are not compatible. The use of grade level can be so problematic that the International Reading Association and the National Council of Teachers of English (IRA/NCTE Joint Task Force on Assessment, 1994) recommended that it not be used for K-12 because it is hard to know the individual ability of readers. Therefore, we cannot assume that all 7th grade and 8th grade students taking the survey were able to read the survey. For example, teachers assisted two students during the survey by reading it aloud to them.

CONCLUSION

This preliminary study represents the first investigation of middle school youths' literacy influences, reading ability, and preventative health behavior. These results begin to quantify how adolescent reading ability is associated with choosing preventative health behaviors and provide evidence that further supports the relationship between literacy and adolescent health and well-being (Zullig & Ubbes, 2010). Future research should explore the relationship between health and reading ability at even earlier grades. Additional information is needed regarding the literacy influences and reading practices of youth, especially the effects of peer and adult role models for reading, and the type of health-related resources available for reading. A variety of research methodologies should be used to uncover the key mediators between literacy-related skills and health behavior.

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