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Review article

Adolescent health literacy and health behaviors: A systematic review

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ABSTRACT

Objectives: To systematically review and synthesize literature on the relationship between health literacy and health behaviors in adolescents.

Methods: Searches in PsychInfo, PUBMED/MEDLINE, and Educational Resources Information Center (ERIC) were conducted. Studies were included if they reported original data on the relationship between health literacy and a health behavior in adolescents, were written in English, and the population did not have a chronic illness or disability.

Results: Seventeen studies met inclusionary criteria. Definition and measurement of health literacy, and theoretical frameworks varied across studies. Studies investigated the relationship between functional and media health literacy and adolescent health behaviors, thirteen reported significant, linear relationships.

Conclusions: The results suggest that there is a meaningful relationship between health literacy and adolescents' health behaviors. To fully understand the role of health literacy in adolescents' health decision-making, future research should use comprehensive definitions and measures of health literacy, and integrate health behavior and adolescent development theoretical frameworks in study design.

According to the 2015 Youth Risk Behavior Surveillance System, ~18% of U.S. adolescents engaged in binge-drinking, ~11% smoked cigarettes, 80% and 85% ate less than the recommended servings of fruits and vegetables respectively, and 51% engaged in insufficient physical activity (Kann, 2016). In addition, 41% were sexually active with ~14% to ~21% engaging in risky sexual behavior (Kann, 2016). These behaviors in adolescence are related to adult health behaviors and increased disease risk. For example, adolescents who engage in obesogenic behaviors are at greater risk for obesity and obesity-related health complications in adulthood (Fuemmeler, Pendsich, & Tercyak, 2009; Juonala et al., 2011; Tirosh et al., 2011). Adolescents' alcohol use is associated with alcohol-related disorders, mental health problems, and chronic diseases in adulthood (Baranowski et al., 1997; Berkey et al., 2010; Charakida et al., 2014; DeWit, Adlaf, Offord, & Ogborne, 2000; Duncan, Alpert, Duncan, & Hops, 1997). Similarly, individuals who begin smoking in adolescence are more likely to be nicotine-dependent (Lanza & Vasilenko, 2015), and are at increased risk for cancer and cardiovascular diseases (Charakida et al., 2014; Marcus et al., 2000; Strand et al., 2004) in adulthood. Moreover, studies suggest clustering of preventive and risk behaviors among adolescents implicating a more global approach to health behavior change may be necessary. For example, Fleary (2017) found adolescents engaged in combinations of risk and preventive health behaviors and these patterns differed by sex (e.g., 28% boys engaged in recommended physical activity and cigarette, alcohol, and marijuana use; 21% girls engaged in alcohol and marijuana use but no physical activity or healthy eating). Several researchers have also found that

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adolescents who participate in sports are likely to engage in a combination of preventive and risky health behaviors (Kwan, Bobko, Faulkner, Donnelly, & Cairney, 2014; Pate, Trost, Levin, & Dowda, 2000; Veliz, Boyd, & McCabe, 2015).

Both animal and human studies suggest that engagement in health risk behaviors or failure to engage in preventive health behaviors also affect the developing adolescent's brain. For example, Allen, Rivier, and Lee (2011) found that alcohol exposure in adolescent rats was related to alterations in the hypothalamic-pituitary-adrenal axis which regulates the stress response. De Bellis et al. (2000) also found that early age of onset of alcohol use and duration of alcohol use disorder were associated with lower hippocampal volumes in [human] adolescents. Adolescents' brains are sensitive to nicotine, especially in the still developing prefrontal cortex. The prefrontal cortex is important for executive functions and attention, and nicotine use affects cognition by modifying information processing, thus adolescent smokers are at increased risk for cognitive impairment in adulthood (Goriounova & Mansvelder, 2012). Verbal intelligence in adolescents is also reduced with poor nutrition and insufficient physical activity (Jackson & Beaver, 2015).

Important aspects of adolescent development related to health behaviors include autonomy, cognitive processes, and social influences (Chassin, Presson, Sherman, & McConnell, 1995). Autonomy provides adolescents with the opportunity to engage in independent health decision-making with lifelong consequences. However, the cognitive processes influencing adolescent decision-making are equally important. Decision-making and judgment skills in adolescents are not fully developed. Albert and Steinberg (2011) argued that adolescents' decision-making is influenced by socio-emotional and self-regulatory factors. Similarly, Blakemore and Robbins (2012) proposed that slow development of impulse control and response inhibition increases adolescents' reliance on social factors and emotions to make decisions; thus, adolescents are more likely to make non-deliberate decisions. Given this and the long-term consequences of adolescents' health behaviors, it is imperative that health behavior interventions focus on adolescents' decision-making.

Several health behavior interventions have addressed adolescent decision-making via knowledge-based curriculums with mixed success (e.g., Coyle et al., 2001; Horn, Dino, Gao, & Momani, 1999; Malmberg et al., 2015; Neumark-Sztainer, Story, Hannan, & Rex, 2003; Peralta, Jones, & Okely, 2009; Sloboda et al., 2009). We propose that success has varied because these studies exclude a key element of health behavior decision-making, health literacy. Health literacy is the extent to which individuals attain, manage, and understand health information and apply that information in health decision-making (Parker, Ratzan, & Lurie, 2003). Nutbeam (2000, 2008) proposed three types of health literacy: functional, communicative/interactive, and critical health literacy.

Functional health literacy is the application of literacy and numeracy skills to health-related materials such as medicine labels and prescriptions (Nutbeam, 2000; Parker, Baker, Williams, & Nurss, 1995). Functional health literacy is the most common type of health literacy assessed and common objective measures include the Rapid Estimate of Adult Literacy in Medicine (REALM; Murphy, Davis, Long, Jackson, & Decker, 1993), REALM-Teen (Davis et al., 2006), Test of Functional Health Literacy in Adults (TOFHLA; Parker et al., 1995), Short-Test of Functional Health Literacy in Adults (s-TOFHLA; Baker, Williams, Parker, Gazmararian, & Nurss, 1999) and Newest Vital Sign (NVS; Weiss et al., 2005). Communicative/interactive health literacy is the application of cognition and social skills to actively participate in understanding varying forms of communications and applying the new information to evolving situations (Nutbeam, 2000). Critical health literacy involves critically analyzing and acting on health information for personal and social benefit (Nutbeam, 2000). Critical health literacy empowers individuals to act on the social, economic, and environmental determinants of health through individual and collective efforts, yet, it is the least developed and understood aspect of health literacy (Chinn, 2011; Sykes, Wills, Rowlands, & Popple, 2013).

Manganello (2008) included media literacy as a fourth level of health literacy for adolescents. Levin-Zamir, Lemish, and Gofin (2011) further distinguished media health literacy from media literacy by incorporating Nutbeam (2000)'s three types of health literacy in their definition and media health literacy measure development. Specifically, media health literacy includes identification of health-related media, recognition of its effects on health behavior, critical analysis of the content, and action or intention to act on media message for one's self or society. Conversely, Primack, Gold, Switzer, et al. (2006) developed a behavior-specific media literacy measure, the Smoking Media Literacy Scale. Norman and Skinner (2006b) introduced another type of health literacy related to media: electronic health literacy. Electronic health literacy involves the application of health information acquired from electronic sources to address health problems. They developed the Electronic Health Literacy Scale (eHEALS; Norman & Skinner, 2006a) to measure the construct. Media literacy, in general, has been widely studied in adolescence over the last decade (e.g., Chen, 2013; Kaestle, Chen, Estabrooks, Zoellner, & Bigby, 2013; Primack, Douglas, Land, Miller, & Fine, 2014) but few studies have focused on health-related literacy in interactions with the media as defined by Levin-Zamir et al. (2011).

Health literacy is worthy of further analysis regarding its value to improving adolescent health and ultimately adult health. Approximately one third of American adults have basic or below basic health literacy (Kutner, Greenburg, Jin, & Paulsen, 2006), and low health literacy is associated with less satisfaction with disease status, increased use of treatment and emergency services rather than preventive services, embarrassment due to low health literacy, and reduced interest in decision-making regarding health (Baker et al., 1996, 2004; Mancuso & Rincon, 2006; Scott, Gazmararian, Williams, & Baker, 2002). Barriers in language and communication are also associated with low health literacy and result in impaired communication with medical providers, understanding of informed consent, and adherence to treatment (Davis, Williams, Marin, Parker, & Glass, 2002; Williams et al., 1995). Low health literacy also increases the risk for health disparities and researchers argue that low health literacy is sometimes misinterpreted as health disparities (Osborn, Paasche-Orlow, Davis, & Wolf, 2007). Nonetheless, the commonalities between individuals with low health literacy and health disparities include low education, racial/ethnic minority status, low income, and non-native English speaking (Braveman, 2006; Gazmararian et al., 1999). While researchers have begun exploring health literacy levels in adolescents (see Ormshaw, Paakkari, & Kannas, 2013; Perry, 2014 for reviews), and some research suggest that adolescents who participate in sports teams have higher health literacy (Paakkari, Kokko, Villberg, Paakkari, & Tynjälä, 2017), connecting health literacy with adolescents' health

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