

**The Development of a Community-Based Adolescent Health Promotion Social Media
Intervention**

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Abstract

Background

Engagement in preventive health behaviors, namely healthy eating, physical activity, and sleep, during adolescence are low. Practices of these preventive health behaviors are even worse for adolescents who are low-income, racial minorities. Given that adolescents who are disadvantaged face increased health risks, efforts to engage this population in health promotion interventions are critical.

Theoretical Considerations

Theories of adolescent development, including decision-making about health behaviors, health self-concept formation, and social development were used to derive a theory of adolescent health behavioral change for the current intervention.

Method

Four focus groups with adolescents were conducted to ascertain adolescent engagement in preventive health behaviors, media use, and adolescent motivation for behavioral change. Focus group results and extant intervention efforts were coalesced in the design of a developmentally grounded, tailored, health promotion social media intervention.

Evaluation and Assessment

Measures to assess intervention efficacy and test the intervention theory of change are described.

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The Development of a Community-Based Adolescent Health Promotion Social Media Intervention

Over the past few decades, public health efforts have focused on improving adolescent health by promoting engagement in preventive health behaviors (Sawyer et al., 2012); yet, according to the 2013 Youth Risk Behavior Surveillance System, only 38% of adolescents ate breakfast every day, 27% met daily recommendations for physical activity, and approximately 32% of adolescents reported sleeping eight or more hours on a school night (Kann et al., 2014). Additionally, preventive health behaviors for particular groups of adolescents are even lower. Due to the strong relationship between socioeconomic status and race in the United States— a result of historically unequal distribution of resources, and contemporary discriminatory housing, employment, and medical practices, on the basis of race (Coates, 2014; Williams, 1999)—a subset of the population experiences cumulative health risks due to dual status as both a racial minority and low-income. In fact, low socioeconomic and racial minority statuses are independent predictors of engagement in healthy diet, physical activity, and sleep behaviors (Marmot, 2005). For example, higher socioeconomic status is positively related to breakfast consumption and physical activity engagement (Hanson & Chen, 2007). Adolescents from lower socioeconomic status households reported falling asleep later, having shorter sleep durations, and experiencing greater discrepancy between school night and weekend sleep than their more affluent peers (Pagel, Forister, & Kwiatkowi, 2007). Similarly, adolescents who identified as racial minorities reported sleep durations 20 minutes shorter per night than non-minorities, variability in sleep and wake times from night to night (Moore et al., 2011), had lower levels of physical activity (Gordon-Larsen, McMurray, & Popkin, 1999), and were less likely to consume breakfast daily

(Merten, Williams, & Shriver, 2009). Because adolescents who engage in one unhealthy behavior are likely to engage in others (Golley, Maher, Matricciani, & Olds, 2013), and diet, sleep, and physical activity are interrelated health behaviors, clustering of these preventive health behaviors can create multiplicative risks for poor health among adolescents who are low-income, racial minorities. For instance, these adolescents tend to have poor health outcomes, such as mortality and higher incidence of obesity, overweight, asthma, and diabetes (Hayward, Crimmins, Miles, & Yu, 2000; Kaan et al., 2014; American Diabetes Association, 2014). Yet, early adoption of preventive health behaviors, such as diet, physical activity, and sleep, can help mitigate health risks associated with dual status as a racial minority and low-income adolescent (Hanson & Chen, 2007); therefore, efforts to engage adolescents who are low-income, racial minorities in preventive health behaviors are increasingly important (Fahlman, McCaughy, Martin, & Shen, 2010). As such, the current study will focus on the development of a tailored, community-based, health promotion intervention to encourage adolescents who are low-income and identify as racial minorities to engage in preventive health behaviors.

Adolescent Development

Adolescence is the developmental period in which young people experience increased autonomy and decision-making with regards to their health behaviors; for example, half of adolescents' daily meals are consumed outside of the home, adolescents are often responsible for commuting to and from school, and parental monitoring of bedtime and bedtime behaviors is limited (Carskadon, 2002; Park & Kim, 2008; Story, Neumark-Sztainer, & French, 2002). As such, a consideration of adolescents' decision-making with regards to engagement in preventive health behaviors is appropriate for this study. Adolescent brain maturation in the prefrontal cortex is linked to cognitive capabilities including abstract, multidimensional, planned, and

hypothetical thinking (Hazen, Schlozman, & Berestin, 2008; Sanders, 2013; Steinberg, 2005).

Improvements to these cognitive capabilities allow adolescents to link risk behaviors with future outcomes and make decisions about health behaviors in ways that are similar to adults (Hazen et al., 2008; Sanders, 2013); yet, overactive emotional brain areas, previous experience, and environmental factors may impede adolescents' ability to make reasoned decisions about engagement in preventive health behaviors (Albert & Steinberg, 2011). Specifically, the asynchronous development of cognitive abilities and self-regulatory capabilities, combined with a lack of previous experience in decision-making about health behaviors, may lead adolescents to rely on social and emotional factors to make health-related decisions, especially in affective situations (Steinberg, 2005).

In considering the role of social factors in adolescent decision-making, peers cannot be disregarded. Given the increased importance of peers during adolescence, and adolescents' heightened sensitivity to social stimuli, adolescents' are more likely to make risky decisions in the presence of peers (Sanders, 2013). Albert, Chein, and Steinberg (2013) argue that in presence of peers, adolescents are in an emotional state in which the value of immediate rewards increase, leading adolescents to prefer more immediate options. Similarly, Galván and McGlennen (2012) found that in highly stressful situations, adolescents increased their reliance on emotions and reward motivation to make decisions. Because stress mediates the link between low socioeconomic status and poor emotional regulation in children (McLoyd, 1998), and racial minority adolescents experience additional stressors, such as discrimination (Krieger, 2012; Williams, 1999), low-income, racial minority adolescents may be even more reliant on social and emotional cues during decision-making processes than their advantaged peers.

Another important part of development relevant to adolescents' health behaviors is self-concept. In adolescence, self-concept shifts from the self-descriptions of individual behavior in childhood to a psychosocial interior (Harter, 1990). This shift in the self-concept is linked to cognitive capacities developed in adolescence, such as abstract and hypothetical thinking, which enable adolescents to understand their own thoughts, leading to more complex and differentiated self-concepts (Harter, 1990). As a result, adolescents are more likely to engage in health behaviors that are consistent with their self-concept (Oosterwegel & Oppenheimer, 1993; Oyserman, 2001). Historically, researchers have measured the valence attribute of adolescent self-concept, self-esteem (Greenwald et al., 2002). Specifically, researchers examined the role of self-esteem in health behaviors and found that low levels of self-esteem were related to poor health behaviors in adolescence (McGee & Williams, 2000; Trzesniewski et al., 2006), and that promotion of self-esteem can improve adolescent engagement in preventive health behaviors (Neumark-Sztainer, Story, Hannan, & Rex, 2003).

The self-concept consists of self-state presentations, the *actual self*, a representation of the attributes adolescents possess as defined by themselves, or others, and *possible selves*, the cognitive representations of adolescents' goals, aspirations, and fears (Higgins, 1987; Oosterwegel & Oppenheimer, 1993). Possible selves, described by Higgins (1987) as self-guides, serve a motivational purpose. Self-discrepancy theory (Higgins, 1987) and cognitive dissonance theory (Festinger, 1962) posit that individuals seek consistency among their cognitions or beliefs, and that an inconsistency between the actual and possible selves would result in psychological discomfort, or dissonance. Because the possible self mediates feelings about the actual self, and regulates effort and task persistence, the actual self is motivated to align with the possible self to resolve dissonance (Harter, 1990). For example, an adolescent

describes herself as an avid runner, and is motivated to possess this attribute. When she misses a week of running, she may feel dissonance. This dissonance, or psychological discomfort, may motivate her to complete her run to match her actual behavior to her self-description as an avid runner.

The actual and possible selves are highly sensitive to both situational and social contexts as social contexts help adolescents to form, explore, and consolidate various self-descriptions into a clear self-concept (Harter, 1990; Oyserman, 2001). Because the self-concept forms based on the social environment, and adolescents are motivated to achieve belongingness in the peer group, or group cohesion, adolescents are likely to integrate the norms and behaviors of peers into their self-concept (Brechwald & Prinstein, 2011; Côté, 2009). Through socialization processes adolescents adopt and display norms and behaviors to their peers. Peers then reject or reinforce adolescents' presentation of these norms and behaviors. This process, reflexive feedback, helps adolescents decipher which self-descriptions to include or exclude from the self-concept. Integration of self-descriptions into a clear self-concept results in the development of a favorable sense of self, and is intrinsically rewarding for adolescents (Gibbons, Gerrard, & Lane, 2003). Because self-concept formation is dependent on the social environment, adolescents' contribution of attitudes and behaviors to peers are likely to shape their social environment. Reinforcement of health-related attitudes and behaviors by peers would then create normative attitudes and behaviors, which are likely to be adopted by adolescents and integrated into the self-concept. In comparison to traditional social environments, new environments for adolescent socialization, such as media, may be more influential in determining the norms and behaviors that are integrated into adolescents' self-concept, specifically, their health self-concept.

Health Self-Concept and Health Behavior. The health self-concept consists of health-related knowledge structures about the self that are generalized over different health-related areas and over experiences at different times and includes health behaviors, health-related attitudes and norms, and health-related skills (Wiesmann, Niehörster, Hannich, & Hartmann, 2007). Health information and training of health-related skills are delivered to adolescents via socializing agents, namely peers and media (Paek, Reber, & Lariscy, 2011). Several studies link peer norms to adolescent engagement in preventive health behaviors. For instance, friend participation in physical activity is positively related to adolescent girls' participation in moderate to vigorous physical activity (Springer, Kelder, & Hoelscher, 2006), and peer support for unhealthy eating is positively related to adolescent unhealthy food intake (Fitzgerald, Heary, Kelly, Nixon, & Shevlin, 2013). Super-peer theory posits that media exerts pressure on adolescents through social norms because adolescents believe social network site references to be accurate; as such, adolescents' own behaviors are influenced by what they see on these networks (Strasburger, Jordan, & Donnerstein, 2010). Strasburger et al. (2010) argue that social media platforms allow adolescents to display information about risky behaviors, and positive peer feedback exacerbates these risky behaviors. Yet, social media also has the potential to construct social norms around healthy behaviors, through modeling, information provision, and social support.

Formation of a positive health self-concept, through positive feedback and skills training is related to improved adolescent engagement in health behaviors (Schneider, Dunton, & Cooper, 2008; Wilson et al., 2002), though intervention results are mixed. In a review of educational interventions, O'Mara, Marsh, Craven, and Debus (2006) found that the interventions that had the greatest effect on self-concept were those that targeted and measured domain specific self-concepts, rather than global self-concept, and provided skills training, and feedback to

adolescents. For instance, Debar et al. (2011) conducted a randomized control trial in which middle school students volunteered as peer communicators in a healthy lifestyle intervention. Researchers proposed that students' commitment to being a peer educator, or to developing media promoting healthy behaviors, was a display of a public commitment, or presentation of a possible health self-concept. Results indicated that students who participated in the public commitment activities were less likely to be obese than students in the control group; however, no significant results were found with regards to students' engagement in health promoting behaviors. The lack of adolescent behavioral change could have been due to self-selection bias in the sample of students that made the public commitment. These students likely had positive health self-concepts, and engaged in health promoting behaviors prior to the intervention. For these students, engagement in the commitment activities simply validated their actual health self-concept. Similarly, Wilson et al. (2002) targeted adolescent fruit and vegetable intake and physical activity behaviors through self-concept alteration and provision of behavioral skills. Participants were asked to describe their strategies around engaging in healthy behaviors to peers and were video-recorded. The process of video recording participants was akin to self-presentation of the possible-self in the theory of self-concept, and produced cognitive dissonance in participants. Results of the intervention indicated a positive change in health self-concept, and increased fruit and vegetable consumption. Though health self-concept interventions may produce positive behavioral change, only one intervention measured and demonstrated an effect on adolescents' health self-concept (Wilson et al., 2002). Yet, self-concept formation was not measured in relation to active feedback from the social environment; therefore, I suggest measuring self-concept and having adolescents self-present in a manner through which they can receive feedback from peers. Social media provides a medium through which adolescents can

engage in presentation of their possible health self-concept to induce cognitive dissonance, receive positive feedback from peers, and shape an environment that can be supportive of their possible health self-concept.

Social Media, Health Self-Concept, and Health Behaviors

Social media provides adolescents with opportunities to engage in important developmental tasks, yet poses several risks. Evidence suggests that social media sites offer adolescents additional opportunities to achieve social, identity, and self-concept development tasks (Valkenburg & Peter, 2011). For instance, social media offers adolescents more opportunities for self-presentation and to receive feedback from peers, both of which are necessary for self-concept formation. Furthermore, social media sites offer enhanced controllability of the self as it is presented, creating a sense of security for adolescents (Valkenburg & Peter, 2011). Controllability is enhanced on social media through the absence of audio or visual cues, easy distribution of information, and the ability to change and reflect on what is posted. These features optimize self-presentation and allow adolescents to present the self in a manner with which they are comfortable, or to present their possible self. Oosterwegel and Oppenheimer (1993) assert that individuals present themselves in ways to match their actual-self with possible-self, or in ways to impress others, which can be enhanced through use of social media. Though enhanced controllability may be beneficial to adolescents due to the heightened self-consciousness that is experienced by adolescents during this developmental period, these features of social media sites leave adolescents susceptible to cyberbullying, strangers, and online predators (Valkenburg & Peter, 2011).

Comparable to the relationship between social media and adolescent development, there is a complex relationship between media and social media use, and adolescent engagement in

preventive health behaviors. Displacement theory suggests that adolescents do not engage in health promoting behaviors because their time is instead spent engaged with media (Strasburger et al., 2010). Competing needs, such as adequate sleep, and socializing with peers, may cause adolescents to utilize time that should be spent sleeping to engage in interactions with peers via social media (Sanders, 2013). Van den Bulck (2007) noted that adolescents, who use mobile phones after lights out, even one night a week, were 3.3 times more likely to be tired after a year. Evening exposure to bright light is also linked to altered physiological mechanisms, such that media use at bedtime may cause adolescents to become more aroused, making it more difficult to relax (Cain & Gradisar, 2010).

In relation to physical activity, there is a negative association between leisure physical activity and adolescent computer and screen-based media use (Ianotti, Kogan, Janssen & Boyce, 2008; Utter, Neumark-Sztainer, Jeffery & Story, 2003). In a qualitative study on social media use and exercise behaviors, Vaterlaus, Patten, Roche, and Young (2015) found that social media sites increased young adults' access to applications for physical activity accountability, new exercises, and motivation for physical activity. Yet, social media also created barriers to exercise including displacing exercise time, being a distraction during exercise, and providing inaccurate information about exercise. Although this study concentrated on young adults as opposed to adolescents, the findings may be applicable to the adolescent population. Cavallo et al. (2014) found changes in adolescent physical activity were more strongly linked to individual Facebook use for social support than an intervention Facebook page. These findings may be due to the fact that adolescents' primary use of social media sites is to maintain communication with existing peers (Valkenburg & Peter, 2011), but also implicate the collective role that peers and social media may have in affecting adolescents' health behaviors. In fact, evidence suggests that when

adolescents viewed an online social peer taking large or small quantities of food, adolescents modeled the eating habits of the online social peer (Bevelander, Anschütz, Creemers, Kleinjan, & Engels, 2013). Given that adolescents believe social networking references to be accurate (Stratsburger et al., 2010), and are highly influenced by peers and normative behaviors, peers' display of health behaviors on social media are likely to influence adolescents' engagement in preventive health behaviors.

Media may also impact adolescent engagement in preventive health behaviors through exposure to advertisements of unhealthy behaviors. Wiecha et al. (2006) found that increased television viewing is associated with increased caloric intake as well as increased consumption of the food advertised among youth. Similarly, Utter, Neumark-Sztainer, Jeffery, and Story (2003) determined that high rates of television viewing among adolescents' is related to increased consumption of soft drinks, fried foods, and snacks. These results are replicated in studies that explore the relationship between social media advertisements and adolescent food consumption. Williams (2013) argues that soft drink and fast food franchises dominate social media marketing and directly targeted adolescents. However, social media also offers young adults increased food choice, the ability to share pictures of food to social networks (Vaterlaus et al., 2015). Holmber, Charplin, Hillman, and Berg (2016) found that when adolescent users shared images of food on social media sites, the majority of the food images shared were high in calories and low in nutrients. In addition, fruits and vegetables accounted for less than a quarter of the images shared by adolescents. Given that adolescence is a developmental period where peer influence and social norms are important to adolescent decision-making, the types of food and information shared may impact adolescent dietary behaviors. In fact, social media has the

potential to be used to either promote negative or positive norms around engagement in preventive health behaviors.

Social media also has pro-social properties that can increase participant engagement in health initiatives and programs. Neiger, Thackeray, Burton, Giraud-Carrier, and Fagen (2013) describe social media as a mechanism for involving individuals in the creation of environments and social conditions that promote health, and as a tool to provide information about programs and services that can improve personal health. High engagement, described as individuals serving as participants in a program, or as partners that help the program achieve its health promotion activities, may increase participants' involvement in the health program. Additionally, tailored messaging, or customized health information that is delivered to specific participants is likely to be viewed by participants as more personally relevant, and increase the likelihood that the information will be read, processed, and have a chance of stimulating behavioral change (Noar, Harrington, Van Stee, & Aldrich, 2011). Therefore, adolescents' dissemination of health-related information to peers on social media around health promoting behaviors may change norms around health behaviors, and shape a social environment that reinforces these norms, which would improve the likelihood of adolescents engaging in health promoting behaviors.

Despite the negative associations between social media use and adolescent engagement in preventive health behaviors, the relationship between these two constructs were dependent on how social media was used. Social media has the potential to promote pro-social or healthy behaviors through normative beliefs, and deliver adolescents accurate health-related information. Moreover, social media provides an opportunity for the promotion of healthy behaviors in a developmentally appropriate manner. Social media can also be used as a tool for adolescents to complete important developmental tasks, like social development and formation of a clear self-

concept. Given these properties of social media, it has been utilized as a feature in adolescent health promotion interventions.

Evidence for Use of Social Media Health Interventions with Adolescents

Four social media health promotion interventions have been implemented with adolescents (Shaw, Mitchell, Welch, & Williamson, 2015; Wójcicki, Grigsby-Toussaint, Hillman, Huhman, & McAuley, 2014). All of the studies used a Facebook page or group to deliver health information to participants, and targeted health behaviors included physical activity (Cavallo et al., 2012; Wójcicki, et al., 2014) and STI prevention (Bull, Levine, Black, Schmiede, & Santelli, 2012; Jones, Baldwin, & Lewis, 2012). Information was delivered through websites, infographics, public service announcements, motivational quotations, video links, games, quizzes, and discussion threads, and was posted by researchers in all but one study. For one study, informational posts were created by researchers, in collaboration with youth facilitators who posted the information and resources to the Facebook page (Bull et al., 2012). In addition to participants joining the Facebook page, Wójcicki, et al. (2014) delivered personalized messages to participants. Evaluation measures included measures of behavioral change, peer norms, interaction with the Facebook group or page, and satisfaction with the intervention. Findings suggest that adolescent engagement in social media delivered interventions decreased throughout the duration of the studies, and the interventions produced modest (Bull et al., 2012; Jones et al., 2012; Wójcicki, et al., 2014), or negligible (Cavallo et al., 2012) behavioral change.

The aforementioned interventions may have produced modest or negligible results due to *how* social media was used in the intervention design. For instance

- (1) The interventions encouraged passive use of social media; the lack of interactive social media use in each intervention may have led to declining engagement in the

Facebook page or group throughout the duration of each intervention. Therefore, I propose that efforts to maintain adolescent engagement in social media health interventions is important, as engagement may increase behavioral change, or lasting effects on behavioral change.

- (2) No intervention capitalized on participants' existing social networks; rather health information was delivered to participants via social media, or social support was artificially developed on social media through a group page. I propose that capitalizing on adolescents' current social networks, would not only provide adolescents with support for behavioral change within their existing social networks, but would also sustain adolescent engagement throughout the duration of the intervention.
- (3) Though behavioral change was the goal of the interventions, behavioral change may not have been the relevant outcome associated with engagement in the intervention; instead, the interventions may have altered adolescents' readiness to engage in behavioral change. Prochaska, Redding, and Evers (2015) argue that most at-risk populations are not prepared for action, and that measuring stages of change can help move these populations, specifically adolescents, through the other stages of change and towards action (see next paragraph for more detailed discussion). Therefore, I propose that a social media intervention, that measures stages of change, and incorporates the mediating processes of change may be beneficial in moving adolescents towards readiness to engage in behavioral change.
- (4) Researchers assumed that adolescents possessed media health literacy skills, which are needed to translate the health knowledge presented in the intervention into

behavioral change. Given that media health literacy tends to be low in adolescents (Gray, Klein, Noyce, Sesselberg, & Cantrill, 2005), I propose that media health literacy training be embedded into health social media interventions to help adolescents understand how health-related media messages can be used to engage in health behavioral change.

Social media may be a way to move adolescents towards health behavioral change rather than as a platform from which to invoke behavioral change. The Transtheoretical Model (TTM) describes behavioral change as a process that unfolds through stages of change (Prochaska & DiClemente, 1992; Prochaska et al., 2015). The first stage of change, *precontemplation*, is characterized as no intention to take action towards behavioral change within the next six months. The following stages, *contemplation*, intention to take action within the next six months, and *preparation*, intention to take action within the next thirty days and taking behavioral steps towards change, occur prior to action. *Action* is a change in behavior for less than six months, while *maintenance* is a change in behavior for more than six months. However, the process of behavioral change does not occur in a linear manner, for example, individuals may move from preparation back to contemplation. Use of the TTM may reveal that the interventions were responsible for a shift in adolescent stage of change towards action; however, because action was the goal in every intervention, and adolescents may lack the resources necessary to engage in action of the health behavior, the interventions produced negligible or temporary results. Therefore, in populations with limited resources necessary to engage in behavioral change, use of the stage of change measure could reveal intervention effectiveness, or barriers adolescents experience with respect to engaging in preventive health behaviors. The TTM also describes the processes that mediate progression through stages of change, many of which can be delivered

through a social media platform; therefore, use of the TTM may have allowed researchers to tailor information to adolescents that could have shifted adolescents' stage of change towards action (i.e. Di Noia, Contento, & Prochanska, 2008).

Current Study

Adolescent engagement in preventive health behaviors sets the stage for future health and health outcomes; yet, many adolescents do not consistently engage in preventive health behaviors. Practice of preventive health behaviors among adolescents who are low-income, racial minorities, tend to be even worse, increasing their risk for poor health outcomes. Given that adolescence is an important period for self-concept formation, the health self-concept is related to motivation for behavioral change, and health self-concept is easily amendable to change (Harter, 1990), the current intervention will capitalize on health self-concept to encourage adolescent readiness for behavioral change. Theories related to adolescent self-concept formation and motivation for behavioral change can be conceptualized within a model (see Figure 1) that encompasses theories of adolescent development. The Social Ecological Model (Bronfenbrenner, 1986) suggests that adolescent development is context dependent; therefore, the health self-concept is formed based on feedback from the social environment. Relational Developmental Systems theory (Overton, 2013) builds on Bronfenbrenner's (1986) model and serves as a framework for understanding health self-concept formation as a result of interactions between adolescents and their social environments. That is, adolescents are not only influenced by their interactions with the social environment, but through these interactions adolescents shape their social environment. Given that adolescence is a time linked to increased importance of peer relations, the current intervention will focus on the social environment as adolescents' interactions with peers. Because peers and media are essential in shaping the health

self-concept, and social media provides adolescents with additional opportunities to receive feedback from peers, the current study proposes that altering adolescents' possible health self-concept, and creating a social media environment that supports this possible health self-concept, may increase adolescents' motivation to engage in preventive health behaviors.

The current study focuses on the development of a health intervention to alter adolescents' possible health self-concept by scaffolding adolescents in the dissemination of a health knowledge and strategy-based social media campaign (see Figure 2). Health-related knowledge and strategies within the intervention will concentrate on healthy eating, sleep, and physical activity behaviors. Given that possible self-concepts are more sensitive to incentives from, and changes in the social environment (Harter, 1990; Oosterwegel & Oppenheimer, 1993; Oyserman, 2001), alterations to adolescents' possible health self-concept may lead adolescents to experience cognitive dissonance, or a mismatch between their possible and actual-selves. Resolution of cognitive dissonance requires adolescents to engage in behavioral change, yet, adolescents that are low-income may lack the resources needed for behavioral change. Therefore, I propose a more likely outcome of the intervention is a shift in adolescents' readiness to engage in behavioral change, detectable through a stage change according to the TTM. As such, the current study will resolve the following research questions: 1) can a tailored health intervention that engages adolescents' in a social media health promotion campaign alter their possible health self-concept and 2) does the alteration of a possible health self-concept move adolescents' stage of change towards readiness to engage in physical activity, healthy eating, and sleep behaviors?

Method

Exploratory methods were used to gather preliminary information from adolescents that would be used in the development of a tailored health intervention. Focus groups provided

information about the sample population's engagement in preventive health behaviors and media use behaviors. Adolescents, ages 12-18, who were enrolled in Brookview House summer programming, were recruited to participate in the focus groups.

Brookview House is a community-based organization located in Boston's Dorchester and Roxbury neighborhoods that provides transitional housing assistance to families, the majority of which are female-headed, and are at-risk for homelessness or are homeless. As a result of residential segregation, the majority of residents in the Dorchester and Roxbury neighborhoods are Black and Hispanic (Shah et al., 2015). Approximately, 22% of Dorchester residents, and 36% of Roxbury residents live in poverty; yet, Black and Hispanic residents in Boston are more likely to live in poverty, have lower levels of educational attainment, and lower median income levels than other races (Shah et al., 2015). Within Brookview House there is a youth program that provides services to school-aged children and adolescents during the summer and school year. Children and adolescents enrolled in the programs include current and past residents, and children in the community.

Procedure

The procedure for this study was reviewed and approved by the Social, Behavioral and Educational Review Board (SBER) at Tuft's University. Staff at Brookview House agreed to the administration of focus groups during the summer program. Flyers and parental permission forms were given to personnel at Brookview House to distribute to the parents of adolescents enrolled in the summer program at Brookview House. Passive consent was utilized in lieu of signed parental permission forms, and adolescents provided their assent for participation in the study. Minors with signed parental forms were not eligible to participate in the study. Four focus groups were conducted with two to five, same-sex adolescents (adolescents self-identified sex).

Focus group participants were asked to complete a demographics questionnaire (Appendix A), and open-ended questions were asked to generate discussion about health and media use behaviors (Appendix B). Light refreshments were provided to participants during the focus group, and for their participation in the study, each adolescent was given a pair of headphones valued at five dollars.

Measures

The demographic questionnaire and focus group questions were developed based on adolescent health literature. Self-reported socio-demographic characteristics including age, gender, ethnicity, grade, acculturation status, free lunch status, primary language spoken at home, and housing type were collected from participants. Participants were asked to answer questions about their current eating, physical activity, sleep, and media use behaviors. Individual, relational, and access related protective and risk factors were explored through focus group questions. In order to gauge both adolescent motivation towards change, and targeted health behaviors for the intervention, adolescents were asked to identify a specific behavior to change in relation to each health topic. The focus group protocol also included exploratory inquiries into adolescents' social media use. Several of the questions asked in the focus group were also asked within the demographic form to allow for cross-referencing of data.

Data Analysis

Data from the demographic forms were entered into a spreadsheet and cleaned. The cleaning process included cross-referencing individual participant data across the questions in the demographic form. For example, one participant stated that his parents were from another country; however, he filled in the country name as Alabama. Because the primary investigator knows Alabama is not a different country, the parent migration question was changed to indicate

no for this participant. In addition, one participant stated that she did not use media before bed, but in a later question reported using media for three hours before bed. As such, the response to the first item was changed to a yes for this participant. Two participants reported that they lived at home with their parents in unsupervised housing, but while filling out the demographic form asked the primary investigator the zip code for a transitional housing program at which they lived. For these participants, an accurate selection to the housing type question would be that they lived with their parents in a supervised shelter or transitional housing; however this error was not changed in the cleaning process. These discrepancies can be attributed to the demographic form as it was not written at a third grade reading level and may have posed difficulties for participants to understand and accurately complete the form. Future measures within this project will be written at no more than a third grade reading level to ensure participant understanding.

Focus group recordings were transcribed verbatim and coded using the framework approach (Smith & Firth, 2011). The primary investigator and a colleague began by highlighting keywords and phrases from a subset of focus group transcripts, one male and one female, to develop “in-vivo” codes. Comments related to keywords were then written in the margins of the transcript, and utilized with “in-vivo” codes to develop initial categories. Initial categories were then combined into themes that were used to code the focus groups. Analyses of focus group coding led to the creation of core concepts, which were combined with demographic questionnaires and extant literature on adolescent preventative health behaviors.

Results

Phase I: Focus Groups

Thirteen adolescents participated in the focus groups. Approximately half of the participants were female (53.8%), and the majority (77%) were between the ages of 13-15. More than half of participants self-identified as African-American or Black (61.5%), and 92% of participants reported receiving free lunch at school, which is a proxy for low-income status. Demographic forms and focus group analyses revealed adolescent current engagement in preventive health behaviors, as well as their potential stage of change with regards to readiness to engage in the respective preventive health behavior.

Physical activity behaviors. Participants' commute included combinations of public transportation and walking; on average, adolescents walked 1.15 ($SD = 1.62$) miles in their commute to school. Participants mentioned walking for leisure time physical activity, and using school and community resources. "Um, I exercise at the gym by [de-identified] community center." "I go to the basketball court like down the street from my house." "I did track during the school year." Overall, participants mentioned frequent engagement in sports and other physical activities that they enjoyed, and were good at: "Sometimes we exercise, we run on the machine, and sometime we hang out in the teen room."

Stage of change for PA. When asked what they would change about their physical activity behaviors, many adolescents mentioned having nothing to change, or wanting to engage in more physical activity. Responses such as, "I don't know what I would change.", and "I would change nothing", are related to the precontemplation stage of change, no intention to take action. A female participants' response, "I'd start going to the gym", could be considered the contemplation or preparation stage of change. According to the focus group results, very few participants would be considered as being in the action stage of change.

Eating behaviors. Though 92% of participants reported eligibility for free school lunch, many did not eat the lunches provided by school. Participants stated that they did not eat school meals because of the taste and quality; instead, they packed their own lunch to take with them or purchased lunch at nearby fast food restaurants and corner stores. Breakfast consumption followed a similar pattern. Breakfast skipping was reported by both male and female participants, “I don’t eat breakfast at school. Well, I don’t really eat breakfast at all.” “I’m never that hungry in the morning to eat” “Just depends on how hungry I am when I wake up.” Other participants were given breakfast by their parents, “My mom makes me breakfast.” “Always my mom cooks pancakes or something or cereal.” “My mom usually comes back with Dunkin Donuts”, or purchased their own breakfast, “I, um. Sometimes even though, sometimes when I don’t want to go to subway, I get like Dunkin Donuts for breakfast. But if I don’t want to go there, I just go to store and buy me snacks and get beef patties and stuff because I don’t like the school lunch.” Participants also mentioned purchasing snack foods when they had money, “Sometimes I go to the store to buy some candy. Cuz my mom at home doesn’t let me eat candy, so when I have my own money, I feel like free to buy it.”

Stage of Change for Eating Behaviors. When asked what they would like to change about their eating habits, female participants reported wanting to eat smaller portions. Male participants generally expressed positive attitudes towards eating healthy, citing being an athlete as the rationale behind doing so, and did not feel that their eating behaviors needed to change, “Nothing makes me want to eat healthy.” Therefore, participants could be considered as being in the precontemplation, or contemplation stages of change for healthy eating.

Sleep behaviors. Adolescents reported using media devices for several hours, $M = 3.55$ ($SD = 2.21$), before going to bed and while in bed. Media devices included cellphones, laptops,

and televisions, and often use of these devices was simultaneous. “Umm take a shower, check social media, then wait until I get tired. Watch Netflix or something.” Focus group analyses suggest that participants were largely uncertain of the amount of time they spent engaged in media prior to, and while in bed. Many participants reported falling asleep with the TV on, “My mom just comes in my room and like turn off the TV because I fall asleep with the TV on.” Additionally, participants reported texting, and using social media to talk to friends prior to falling asleep. Focus group participants noted a discrepancy between their weekend and weeknight sleep schedules, and reported trying to staying up later on the weekends, “I try to challenge myself to stay up all night.” “I be trying to stay up, but it don’t work. Now I usually fall asleep around like two.” Moreover, participants were unsure of how much sleep they were getting on school nights, but they knew that they were not getting enough. Many participants reported daytime sleepiness and feelings of grogginess in the morning, “When I wake up-I feel, I feel grumpy.”

Stage of Change for Sleep Behaviors. The majority of participants reported feeling like they did not get enough sleep, and mentioned wanting to get more sleep; however, these participants did not identify a change in their sleeping behaviors as necessary. Therefore, they could be considered as being in the precontemplation stage of change. One participant stated, “I’d change going to sleep earlier, so I can get enough sleep and I won’t be all mad in the morning, so mad.” This participant would be considered as being in the contemplation stage of change with regards to sleep.

Social media use. Demographic forms indicated that participants had several social media accounts; however, Instagram (38.5%) and Facebook (38.5%) were the primary accounts used. Yet, focus groups revealed that Facebook use was less prevalent than what was suggested

by the demographic forms; instead, participants commonly used Snapchat and Instagram. Social media use coincided with peers, specifically viewing friends' pages and liking posted items.

Participants also mentioned using private messaging components of social media sites to socialize with peers.

Phase II: Intervention Design

Focus group results were used to develop a tailored health promotion intervention for adolescents at Brookview House. The intervention consists of five, weekly one-hour sessions. The goal of the intervention is to train adolescents on critical media health literacy skills, and provide information related to each health behavior in order to scaffold adolescents in the deliverance of a social media health promotion campaign. Focus groups with adolescents revealed basic knowledge about healthy eating, physical activity, and sleep behaviors; therefore, the current intervention assumes a novice level of knowledge, and aims to provide adolescents with the basic information and strategies needed to successfully create and deliver health-related media messages. Even though researchers note that adolescents showed improvement in media health literacy skills after one workshop (Begoray, Banister, Wharf Higgins, & Wilmot, 2014), health promotion interventions ranged from four sessions (Moseley & Gradisar, 2009) to five semesters (Debar et al., 2011); therefore, the current intervention will consist of five sessions.

Given that participants reported Instagram as their preferred social media site, and Instagram has capabilities that allow researchers to view adolescents' posts, the current intervention will scaffold adolescents towards the deliverance of an Instagram health promotion campaign. Instagram is a mobile online social network device that allows users to share photos and videos either privately or publically. Users are also able to comment and like pictures and videos shared by other users. In the current intervention, at the conclusion of each module,

adolescents will be asked to develop images that incorporate a health-related media message and deliver the message via Instagram. Adolescents will be asked to tag the intervention Instagram page in their post.

Media health literacy training. Because self-concept interventions were most successful when they included some form of skills training in conjunction with positive feedback (O'Mara et al., 2006), and adolescents are constantly being provided with health information from peers and the media (Paek et al., 2011), the current intervention aims to train adolescents with skills to ascertain the accuracy of, and how to use health-related information to engage in preventive health behaviors. Gray et al. (2005) found that when seeking health-related information, adolescents often had difficulty assessing the accuracy of the information and applying the information to health behavioral change in their everyday lives. Health literacy has been proposed as a skill to assist adolescents' in the process of obtaining, processing, understanding, and applying health-related information to health decision-making (Nutbeam, 2000). Given adolescents' access to, and use of media to gather health-related information, researchers have begun to focus on media health literacy (Manganello, 2008). Levin-Zamir, Lemish and Gofin (2011) describe media health literacy as encompassing four processes: identification of existing health messages, awareness of the potential influence the health message can have on health behaviors, abilities to critically analyze health messages, and action, intention to take action on the health message.

Social Media Campaign. Through the intervention activities adolescents will be engaged in the deliverance of health information and strategies to peers. Given the significance of peer relations, and the influence of peers during adolescence, several interventions utilize peers to deliver health information to adolescents (Harden, Oakley, & Oliver, 2001). In the SnaX

intervention peers delivered educational messages to other students about healthy dietary choices (Bogart et al., 2010). Debar and colleagues (2011) developed an intervention through which adolescents designed media that promoted healthy behaviors, which were delivered to peers. Focus group results with adolescents suggested that social media use was a method used by participants to connect with friends and share information. Participants' description of social media use included, "to add pictures", "for people to see them", "to see other people's pictures", "talk to my friends and see things", "Instagram, I use to watch pictures and Snapchat to take chats with my friends. Like we send pictures of what we do to each other." Considering the strength of peer influence, and social media as an arena for peer socialization, the current study will use social media as a tool for adolescents to disseminate information to peers.

Social media also provides adolescents with accessibility to peers to complete developmental tasks related to self-concept development, including self-presentation and feedback from peers (Valkenburg & Peter, 2011). A female focus group participant explains this use of social media, "And like you can get people's opinions on you, and you can be honest and stuff like that." Therefore, the creation of social media posts containing information and strategies related to health behaviors will be used to engage adolescents in the presentation of their possible health self-concept. I propose that feedback from peers via social media may create dissonance, which may encourage adolescents to align their possible self-concept to their actual self. Moreover, through deliverance of social media posts adolescents may begin to shape their social media environment, increasing the likelihood that positive feedback may occur.

Transtheoretical Model Components. According to the TTM, there are processes that mediate transitions from one stage of change to another (Prochaska et al., 2015). Consciousness raising increases the awareness about the causes, consequences, and cures for a problem

behavior, and is integrated into the modules as activities that provide adolescents with education about each preventive health behavior. Self-reevaluation activities have been integrated into the modules to help adolescents assess their own health behaviors. Dramatic relief, increasing positive emotions around action, is integrated into the intervention through the interactive activities, and adolescent dissemination of knowledge about health behaviors. The goal is for adolescents' participation in intervention activities to increase their positive emotions around engagement in health behaviors.

Intervention Modules. The first two modules teach adolescents health media literacy skills needed to deliver media messages to their friends. The remaining sessions are behavioral focused modules through which adolescents will be provided with information and strategies about sleep, physical activity, and health eating behaviors. In modules 2-5, adolescents will be asked to design and share messages about each health behavior with their peers. A recap activity is integrated into intervention sessions 3-5 to explore the feedback adolescents may receive on their social media post from the previous session.

Module 1: Media and health. The first module will engage adolescents in activities concerning the relationship between health and media, with particular attention to media messages. Activities are focused on media health literacy skills related to identification of media messages, and awareness of how media messages may influence health and health behaviors.

Media is good for health. In this activity, adolescents will be asked to agree or disagree with the statement, "media is good for health", by walking to one side of the room or another. After adolescents make their decision about whether or not they agree with the statement, the facilitator will engage adolescents in a discussion through which they will be asked to provide justification for their choice using examples of how media may influence health behaviors.

Health message identification. The purpose of this activity is for adolescents to practice identifying health messages presented in the media and to increase adolescents' ability to identify health messages across a variety of media channels and preventive health behaviors. Advertisements, print, social media messages, and screen shots of videos will be given to adolescents in handout form. In groups, adolescents will be asked to sort the media messages and place the health-related media messages in a pile. After adolescents have divided their media messages, the facilitator will engage the adolescents in a brief discussion about whether the health-related media messages are positive or negative, and how these messages may influence health behaviors.

Techniques of health messages. The purpose of this activity is to provide adolescents with information about the different techniques included in health messages to encourage or discourage engagement in health behaviors. The facilitator will describe a media message technique, and adolescents will be asked to choose an example of a media message that incorporates this technique from their pile of health-related media messages from the previous activity.

Message presentation and persuasion. The final activity focuses on a specific media message technique, persuasion. This activity begins to engage adolescents in critical thinking and evaluation of health related media messages, the focus of the subsequent module. Adolescents will be presented two facts about adolescent media use. Though both facts are accurate, adolescents will be asked to choose the accurate fact. The purpose of this activity is to help adolescents understand that information can be presented in different ways and still be accurate, but that the presentation of the information is intended to persuade the reader. The facilitator will

engage adolescents in a discussion about their decision to choose one fact as more accurate than another.

Relevance to population. Given that adolescents who are low-income racial minorities spend more time engaged in media than their advantaged counterparts, and are less likely to have content or time restrictions placed on media use (Grier & Kumanyika, 2006), they are more likely to be exposed to advertisements and health-related media messages (Grier & Kumanyika, 2006; Story et al., 2002). Evidence suggests that many advertisements of unhealthy behaviors specifically target racial minority adolescents, or are over represented in neighborhoods where low-income, racial minorities live (Yancey et al., 2009). Because adolescents are likely exposed to targeted marketing, it is important for adolescents to understand how health messaging can influence health behaviors. Therefore, this module focuses on training adolescents to recognize health-related media messaging, and to understand how these messages may influence their health behaviors and decisions.

Evidence suggests that new information is encoded into existing knowledge more easily (Freedman, Heary, Kelly, Nixon & Shevlin, 2013; Schwartz & Goldstone, 2015; Snell, 1999); therefore, the intervention begins with an activity to trigger adolescents' current knowledge about the relationship between media and health, on which subsequent activities will expand. Focus group results revealed that adolescents do not associate media use, particularly television viewing and social media use, with their engagement in preventive health behaviors. Given the high prevalence of media in adolescents' lives, more than half of adolescents report going online several times a day (Lenhart, 2015), and focus group participants reported use of social media "every five minutes", it is important adolescents gain an understanding of how media may influence their health behaviors. Cognitive load theory suggests that learners should be guided

from simple-to-complex tasks (De Jong, 2010); identification of health media messages is the foundation of media health literacy and a low ordered cognitive task; therefore, media health literacy training begins with this task (Anderson & Krathwohl, 2000; Levin-Zamir et al., 2011) and moves to more complex tasks, such as critical thinking and creation of health messages. Focus groups with adolescents suggested that participants were able to identify media messages that encouraged them to engage in preventive health behaviors: “A lot of like advertisements of like childhood diabetes and all that stuff. Cuz in the news, I see stuff the people. They eat a lot of junk food and they get fat.” Participants cited media coverage of obesity as rationale for engaging healthy eating behaviors; yet, did not mention media in relation to other preventive health behaviors. As such, it is evident that adolescents need more practice in identifying health-related media messages, before moving on to higher ordered tasks.

Previous media literacy interventions focused on participants’ ability to ascertain the persuasive techniques utilized in media messaging; for example, understanding the sponsor of the message and their intentions, and the underlying values, lifestyles, and encouragement of healthy or unhealthy behaviors within media messages (Austin Pinkleton, Hust, & Cohen, , 2005; Hove, Paek, & Isaacson, 2011; Hill & Lindsay, 2003). Hill and Lindsay (2003) used inductive learning strategies to help adolescents make generalizations about the components of health media infomercials. Inductive learning strategies are related to higher order cognitive processes, specifically critical thinking (Abrami et al., 2015; Schwartz & Goldstone, 2015); yet, focus groups with adolescents revealed varied abilities in terms of literacy and critical thinking capabilities, as a few adolescents faced difficulties in responding to the demographic questionnaire. Furthermore, adolescents do not develop critical thinking in all domains simultaneously (Manaster, 1989). Therefore, a combination of inductive strategies and guided

questioning are used to help adolescents identify the techniques utilized in media messages.

Given that adolescents lack the experience necessary to make reasoned decisions about engagement in health behaviors, and are influenced by peer norms (Brechtwald & Prinstein, 2011); it is important adolescents have skills to think critically about how information is presented to encourage or discourage engagement in health behaviors.

Module 2: Critiquing and creating media health messages. The *Critiquing and Creating Media Health Messages* module builds on the media health literacy skills adolescents developed in the first module. Now that adolescents are able to identify and understand the influence of media messages on health, they will be guided through the development of skills related to critical analysis, evaluation, and creation of health media messages. The skills developed around critiquing and creating health-related media messages will be practiced throughout the remaining intervention sessions.

Critiquing Media Messages. The goal of this activity is to help adolescents apply the information from the first module to evaluate the accuracy, purpose, and effectiveness of health media messages. Adolescents will be presented with video clips of health-related media campaigns they have likely seen on television, related to physical activity, diet, and sleep. In groups, adolescents will be asked to rate the health campaigns along the following dimensions: ability to grab their attention and the persuasive techniques used in the campaign, presentation of facts, the sponsor of the message and their intentions, and the encouragement of healthy or unhealthy behaviors. Adolescents will also be asked to choose one health campaign and create a health message related to the campaign. After each video, the facilitator will lead a brief discussion about adolescents' rating of the media campaign and their rationale for the rating.

Why like: Designing media messages. The purpose of this activity is to use adolescents' social media experience and theories of tailored media messaging to teach adolescents how to create media messages for their peers. In focus groups, adolescents mentioned engaging with social media by liking friends' posts, or using social media to communicate directly with friends. In this activity, adolescents will be asked to bring elements of their social media experience into how they plan to share information with peers. Elements of tailored media messaging will focus on adolescents creating messages that are relevant to, and trigger the prior knowledge of their peers (Wilson et al., 2007); for example, use of true or false statements, mythbusters, or "did you know" statements. Using these components of tailored media messaging and their own knowledge about creating engaging messages, adolescents will be asked to edit their media messages developed in the previous activity. In the remaining modules, adolescents will practice writing media messages using these components of engaging media messages.

Social media post. Adolescents will be asked to choose one of the messages they created in the module to share with peers via social media.

Relevance to population. Past media messaging interventions have focused solely on critiquing media messages (i.e. Hill & Lindsay, 2003); however, Begoray et al. (2014) argue that media literacy education must shift from solely critiquing media messages to a focus on production of media messages in order to empower students. As such, the *Critiquing and Creating Media Messages* module provides adolescents with skills training to improve their ability to critique and create health-related media messages for dissemination. As previously mentioned, adolescents who are low income, racial minorities are surrounded by unhealthy advertisements, and are targeted with advertisements of unhealthy behaviors (Grier &

Kumanyika, 2006; Story et al., 2002); therefore, it is important these adolescents develop skills to be able to assess the content, and trustworthiness of health messages.

Criteria used to critically evaluate media messages included in health-related critical media literacy interventions will be taught to adolescents in the current module (Begoray et al., 2014; Austin et al., 2005). In critiquing health-related messages, adolescents will also be able to identify the components of successful health messages to guide the creation of their own health messages. Adolescents' engagement in the creation and deliverance of health messages to friends on social media allows adolescents to present their possible health self-concept, shape the social environment to be supportive of the possible health self-concept, and empowers adolescents to take action with regards to creating and disseminating health messages (Begoray et al., 2014; Levin-Zamir et al., 2011).

Module 3: Sleep. The sleep module is designed to provide adolescents with knowledge about the benefits of sleep, adolescents' need for sleep, good sleep hygiene practices, and the relationship between sleep and media use. Strategies around reducing media use at bedtime, ending social conversations with friends, and creating a relaxing sleep environment are integrated into the module activities. Adolescents will engage in the analysis of a sleep related commercial or video, and the creation and dissemination of a sleep health message for the health promotion social media campaign.

Recap. The recap activity, Hearts and Comments, is a check-in about the health promotion social media campaign, specifically the media health message from the previous module. Because Instagram uses hearts for likes and has a comment feature, each adolescent will be given a heart and a comment bubble. In a group, the facilitator will ask adolescents to hold up the sign corresponding to the feedback they received on their media message, to prompt a brief

discussion about the feedback adolescents received. This activity will be implemented at the beginning of each remaining module.

Sleep difficulties quiz. The goal of this activity is to help adolescents consider the environmental factors that may impede their ability to get enough sleep. Adolescents will be asked to go through the list and circle all of the factors that may influence their sleep behaviors. After identifying the factors that may be related to poor sleep quality, adolescents will be asked to choose one factor that is amendable through behavior change and write a media message that about a behavioral change strategy.

Mythbusters: Adolescent sleep. In two groups, adolescents will be presented with facts about adolescent sleep needs, changes, and benefits. After presentation of each fact, adolescents will be asked to hold up signs indicating whether the fact is true or false. The group that chooses correctly receives a point. At the end of the activity, adolescents will be asked to choose one “mythbuster” from which to develop a health media message.

Critique of sleep related message. Adolescents will watch a video about a sleep related message and critique the video according to topics discussed in the *Creating and Critiquing Media Messages* module. This activity promotes active learning and evaluation of the normative beliefs, or false information portrayed regarding sleep needs. After critiquing the video, adolescents will be asked to create a media message related to the video, or a sleep related strategy for peers.

Social media post. Adolescents will be asked to choose one of the three messages they developed to share with peers in a social media post.

Knowledge quiz. A brief sleep knowledge quiz will be completed at the beginning of the next module. The knowledge quiz is a formative evaluation measure that will be used to assess

adolescent gains in sleep knowledge, and determine the efficacy of the knowledge-based activities in the sleep module. This quiz will precede the check-in activity, and quizzes related to the remaining health behaviors will be implemented in the following modules.

Relevance to population. Puberty causes a shift in adolescents' sleep-wake cycle through which adolescents stay up later at night, and awake later in the day (Dahl & Lewin, 2002; Wolfson & Carskadon, 1998). Yet, adolescent bedtime behaviors may exacerbate their preference for staying up late. Focus group participants reported staying up late at night and engaging with various forms of media including cell phones, tablets, and watching television: "um take a shower, check social media, then wait until I get tired. Watch Netflix or something." "Watch movies. Or sometimes, I don't want to watch movies, so I get to bed with my tablet." Given that media engagement, particularly bright light exposure late into the evening is linked to increased arousal and difficulties sleeping (Van den Bulck, 2007; Cain & Gradisar, 2010), adolescent engagement with media devices may further delay sleep onset. In addition, the importance of peer relations to adolescent social development may cause adolescent communication with their friends to supersede their need for sleep (Hazen et al., 2008). Focus group participants mentioned using their phones in bed to communicate with peers via social media or text messaging. Increased autonomy during adolescence is related to decreased parental monitoring at bedtime, or set bedtimes (Carskadon, 2002). As such, focus group participants reported use of several media devices in the bedroom, and no adult monitoring regarding use of the devices or a set bedtime. "She tells me on the weekends that I can stay up, but if I wake her up, its gonna be a problem." "My aunt she be going to sleep at twelve she be like this, "hey if you don't want to go to sleep that's on you, if you miss your bus then it's just going to be me and you".

The activities in the sleep module focus on helping adolescents develop skills and problem-solving strategies to address the barriers they face in obtaining eight or more hours of sleep a night. Household noise and chaos, media use, and socializing with peers, have been identified as specific barriers to low-income, minorities adolescents' sleep (Bartel Gradisar, & Williamson, 2015; Billows et al., 2009; Van den Bulck, 2007; Cain & Gradisar, & Moseley, 2010). Because adolescents are largely responsible for their own sleep schedule, the current module provides adolescents with information regarding strategies they can implement to improve their sleep duration and quality, specifically regulating their media use at bedtime and creating a relaxing sleep environment.

Previous adolescent sleep interventions have used a sleep quiz or survey as an awareness activity to help adolescents link their before bedtime behaviors to consequences related to poor sleep quality, such as daytime sleepiness (Cain, Gradisar., 2010; Sousa, Cortez, Araújo, Azevedo, & Macêdo, 2007). In focus groups adolescents reported experiencing negative consequences associated with poor sleep; therefore, it is important for adolescents to understand how their bedtime behaviors may contribute to their experience of daytime sleepiness or negative emotions. Good sleep hygiene behaviors and consequences related to poor sleep identified in the literature (Bartel, Gradisar, & Williamson, 2015; Malone, 2011; Storfer-Isser et al., 2013) that are specific to adolescents who are low-income, racial minorities, will be included in the poll. Specifically, factors mentioned in the focus groups such as, media use before bed, including socializing with friends and watching movies, and noisy sleep environments will be referenced.

Sleep focused interventions have also provided adolescents with information concerning sleep-wake cycle changes in adolescence, adolescent needs for sleep, and the benefits of good sleep hygiene practices (Bakotić, Radošević-Vidaček, & Košćec, 2009; Cassoff, Knäuper,

Michaelsen, & Gruber, 2013; Moseley & Gradisar, 2009; Sousa et al., 2007). Focus group results were not sufficient in identifying the level of knowledge participants had about adolescent sleep needs, therefore this activity assumes a novice level of sleep knowledge. The presented facts about adolescent sleep will consist of facts that are relevant to low-income, minority populations; for example, information regarding how sleeping with the television on, noise in the sleep environment, and sleeping with cellphones and other media devices can affect sleep quality.

The purpose of the critical analysis of a sleep commercial is to help adolescents understand the normative beliefs around sleep needs. Similar to school-based sleep interventions that have used norms to encourage adolescent behavioral change regarding sleep (Sousa et al., 2007), the current activity uses critical thinking skills to help adolescents compare the sleep related norms expressed in the video to actual adolescent sleep needs.

By providing adolescents with relevant information and strategies, around sleep they may be more likely to post about these strategies to peers, a display of their possible health self-concept. Because a mismatch between the possible and actual health self-concepts results in dissonance, adolescents may be more likely to use the strategies delivered in the module to resolve dissonance.

Module 4: Home-based physical activity. The purpose of this module is to provide adolescents with knowledge and strategies for engaging in home-based physical activity. Like the previous module, adolescents will be engaged in the critique of a physical activity video intended for use in the home, and the deliverance of a physical activity strategy for the social media campaign.

Physical activity jeopardy. This activity will provide adolescents with knowledge about the benefits, requirements, and consequences related to adolescent physical activity. Adolescents

will be provided statements and asked to answer the statement in the form of a question. At the end of the activity, adolescents will be asked to write a health message about something they learned from the jeopardy game.

Home-based physical activity tools. This activity will inform adolescents about different household items and opportunities for physical activity at home. Adolescents will be given items and asked to come up with ways that these items can be used for home-based physical activity. For example, adolescents may be given soup cans and asked how they can be used to engage in physical activity. In addition, adolescents will be given information about different apps and ways to engage in these activities with peers via social media. At the end of the activity adolescents will be asked to create a media message about one of the home-based physical activity tools.

Physical activity video critique. Adolescents will watch two short physical activity videos from YouTube and use their critical thinking skills to discuss the ways in which the videos were realistic or unrealistic representations of home-based physical activity and why. After viewing the videos, adolescents will develop a media message for peers around a strategy or exercise that was showcased in one of the videos.

Social media post. Adolescents will be asked to choose a media message that they developed and share it with peers in a social media post.

Knowledge quiz. A brief home-based physical activity knowledge quiz will be completed at the beginning of the next module. The knowledge quiz is a formative evaluation measure that will be used to assess adolescent gains in home-based physical activity knowledge, and determine the efficacy of the knowledge-based activities in this module. This quiz will precede the check-in activity.

Relevance to population. Evidence suggests that adolescents who are disadvantaged are more likely to engage in physical activity when there are community resources available at low cost (Humbert et al., 2006). Yet, adolescents may face transportation related barriers, have other responsibilities that prevent them from engaging in physical activity outside of the home (Wright et al. (2010), or live in neighborhoods that do not permit safe engagement in outdoor physical activity (Davison & Lawson, 2006; Molnar Gortmaker, Bull, & Buka, 2004). For example, all of the focus group participants had memberships to the local YMCA; however, transportation was a barrier to utilizing the YMCA for physical activity engagement. A male focus group participant also mentioned having a time limit that prevented him from engaging in physical activity at his neighborhood park, “My timing. My mom makes a time limit. Like when I go to the basketball court she gives like a time.” In focus groups, late school end times were also identified as a barrier to engagement in physical activity. Adolescents may also have responsibilities that require them to be home after school. In focus groups, adolescents mentioned homework, and not enough places to work out as barriers to their physical activity engagement. Wright, Wilson, Griffin and Evans (2010) noted that adolescents who are low-income’s responsibility for watching younger siblings impeded their ability to engage in leisure time physical activity. Furthermore, environmental considerations, such as poor weather, working afterschool, neighborhood safety, or other responsibilities may make adolescent engagement in outside physical activity impractical for this population of adolescents. Because of the barriers adolescents faced when engaging in leisure time physical activity, the *Home-Based Physical Activity* module focuses on providing adolescents with strategies to engage in physical activity within the home, which may increase their autonomy for physical activity engagement.

Past adolescent physical activity interventions focused on increasing adolescent knowledge about physical activity requirements and providing adolescents with strategies to engage in physical activity (Cavallo et al., 2012; Neumark-Sztainer et al., 2003; Wilson et al., 2002); therefore, the activities in this module will provide adolescents with information about physical activity and strategies for engaging in physical activity at home. Given that adolescent engagement in physical activity is tied to social support from peers (Springer et al., 2006), the *Home-based physical activity tools* activity incorporates ways through which adolescents can engage in home-based physical activity with peers.

The *Physical activity video critique* activity engages adolescents in critical thinking skills, and provides adolescents with an online resource to engage in home-based physical activity behaviors, a similar strategy used in a social media delivered physical activity intervention (Wójcicki et al., 2014).

Providing adolescents with strategies that are relevant, and can easily be implemented into their everyday lives, may increase the likelihood that adolescents will engage in physical activity and that they may be willing to deliver these health strategies to their friends via social media. Deliverance of the health related strategies might shape adolescents' social environment to be more supportive towards their presentation of a possible health self-concept. Through feedback from peers, adolescents may experience dissonance, and be able to use the strategies presented in the *Home-Based Physical Activity* module to resolve dissonance.

Module 5: Healthy eating. The *Healthy Eating* module focuses on breakfast and snack consumption. Adolescents will analyze the advertisement strategies used by cereal makers, gain information about making healthy snack choices, and create a media message for the social media health promotion campaign.

This or that: Snacks. Images of two different snack options will be presented and adolescents will be asked to choose the healthier option. Many of the snacks listed on the slides will include those available to adolescents at their local convenience stores and those that adolescents reported eating in the focus groups. At the end of the presentation, adolescents will be asked to create a media message around choosing healthy options in their neighborhood.

Breakfast tips. Adolescents will read case studies about adolescents who either had or did not have breakfast and how their breakfast choice impacted their day. In groups, they will be asked to identify why the adolescent may have skipped breakfast, how having or not having breakfast impacted the adolescents' day, and whether or not the breakfast consumed was healthy. Each group will be asked to present their case study along with a breakfast consumption strategy for the adolescent in the case study. The case studies will feature several behaviors that the adolescents mentioned engaging in during the focus groups.

Cereal commercial critique. Adolescents will view a couple of cereal commercials, paying particular attention to the persuasion techniques and health facts presented about each cereal. While viewing the commercial adolescents will have a copy of the cereal's nutritional facts to compare the facts presented in the commercial to those listed on the cereal box. After watching the videos, the facilitator will engage adolescents in a discussion about the persuasion techniques used in the commercials, and whether the facts presented in the commercial were accurate. Adolescents will then create a message related to cereal.

Social media post. Adolescents will be asked to choose a media message that they developed and share it with peers in a social media post.

Knowledge quiz. A brief healthy eating knowledge quiz will be completed at post-test. The knowledge quiz is a formative evaluation measure that will be used to assess adolescent

gains in healthy eating related knowledge, and determine the efficacy of the knowledge-based activities in the *Healthy Eating* module.

Relevance to population. Adolescents have increased decision-making with regards to their dietary choices; in fact, Story and colleagues (2002) found that adolescents consume more than half of their daily meals outside of the home. Given that adolescents are more likely to be required to wake themselves up in the morning, and to be responsible for making their own breakfast, or getting to school in time to eat breakfast, it is important adolescent develop strategies around making healthy choices. Despite breakfast being offered at school, participants reported waking up late, missing breakfast offered at school, and not being hungry enough as reasons for skipping breakfast. Extant literature identifies breakfast skipping most prevalent in adolescent females (Story et al., 2002), yet, in focus groups, male and female participants mentioned skipping breakfast on a regular basis.

Education-based interventions have proven successful in decreasing adolescent breakfast skipping and adolescent attitudes towards breakfast consumption (Kothe, & Mullan, 2011). Active learning research suggests that case studies improve adolescent engagement in content because they require a deeper level of thinking (McCaughy, Falman, Martin & Shen, 2011). As such, having adolescents read case studies about peers, and offer advice provides adolescents with a forum to create strategies related to breakfast consumption. The case studies may also cause adolescents to consider their own breakfast consumption behaviors, which has proved to be successful in past nutrition education programs (Hoelscher et al., 2002).

Adolescents who are low-income are more likely to live in neighborhoods that have a surplus of fast food restaurants, convenience stores, and lack healthy options for food (Story et al., 2002; Walker, Keane, & Burke, 2010). Focus group participants mentioned going to nearby

fast food establishments and corner stores to buy food when they did not like the options offered in school or had money of their own. Fast food restaurants are particularly attractive to adolescents as they offer adolescents a place to socialize with peers, a prominent developmental task of adolescence (Drewnowski & Specter, 2004; Story et al., 2002). Considering the autonomy associated with adolescence and the purchase and consumption of meals (Story et al., 2002), interventions designed to improve adolescent dietary behaviors commonly focus on education and strategies for healthy options (Bogart et al., 2010; Hoelscher, Evans, Parcel, & Kelder, 2002). For instance, Diamond Saintonge, August, and Azrack (2011) had adolescents map the food options in their neighborhood to discuss which options were the healthiest. The *This or That: Snacks* activity takes a similar approach, by helping adolescents make the best decisions about their eating behaviors given their limited resources.

Diamond et al. (2011) also had adolescents taste test cereal and compare the nutritional labels on the cereal boxes. The *Cereal commercial critique* activity takes a similar approach by having adolescents compare the nutritional facts listed on the cereal box to those emphasized in the cereal commercial.

Adolescents' deliverance of these strategies to their peers may change their possible health self-concept. Because the strategies are practical for adolescents to implement daily, should adolescents experience dissonance, they may be more likely to use these strategies to match their actual health self-concept with the possible health self-concept they presented to their peers.

Proposed Intervention Procedures

Participants. Participants will include 20 adolescents, ages 14-15. About ten adolescents will represent each age group, and be evenly split by gender. Most, about 80%, of the

adolescents will identify as a racial minority, similar to the demographics in the focus groups.

Over three-fourths of adolescents that identify as low-income, determined by eligibility for free lunch, will be invited to participate in the intervention. Intervention sessions will include mixed age and single gender groups. Five adolescents will be included in each intervention implementation, for a total of four iterations of the intervention.

Recruitment. Brookview House staff will be asked to provide flyers to adolescents who are eligible to participate in the intervention. The eligibility requirement is that adolescents are between the ages of 14-15. I will also attend the after school or summer program at Brookview House to describe the program to adolescents in hopes of actively recruiting eligible participants.

Data collection procedures. Approval of the intervention procedures and all accompanying materials will be made by the Social, Behavioral and Educational Review Board (SBER) at Tuft's University. Signed parental permission forms will be required for adolescent participation in the intervention. Brookview House staff and adolescents will be provided with consent forms for distribution to parents. Adolescents without signed parental consent forms will not be eligible to participate in the intervention program. Active consent procedures will be used to gain adolescent assent. At pre-test data collection, adolescents will be read the assent form by the primary investigator and asked to sign. Adolescents will be compensated for participation in the intervention at all data collection points (pre-test, post-test, and follow-up). Compensation will include a gift card valued at no more than \$10. Pre-test data will be collected a week prior to the intervention, post-test a week following the final module, and follow-up one month thereafter (See Table 2). All data will be collected on-site at Brookview House.

Measurement and Evaluation

As previously mentioned, intervention evaluation will occur one week prior to the first session and a week after the final intervention session (See Table 2). The expected outcomes of the intervention include increased knowledge about physical activity, sleep, and healthy eating behaviors, increased media health literacy skills, and adolescents' shift in stage of change towards readiness for action or action. Therefore, measures will include a health self-concept measure, stage of change measure, knowledge quizzes, a measure of media health literacy, and adolescent engagement in the social media campaign (See Figure 3). Adolescent media use and satisfaction with the intervention will also be evaluated.

Health Self-Concept. The Revised Generalized Health Self-Concept Inventory (R-GHRSC; Thomas & Moring 2014) is a short-form 25-item inventory that measures constructs from the General Health-Related Self-Concept Inventory (GHRSC-76; Wiesmann et al., 2008). Constructs include generalized cognitions related to practicing health behaviors, intention to act in a healthy way, attitudes towards performing health behaviors, and subjective norms regarding performing health behaviors. Measures of social support, stress and coping, optimism, vulnerability to illness are also assessed. All items are assessed using a 7-point Likert scale, ranging from -3 (disagree entirely), 0 (don't know/partially agree-partially disagree), to 3 (agree entirely). The R-GHRSC has not been validated for use in adolescent populations, and I am actively looking for another measure of adolescent health self-concept. Given the dearth of measures to assess adolescent health self-concept, I am uncertain if I will find a measure of health self-concept that has been validated for use with adolescents. Therefore, I intend to pilot the R-GHRSC measure, and conduct cognitive interviews with a small group of adolescents prior to intervention implementation to ascertain the feasibility and appropriateness of this measure for use with an adolescent population.

Stage of Change Measure. Stage of change measures have been developed and validated for use in adolescent populations (DiNoia et al., 2012). Stages of change measures assess adolescents' intention to engage in behavioral change around a specific health behavior, through adolescents' self-reported intention to engage in the given behavior in the next six months (contemplation) or next thirty days (preparation). Adolescents who report engaging in the behavior would be asked how long they have been practicing the behavior, less than six months (action), and longer than six months (maintenance). Adolescents who report no intention to change the behavior are considered in precontemplation.

Knowledge Quiz. Knowledge quizzes include direct questions that measure adolescent knowledge about preventive health behaviors, and are built into the intervention so that preventive health behavior knowledge is assessed a week after the respective intervention session. Several interventions with adolescents have used a quiz to assess adolescent knowledge related to the targeted health behavior (Diamond et al., 2011; Moseley & Gradisar, 2009). Likewise, the knowledge quizzes developed to evaluate the current intervention will consist of about five true or false questions to assess adolescent knowledge about sleep, physical activity, and health eating behaviors.

Media Health Literacy. There are several measures of health literacy that incorporate media health literacy items. For instance, the eHealth Literacy Scale (eHEALS) is an eight item measure that assesses adolescents' knowledge, comfort, and perceived skills at finding, evaluating, and applying electronic health information to health problems (Skinner and Norman, 2006). The Health Literacy Measure for Adolescents (HELMA) is a 44-item measure that evaluates functional, interactive, and critical health literacy in adolescents (Ghanbari, Ranezabkhani, Motazeri & Mehrabi, 2016). A multidimensional measure of adolescent health

literacy, developed by Massey and colleagues (2014), assesses adolescent healthcare related health literacy. Yet, all of these measures assess adolescents' perception of their media health literacy skills. Currently there are no objective measures of adolescent media health literacy. In terms of media literacy, interventions have assessed adolescent media literacy using a rubric to rate adolescents' ability to identify the purpose, target audience, point of view, construction techniques used in media messages, and the omitted information from a media message (Hobbs & Frost, 2003). Arke and Primack (2009) developed and pilot tested a 7-item, measure of adolescents' ability to understand and evaluate media messages in a wide variety of forms. Subscales related to the content, purpose, author, audience, techniques used in the media message, and credibility of the media message were used to assess media health literacy. Yet, the subscales included open-response items that would need to be converted into objective scores. Given that training in media health literacy is likely to improve adolescents' perceptions of their media health literacy skills, the intervention may increase adolescents' self-efficacy for identifying, evaluating, and creating media messages. Self-efficacy is a part of the self-concept and is related to adolescents' confidence in performing a task. As such, measuring adolescents' perceived media health literacy skills may provide useful information about self-efficacy for media to find, understand, and apply health information to health problems or health behaviors. Therefore, use of a perception measure of media health literacy combined with a media health literacy critique task may be viable to evaluate adolescents' media health literacy skills.

Engagement in Media Campaign. Adolescent engagement in the social media campaign will be assessed through manual counts. Because adolescents will be asked to tag the intervention's Instagram page in their posts, the primary investigator will be able to see adolescents' posts. At the end of the intervention session the primary investigator will view

adolescents' pages to determine if they developed or posted any other media related messages outside of the intervention requirements. In addition to adolescents' posts, peer feedback regarding these posts will be evaluated. Counts of likes and qualitative analyses of comments will be used to determine the type of feedback adolescents received from peers.

Social Media Use. At present there are no reliable measures of adolescent social media use. However, measures that examine the purpose of adolescent social media use may be informative to the intervention goals. Seo, Houston, Knight, Kennedy, and English (2014) developed a measure that assesses adolescents' purpose for use of social media sites that were popular at the time of the study (i.e. Facebook, Myspace, Youtube, Foursquare, and Twitter). The importance of social media use for each item is indicated on a seven-point scale from 1 (not important at all) to 7 (extremely important). Items included, to pass time, to communicate with friends, to learn things outside school, and to help me feel better when I am feeling down. Given that this measure was not designed for use with Instagram, and has not undergone reliability testing, I will pilot test this measure prior to implementation to determine its reliability and feasibility.

Evaluation of Intervention. Adolescents will be asked complete an evaluation rating their satisfaction with each of the intervention activities and any suggestions they have for changes to the intervention.

Data Analysis Plan

Data from the pilot results will be used to assess intervention feasibility. Repeated measure analysis of variance (ANOVA) will be utilized to assess participant shift in stage of change towards action for sleep, physical activity, and healthy eating behaviors. In addition, pre and posttest measures of participant knowledge related to the preventive health behaviors, media

health literacy skills, and health self-concept will be assessed to explore whether participants' variables on these constructs improved as a result of the intervention. Analyses will also be used to assess the effect size needed to test the proposed intervention theory of change (Figure 3). Pilot test results may also reveal aspects of the intervention activities that may need to be changed prior to replication.

Discussion

The current study focused on the development of a community-based, health promotion, social media intervention for adolescents who are low-income, racial minorities. Using extant intervention efforts and results from focus groups with adolescents, a five-session intervention, incorporating media health literacy training, education on preventive health behaviors, and scaffolding adolescents in the deliverance of a health promotion social media campaign was designed. Grounded in adolescent health self-concept formation and social development, the intervention theory of change posits that adolescents' deliverance of a health promotion social media campaign may incite dissonance between adolescents' possible and actual health self-concept. Simultaneously, adolescents' dissemination of health related information and strategies to peers may create a social environment that is supportive of adolescents' possible health self-concept. Because the resolution of dissonance requires alignment of the possible and actual health self-concepts, adolescents may be motivated to change their behaviors to match the possible-self-concept. Given that adolescents who are low-income, racial minorities may lack the resources necessary to engage in health behavioral change, the intervention is expected to improve adolescents' readiness to engage in health behavioral change.

A review of extant literature identified adolescent health interventions that focused on the provision of information and strategies, and that targeted developmental processes to encourage

adolescent engagement in health behavioral change. For instance, several interventions have targeted adolescent physical activity (Hamel, Robbins, & Wilbur, 2011; Neumark-Sztainer et al., 2003), nutrition (Bogart et al., 2011; Nicklas, Johnson, Myers, Farris, & Cunningham, 1998), or sleep behaviors (Sousa et al., 2007), whereas few interventions have taken a multiple health behavior approach (Moseley & Gradisar, 2009; Wilson et al., 2002). Interventions that target developmental processes have used peers to deliver health information (Bogart et al., 2010; Harden, Oakley, & Oliver, 2001; Story et al., 2002), used theories of cognitive dissonance (Debar et al., 2011; Wilson et al., 2002), or social media (Bull et al., 2012; Jones et al., 2012; Cavallo et al., 2012; Wójcicki, et al., 2014), to influence adolescent health behavioral change. Yet, adolescent decision-making about health behaviors is reliant on emotions, previous experience, and environmental factors (Albert & Steinberg, 2011). As such, the current intervention design utilized a developmentally grounded, multiple-behavioral approach. Yet, there are several limitations to such an approach.

Limitations

Firstly, the current intervention was developed in reference to extant intervention efforts that include behavioral strategies that may not be useful for the population of adolescents served by Brookview House. Given the limited resources of the population, the focus group results were integral in translating extant intervention strategies into strategies that may be beneficial, and sensitive to the needs and resources of adolescents who are low-income, racial minorities.

The methodological challenges experienced during focus group data collection should be considered. The focus group sample included participants that represented the full range of adolescence, creating difficulties in the design of a developmentally appropriate intervention. Older adolescents have more autonomy and experience with health decision-making, and greater

cognitive capacities with regards to critical thinking (Sanders, 2013); therefore an intervention for older adolescents may not require as much scaffolding. As such, the age range of the intervention needed to be narrowed so that the intervention activities could be designed to match the developmental stage of the intended population. Therefore, the intervention is designed for adolescents ages 14-15, the most representative age group of participants in the study. Literacy issues during focus group data collection may have affected adolescents' completion of the demographic form, and some of the results. Although focus group transcripts were combined with demographic forms to determine participant health behaviors and to understand the factors that may impact health behaviors, individual adolescents' engagement in each preventive health behavior could not be determined. Lastly, the focus groups were not designed to gather information about adolescent knowledge regarding preventive health behaviors, and were largely uninformative with respect to the level of knowledge that adolescents had about each preventive health behavior. To resolve this limitation the intervention assumes a basic level of knowledge and is designed for equal dosage of information with respect to each preventive health behavior.

Another limitation is the design of the current intervention as a knowledge-based intervention. Research suggests that education-only interventions are less effective than interventions that engage adolescents in interactive behavioral change strategies (Hoelscher et al., 2002). However, integrating behavioral change strategies into the current intervention design would create difficulties in determining whether adolescents' presentation of a possible health self-concept via social media is responsible for adolescent behavioral change. To increase the likelihood that adolescents may adopt the behavioral change strategies, the intervention includes strategies that are relevant to the population and sensitive to their available resources.

Lastly, the measures for evaluation of the current intervention do not include measures of the context of the organization. Because the intervention is designed for implementation in a community-based organization, consideration of the organization's priorities, goals, and availability of programs related to adolescents' preventive health behaviors would allow for deeper understanding of how the context of the organization may support or attenuate the effects of the intervention.

Future Directions

Future studies will focus on pilot testing the current intervention to assess feasibility. Specifically, pilot test results will be used to determine proper dosage of intervention sessions and information to adolescents around each preventive health behavior, the appropriateness of intervention activities, and measures. The intervention will then be amended for future replication as a large-scale study. To address the aforementioned limitations, the large-scale study design will include three conditions, a control, the current intervention, and an intervention that incorporates the features of the current intervention in addition to activities that allow adolescents to practice behavioral change strategies. Using these three conditions, I will be able to determine whether the addition of interactive activities increases behavioral change above and beyond the current social media health promotion intervention. Evaluations of organization contexts will also be included in the measures for the large-scale study, to determine whether organizations support the effects of the intervention, and whether the intervention can be easily implemented into different community-based programs. Future studies will also explore adolescents' social environment through measures of both media and peers. Social network analysis can be utilized to explore the feedback adolescents receive from peers, and whether the intervention has contagion effects on peers' engagement in preventive health behaviors.

Conclusion

This study focused on the development of a tailored intervention to promote engagement in preventive health behaviors for adolescents who are low-income, racial minorities. The design of the intervention capitalizes on developmental tasks associated with adolescence, namely self-concept formation and social development, and uses social media as a platform to incite adolescent motivation towards behavioral change, and to construct a social environment that is supportive of adolescents' health behavioral change. Through the intervention adolescents will gain the skills necessary to evaluate the accuracy of, to create, and to share health-related information. Building adolescents' knowledge and competencies related to understanding and applying health information to health behavioral change and sharing health information may lead to empowerment. Given that a sense of agency is linked to better health status in adulthood (Marmot, 2005; Stokols, 1996), the outcomes of the intervention may improve health past adolescence and into adulthood.

Table 1. Participant socio-demographic variables and media use

Variable	<i>N</i> = 13	Frequency
Age		
12	1	7.7
13	6	46.2
14	2	15.4
15	2	15.4
16	1	7.7
17	0	0
18	1	7.7
Sex		
Male	6	46.2
Female	7	53.8
Race/Ethnicity		
Black/African-American	8	61.5
Hispanic/Latino	2	15.4
Native Hawaiian	1	7.7
Mixed Race	2	15.4
Language Spoken at Home		
English	9	69.2
Spanish	2	15.4
French	1	7.7
Free Lunch		
Yes	12	92.3
No	1	7.7
Social Media Site Used Most Frequently		
What's App	1	7.7
Facebook	5	38.5
Instagram	5	38.5
Other	1	7.7
All Devices Used to Access Social Media Sites		

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Cellphone	12	92.3
Tablet	6	46.2
Laptop	4	30.8

Table 2. Timeline of intervention activities and evaluation

Week	Intervention Activity
1	Pre-test data collection
2	Module 1: Media and health
3	Module 2: Critiquing and Creating Media Health Messages
4	Module 3: Sleep
5	Module 4: Home-Based Physical Activity Sleep knowledge Quiz
6	Module 5: Health Eating Home-based physical activity knowledge quiz
7	Post-test data collection Healthy eating knowledge quiz
8	Follow-up (one week later)

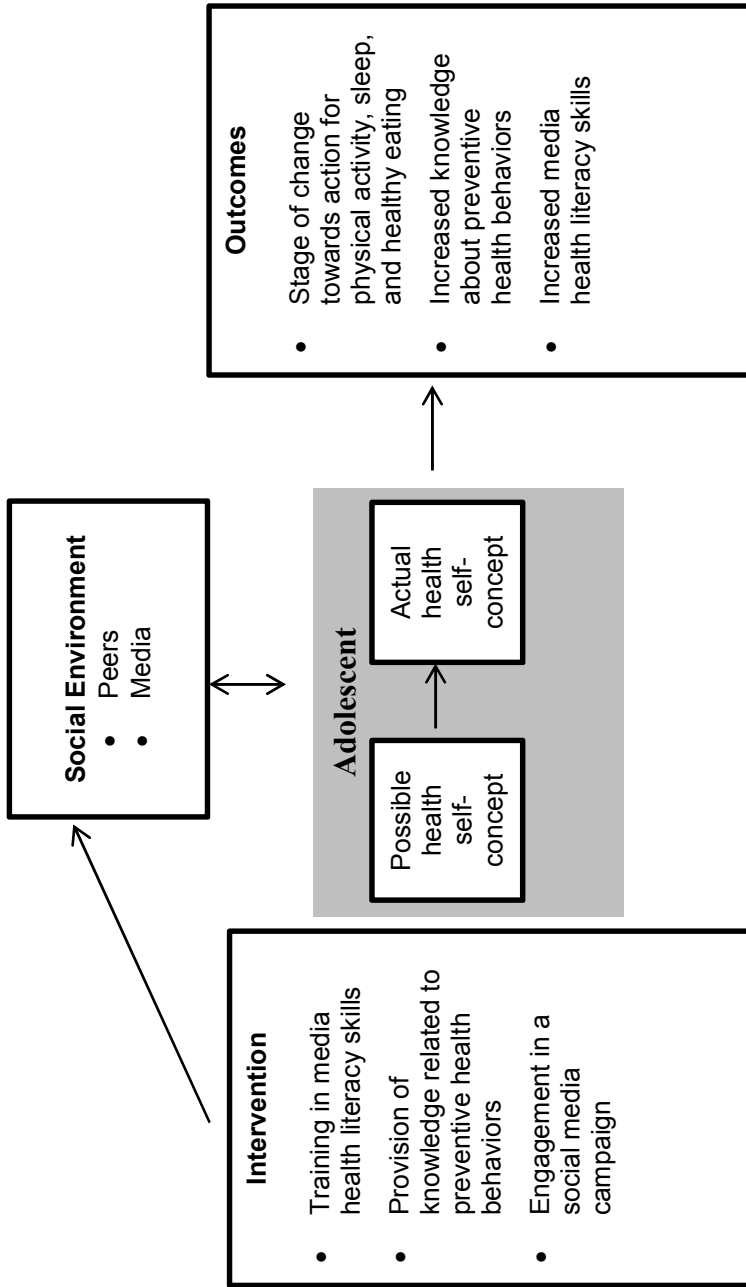


Figure 1. Conceptual framework of the intervention theory of change.

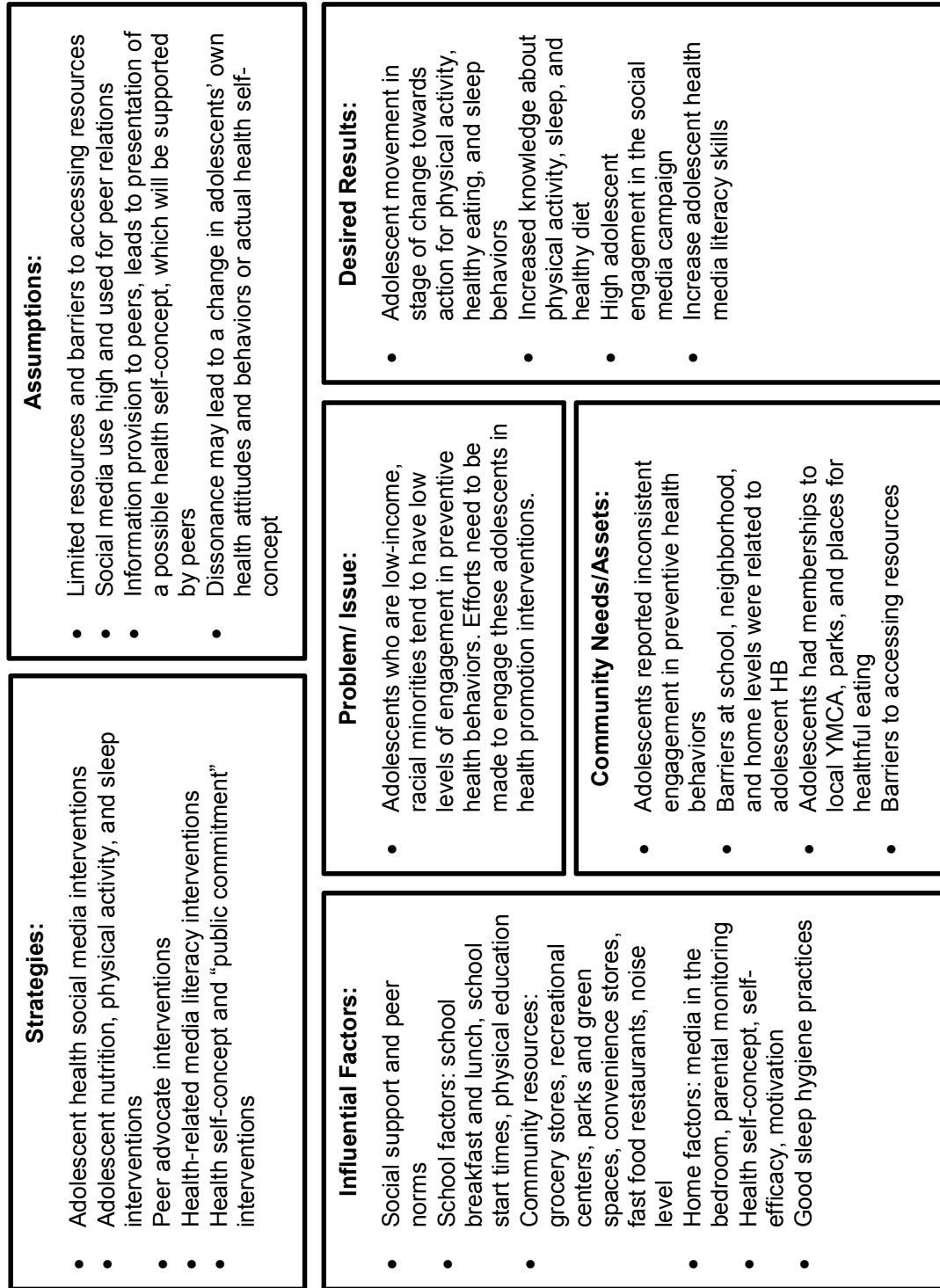


Figure 2. Intervention theory of change logic model

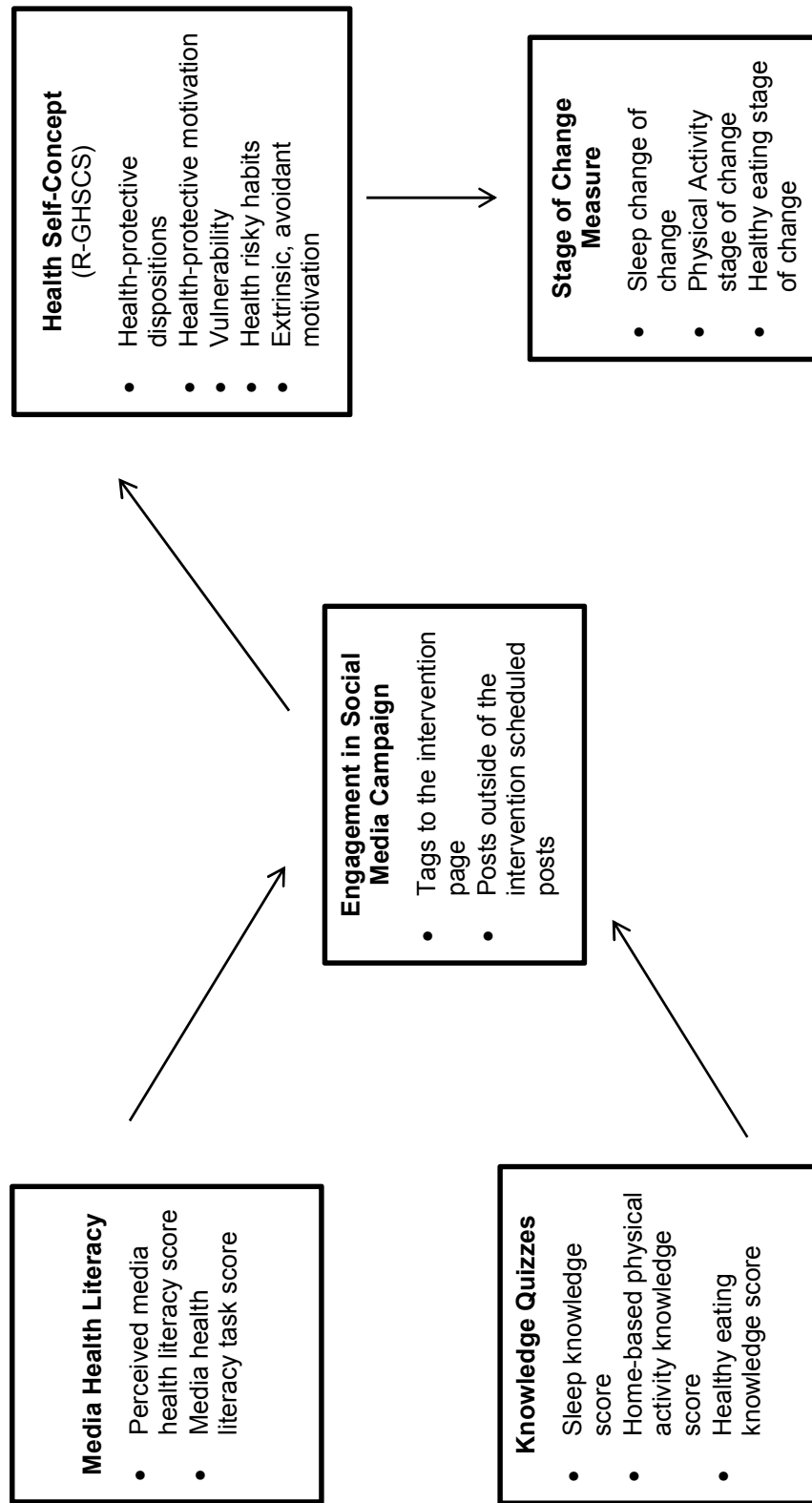


Figure 3. Map of the associations between intervention evaluation measures and variables. The figure depicts the predicted associations between intervention evaluation measures.

Appendix A:

Focus Group Demographic Form**Background Questions**

1. How old are you? _____ years old

2. What is your sex?
 Male
 Female

3. How do you describe yourself? Check all that apply.
 American Indian or Alaskan Native
 Asian
 Black or African American
 Hispanic or Latino
 Native Hawaiian or Other Pacific Islander
 White
 Other, please specify _____

4. What grade will you be entering in September?
 9th grade
 10th grade
 11th grade
 12th grade

5. Do you receive free or reduced lunch at school? _____ Yes _____ No

6. What is the primary language spoken in your home? _____

7. Were you born in the United States? _____ Yes _____ No

If no, where were you born? _____

If yes, did your parents migrate from another country? _____ Yes _____ No

If yes, what country did your parents migrate from? _____

8. How long have you lived in the United States? _____ years
9. Please chose the best description of where you typically sleep at night (check all that apply):
- At home with my parents or guardians
 - At a friend's or relative's home with my parents or guardians
 - At a friend's or relative's home without my parents or guardians
 - In a supervised shelter with my parents or guardians
 - In a supervised shelter without my parents or guardians
 - In a hotel, motel, car, park, campground, or other public place with my parents or guardians
 - In a hotel, motel, car, park, campground, or other public place without my parents or guardians
 - Somewhere else
10. What is your home zip code? _____

Health Related Questions

1. Have you ever been diagnosed with a chronic illness (e.g. asthma, diabetes, cancer)?
_____ Yes _____ No
If yes, what illness? _____
2. How do you get to and from school? (check all that apply):
- Walk

- Public transportation
 - Ride bike
 - School bus
 - Driven / Drive
3. About how far do you walk in your travels to and from school?
_____ miles
4. What time do you wake up to go to school? (Please indicate a.m. or p.m. for all questions) _____
- a. What time do you go to bed on a school night? _____
 - b. What time do you go to bed on the weekend? _____
 - c. What time do you wake up on the weekend? _____
 - d. What time do you go to bed over the summer? _____
 - e. What time do you wake up over the summer? _____
5. How often do you consume energy and caffeinated drinks like soda, coffee, red bull, or monster?
- Two or more times a day
 - Once a day
 - Twice a week
 - Once a week
 - Other, please specify _____
6. What kinds of snacks are available at your home? (Please list 5)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

7. Which social media site do you use most? (Do not include SnapChat.)

a. What do you use it for?

8. How do you access these sites? (check all that apply)

- Cellphone _____ Website accessed (e.g., Facebook) _____
- Computer at home _____ Website accessed (e.g. Facebook) _____
- Tablet _____ Website accessed (e.g. Facebook) _____
- Computer at school _____ Website accessed (e.g. Facebook) _____
- Computer at library _____ Website accessed (e.g. Facebook) _____
- Other, please specify _____ Website accessed (e.g. Facebook) _____

9. Do you normally watch T.V. or use social media before bed?

_____ Yes _____ No

a. How long do you watch T.V. or use social media before bed?
_____ hours

10. Is there a TV in your room?

_____ Yes _____ No

Appendix B:

Focus Group Protocol**Agenda:**

- I. **Introduction and consent forms:** Introduce myself, purpose of the study, and have adolescents sign consent forms. Explain the agenda for the focus group.
- II. Turn on the audio recorder. Ask “I would like to ask your permission again to audio record you. Can I record your responses?”, ask for a verbal yes or no from participants.
- III. **Focus Group Questions:** Explain the format of the focus group and that all questions are based on their experience, there is no right or wrong answers. Explain again how the information will be used.

Mental Health Questions:

1. What makes you stressed or worried?
 - a. How do your sleep habits change when you are worried about something or stressed?
 - b. How do your exercise habits change when you are worried about something or stressed?
 - c. How do your eating habits change when you are worried about something or stressed?
2. How do you normally deal with stress or being worried?
 - a. How does this help you resume your normal eating, sleep or physical activity habits?

Eating Behavior Questions:

1. What is your morning routine on school days?
2. What is your morning routine on weekends?
3. What is your morning routine during school break?

4. How often do you eat breakfast?
 - a. What types of foods do you eat for breakfast?
 - b. Where do you eat breakfast?
 - c. Who prepares breakfast?
5. ***What kinds of snacks are available at your house?
6. When you have money, what kinds of foods do you buy yourself? What makes you want to buy those foods?
7. What makes you want to eat healthy?
 - a. What makes it difficult for you to eat healthy foods?
 - b. If you could change your eating habits, what would you change? Why?
8. ***How often do you consume energy and caffeinated drinks like soda, coffee, red bull, or monster?

Physical Activity Questions:

1. ***How do you get to and from school?
 - a. ***About how far do you walk in your travels to and from school?
2. Think back to the school year, do you normally exercise or engage in physical activity after school?
 - a. How often do you exercise after school? Why or why not?
 - b. What types of exercise do you participate in after school?
 - c. Where do you mainly exercise afterschool?
3. Do you engage in physical activity on the weekends?
 - a. Why or why not?
 - b. What types of exercise do you participate in on the weekends?
 - c. Where do you mainly exercise on the weekends?
4. Do you exercise or engage in more physical activities during school breaks?
 - a. How often do you exercise during school breaks? Why or why not?
 - b. What types of exercise do you participate in during school breaks?
 - c. Where do you mainly exercise during school breaks?
5. What do you normally do after school?
 - a. How often do you exercise? Why or why not?

- b. What types of exercise do you participate in?
 - c. When and where do you mainly exercise?
 - d. Who encourages you to exercise?
6. What makes you want to exercise?
 - a. What makes it hard for you to get enough exercise?
 - b. If you could change your exercise habits, what would you change? Why?
 7. Does anyone encourage you to exercise? Who? How do they encourage you to exercise?

Sleep Questions:

1. What time do you wake up to go to school?
2. What do you do before bed on a school night?
 - a. ***What time do you go to bed?
 - b. ***What time do you wake up?
3. What do you do before bed on the weekends?
 - a. ***What time do you go to bed?
 - b. ***What time do you wake up?
4. What do you do before bed during school break?
 - a. ***What time do you go to bed?
 - b. ***What time do you wake up?
5. What makes you want to get enough sleep?
 - a. What makes it hard for you to get enough sleep?
 - b. If you could change your sleep habits, what would you change? Why?
6. ****Do you normally watch T.V. or use social media before bed?
7. ***For how long?

Social Media Questions:

1. Which social media site do you use most?
 - a. What do you use it for? (not snapchat)
 - b. How do you access these sites?
 - a. How often do you access this site? What do you post?

(Questions A-C will be asked after adolescents identify the social media site they use.)

(***Means that question is asked on demographics form and in focus group)

IV. **Debrief:** Thank you for participation, explaining what the project is again and how to contact me.

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